Addressing Diversity in Health Science Students by Enhancing Flexibility Through e-Learning

Joy Penman[1] and Jyothi Thalluri[2]
[1]Centre for Regional Engagement, University of South Australia, Whyalla, Australia
[2]Division of Health Sciences, University of South Australia, Adelaide, Australia
joy.penman @unisa.edu.au
jyothi.thalluri@unisa.edu.au

Abstract: The technological advancements for teaching and learning sciences for health science students are embedded in the Thalluri-Penman Good Practice Model, which aims to improve the learning experiences of science students and increase student retention and success rates. The model also links students from urban and rural areas, studying both on- and off-campus, with the university campus and with co-students and is primarily structured to boost students' confidence in studying sciences. This paper investigates the introduction of online initiatives, namely, electronic learning communities, online self-assessments, virtual classroom, and the inclusion of social media Facebook to offer practically oriented science learning to urban and regional science students. It examines the issues surrounding the implementation of these technological innovations by identifying the perceptions of the students about their use, illuminating their impact on students, and clarifying the practical issues encountered in the application of these online initiatives. A descriptive analytical approach was used to explore the experiences of students in the use of these innovations. Findings of the evaluations show that the technology exemplified in this paper provides: an approximation of face-to-face lecturing when it is not possible for a lecturer to be at the same site as the class; enhance communication between students and lecturers; and help students access, collaborate and interact with each other. The use of technology that is carefully considered in each stage of the program has been shown to enhance the quality of university teaching and learning, allowing students' greater accessibility, flexibility and interaction.

Keywords: online technology, e-learning, flexibility, learning and teaching

1. Introduction

It has been observed for many years that health science students undertaking science-based programs are confronted by educational challenges. The branches of science dealing with structures, functions and disease processes of the body and management of conditions appear to be stumbling blocks for students. Learning science courses is not easy (Strube, Thalluri & Kokkinn 2004). Enormous amounts of information must be remembered and reading science literature is difficult.

Moreover, increased access to higher educational opportunities in health science courses has led to diverse equity student cohorts with a wide range of academic abilities. Some students, particularly those from regional areas with limited choice in school subjects, may have learning difficulties often associated with a poor background in biology and basic sciences essential to understanding the human body. Students who fail their sciences are delayed in their academic progress and may even decide to leave the program altogether. Iling (1998, cited in Zeegers and Martin 2001), stresses the costly implications of student failure rates at university. Consequently, our University has organised campus- and program-specific systems and processes to help students succeed in their science courses. Some of these include: orientation activities to introduce new students to library facilities and the online environment; the employment of learning advisers who work closely with students to enhance their academic skills; and adopting appropriate pedagogies in teaching science courses. Another strategy is the optimal use of information and communication technology (ICT) by making learning resources available on-line and encouraging discussion groups that allow students greater interaction.

Reference this paper as: Joy Penman and Jyothi Thalluri. "Addressing Diversity in Health Science Students by Enhancing Flexibility Through e-Learning" *The Electronic Journal of e-Learning* Volume 12 Issue 1 2014, (pp89-100), available online at www.ejel.org

The heterogeneity of our students and limitations in rural and regional areas necessitate different and creative strategies to assist students to achieve academic success. Contemporary teaching and learning models in health science that can accommodate such diverse requirements are imperative. The Thalluri-Penman conceptual model is one such framework. It represents the culmination of 45 years of teaching experience combined and the development of innovative learning initiatives designed to contribute to individual student success and positive learning experiences in studying health sciences in higher education.

The Thalluri-Penman model is student-focused and an interactive framework for teaching and learning health sciences. The model aims to guide the delivery and coordination of science courses in order to improve students' positive learning experience and improve student retention and success rates. The approach also links students from urban and regional areas, studying both on- and off-campus, with the university campus and with fellow students. It is structured to: boost students' confidence in studying sciences; provide flexibility and instant feedback to large classes using the latest technology; increase students' capacity to succeed as university students; create and enhance students' positive and satisfying learning experience; reduce students' fears about studying science; and minimise the risk of students dropping out of science-based university studies. The model highlights the optimal use of ICTs, specifically the maintenance of electronic learning communities, online self-assessments, virtual classroom, and inclusion of social media. The description and analysis of the impact of these ICT initiatives is the focus of this paper. The paper concludes by discussing the implication of the initiatives in the educational preparation of students.

2. The Thalluri-Penman conceptual model

The application of the Thalluri-Penman conceptual model for learning and teaching science successfully begins at the time of students' first encounter with the university and extends right through to the completion of their health science program. See Figure 1. Emphasis is placed on achieving sound learning outcomes in such areas as anatomy and physiology, pathophysiology, pathology, microbiology and pharmacology, relating to various health science programs, such as Nursing, Medical Radiation, Physiotherapy, Occupational Therapy, Pharmacy and Podiatry, offered by the University of South Australia (UniSA). The model has evolved from listening to students talking about their learning experiences, looking for insights to help them engage more effectively with their studies, and devising ways to make this engagement happen. The model therefore incorporates features that students have found empowering and relevant to their learning needs.

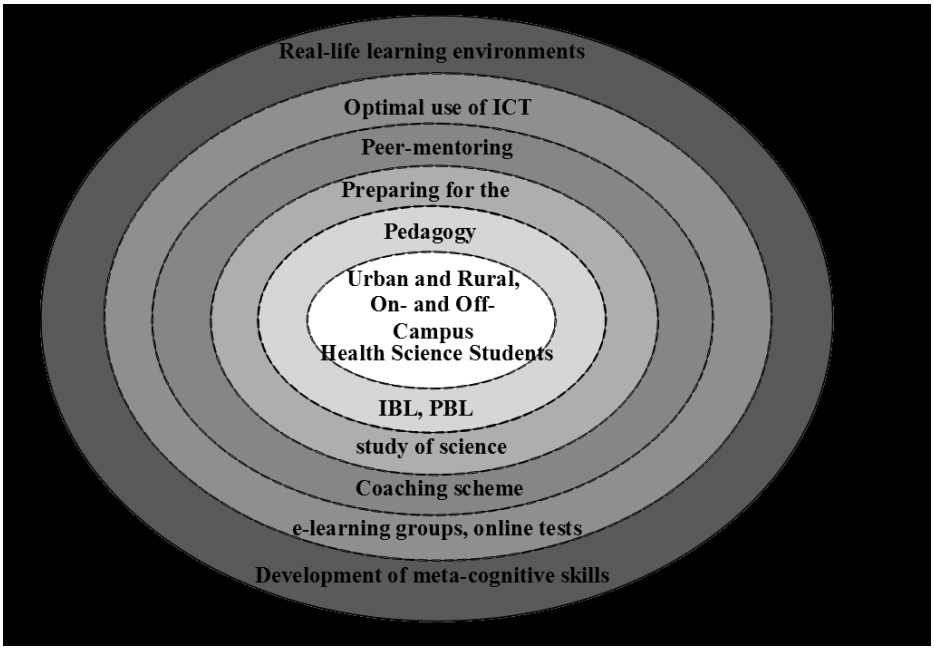

Figure 1: The Thalluri-Penman conceptual model for the successful learning and teaching of science

Legend: IBL (inquiry-based learning); PBL (problem-based learning); CBR (case-based reasoning); ICT (information and communications technology)

The key features of the model include a number of staged initiatives across students' health science undergraduate program. Depicted in the innermost sphere is the core of the conceptual model – the students with their diverse backgrounds and needs trying to learn sciences. Reflected in the second sphere are the pedagogies such as inquiry-based learning (IBL) and problem-based learning (PBL) on which science teaching is based.

In IBL, learning is organised around the individual rather than the content and students learn problem-solving skills, informal reasoning as well as constantly seeking relevance and connections (Duffy & Cunningham 2001; Stripling 2003). IBL falls under the constructivist approach characterised by collaboration, active engagement and personal relevance, amongst others (Savery & Duffy 1996). PBL, on the other hand, is an instructional methodology that allows the attainment of knowledge and skills through real practice situations (Williams 2001). The learners are immersed in the PBL context, requiring them to learn the complexities of an authentic problem, search for connections across different bodies of knowledge, recognise what they know and what they need to know about a problem, and suggest solutions to a given problem derived from the workplace (Gonzalez & Salmoni 2008). In the PBL process, students go through various stages, such as formulating explanations, clarifying personal understanding, critiquing resources, identifying gaps in knowledge, and synthesising what has been learnt and how best to approach the problem (Williams 2001).

Symbolised in the third sphere are pre-university activities for beginning students. In particular, the three-day to a week-long preparatory course called Preparing for Biosciences, is offered to students to introduce them to the language, basic concepts, and clinical usefulness of biosciences (Penman 2005). This short course currently targets incoming students, many of whom are transitioning to university study from non-traditional backgrounds and who have diverse equity characteristics and learning needs.

For first-year students, a student-driven peer-mentoring program (also called student coaching scheme and Golden Key tutoring scheme) is available and this is represented in the fourth sphere of the conceptual model. This initiative provides opportunity for second- and third-year nursing students, who have achieved highly satisfactory grades for all bioscience courses, to receive training to act as mentors to first-year students and to those who have been identified as 'at risk' in their bioscience and pathophysiology studies (Penman & White 2006; Thalluri, Kokkinn & O'Flaherty 2008).

Embedded in the fifth sphere is the optimal use of ICT for all levels of students. Of the many ICTs used and integrated in course delivery, the electronic learning communities, online self-assessments, virtual classroom and the use of Facebook, are examined for this paper.

The final and outermost sphere in the Thalluri-Penman model depicted in Figure 1 symbolises the contextualisation of science, where science is applied specifically to the roles of the future health professionals, illustrating the implications of science for real-life environments and future practices. In addition, students are taught to think about their thinking and learning, and develop meta-cognitive skills which will prepare them for life-long learning. Skills that are metacognitive in nature include: planning the way to approach a learning task, monitoring comprehension, and evaluating the progress towards the completion of a task; they include knowledge about when and how to use particular strategies for learning, problem solving or creative and analytical thinking (Metcalfe & Shimamura 1994).

3. Information and communications technologies used

The electronic learning communities (also referred to as online discussion groups), online assessment and online problem-based conferencing via discussion groups are part of the UniSAnet online learning environment developed in house at the university.

The electronic learning communities have been used in various fields, incorporating both synchronous and asynchronous electronic communications. E-learning and e-teaching is possible and potentially useful for interaction and collaboration, which are crucial for effectively engaging off-campus students and minimising student disengagement. The creation of electronic learning groups, which are carefully designed learning communities whose members work together online to benefit each other, is central to successful engagement in science materials. These have been shown to supplement face-to-face teaching and foster further learning beyond the classroom (Penman & Cook 2009; McCarthy, Smith & DeLuca 2010).

Online self-assessment is a mechanism of ongoing formative assessment for first-year students in nursing and midwifery, and other levels as well. This initiative encourages students to monitor their own progress in the bioscience and clinical science courses and offers complete flexibility in the manner in which students can undertake the assessments. Assuming responsibility for one's own learning is a critical aim of tertiary education, and one which underpins the capacity for students to engage with lifelong learning and exercise good judgement about their body of knowledge, consequently assisting in the development of two of UniSA's graduate qualities (UniSA 2009a).

Virtual classroom is a conferencing technology conducted in cyberspace allowing students and staff to collaborate with audio, video and graphics using a range of tools and function (UniSA nd). It's features include: group text, audio and video chat, presentation sharing, whiteboard collaboration, group polling and file sharing. Virtual classroom is used as a learning space where nursing students construct knowledge in the area of mental health conditions, psychotropic agents and other treatment modalities. Students use the virtual classroom to explore topics, clarify and confirm understandings, hone assessment skills and recommend courses of action for clients.

Finally, the use of Facebook is important to science learning, especially for regional students. Facebook is an online social network site where personal information and photographs are shared and where groups may be formed to connect people. Pre-determined real-life cases with problems and corollary questions are provided to students via Facebook. A case reports typically on a client presenting to a hospital with various medical complaints (Ward & Hartley 2006). Students attempt to solve the general problems of disease causation and suitable interventions. Discussions are threaded so that learners can follow successive postings to a topic.

4. Context

First- and second-year nursing students evaluated these technological advances from 2008 to 2013 in a metropolitan and regional campus of our university. Thirty-four (n=34) second-year off-campus nursing students evaluated the electronic learning communities created. One-hundred twenty-six (n=126) first-year nursing students were surveyed for the online assessments. Twenty-four (n=24) first-year off-campus nursing students were invited to comment about the use of virtual classroom, while seventeen (n=17) second-year nursing on-campus students were surveyed about their perceptions on the use of Facebook.

5. Methodology

Survey methodology was used to evaluate the different ICT initiatives.

The electronic learning communities were evaluated by inviting students to respond to questions on how discussion pages helped them in their studies and difficulties they encountered. The invitation posted on the

discussion pages at the conclusion of the science course included an explanation of the purpose of the survey. E-mail was used to send follow-up reminders to participate in the survey.

The use of online self-assessment and virtual classroom were evaluated via the university's course evaluation instrument (CEI) and 'My course experience', consisting of core Likert-type questions to which students agreed or disagreed. Optional questions were attached to the CEI specifically for the online self-assessment querying the value and impact of the ICT on the students.

On the other hand, the use of Facebook was evaluated by a 25-item Likert and open-type questionnaire posted to students at the conclusion of the course. This post-intervention questionnaire covered various aspects of students' Facebook experiences. Students were asked to indicate the extent of their agreement with statements describing their experiences. See Table 4. Other items explored the best things about the use of Facebook, suggestions for improvement, most important outcome gained, and additional comments. See Table 5.

Survey information given to the students included a statement regarding the voluntary nature of participation and assurance of confidentiality. Completion of the surveys was taken as consent.

6. Students' perceptions of the technologies

Results of the evaluations of these ICTs are reflected in the following tables.

The evaluation of the electronic learning communities showed that these were most favourably rated by the students. Of the 78 students enrolled in the science unit using discussion boards, 34 responded to the survey, for a 44% response rate. All respondents (n=34) agreed that the discussion pages had helped them in their study of the course. See Table 1.

Table 1: Student perceptions about electronic learning communities

Question	Comments (representative responses)
How have the discussion pages helped you?	"daily contact with lecturer" "helped to keep on track" "allowed students to share techniques to understand the material" "provided challenge" "personal connection" "support and guidance" "learning deep and meaningful" "linking of knowledge and experience" "I can honestly say it was fun" "reflection" "enriched by others' personal experience" "quick responses to any queries" "additional revision questions"

	"keeping in touch with other students" "what keeps me going and are a great support … as sometimes one feels so isolated" "preparing us for exams" "makes me feel part of something special" "[lecturer] was monitoring our progress"

Online self-assessment tests have many positive outcomes for student-centred learning and improved student feedback, according to the 126 survey respondents. See Table 2.

Table 2: Student perceptions about online self assessment

Statement	Agree to strongly agree N=126	Percentage
Online self-assessment quizzes give me instant feedback.	91	72
Online self-assessment quizzes help me to focus on the areas to learn.	79	63
Online self-assessment quizzes are good practice to prepare for fortnightly tests and the final exam.	83	66
Flexibility of time enables me to practise online self-assessment quizzes often.	82	65

Of the 24 students enrolled in the unit who participated in the virtual classroom, 7 commented on the technology, for a 29% response rate. Overall, the students articulated positive impressions of this initiative, however, it seemed that timing and access to the recordings were problematic. Table 3 summarises the survey results.

Table 3: Student perceptions about virtual classroom

Question	Comments
How has the virtual classroom helped you?	"increased my interest in the topic, though couldn't attend all because of work" "am enjoying the course" "greater understanding and contact with lecturer" "looking forward to more classes" "assisted my learning and made me feel part of the group" "I couldn't access any VC recordings for mental health, whether by Joy or any other teacher - very frustrating." "I could not access tutorials at all... they were blocked for the whole study period."

The responses evaluating the importance of Facebook within the second-year student cohort in Scientific Basis in Clinical Practice indicated the beneficial effects of the technology for students' academic experience and satisfaction. A survey of ten students from a total of seventeen internal students (representing 59% response rate) revealed that Facebook gave students flexibility, provided opportunities to learn and work with peers and

interact with the lecturer, and increased their interest in the subject. In fact, students concluded that it was an innovative way to learn, recommending the initiative to other students. See Table 4.

Table 4: Student perceptions about Facebook

Statements for rating agreement	Strongly agree	Agree	% Combining Strongly agree and agree	Neutral	Disagree	Strongly disagree
Facebook gave students flexibility in their learning.	4	6	100			
Facebook provided me opportunities to learn with peers.	6	4	100			
Facebook provided me with the opportunity to work with others.	4	6	100			
Facebook provided me with the opportunity to direct my own learning.		8	80	2		
The Facebook initiative facilitated the development of lifelong learning skills.		8	80	2		
As a result of my Facebook experience, I engaged well with the course content.	5	3	80	1	1	
There were many opportunities for me in learning this medium of learning and teaching.	4	6	100			
The initiative increased my interest in the subject.		10	100			
The Facebook initiative allowed me to synthesise my past and present knowledge.		3	30	7		
The initiative further honed my research skills.		6	60	4		
The Facebook initiative was adequately introduced.	4	4	80	2		
The duration of involvement and attention required for the Facebook initiative was		10	100			

acceptable.						
The Facebook initiative assisted my learning about the topics.	3	6	90	1		
The Facebook initiative provided me opportunities to interact with the lecturer.	8	2	100			
It provided me opportunities to learn from my peers.	8	1	90	1		
The Facebook initiative was a pleasant learning experience.	4	4	80	2		
The initiative was a good substitute for classroom.	4		40	2	2	2
I found the use of Facebook an effective way to learn.	6	2	80	2		
I found the use of Facebook an innovative way to learn.	4	6	100			
Overall, the use of Facebook enhanced my understanding of disease processes.		8	80	2		
I recommend this initiative to other students.	8	2	100			

Table 5 summarises the results from the open questions querying about students' perceptions about Facebook.

Table 5: Post-intervention responses from open questions (Perceptions about Facebook)

Open questions	Response
The best things about the use of Facebook are:	Continuation of learning outside of class room time Interaction with peers and lecturer Instant feedback Quick replies from other peers and lecturer Easily accessible. Able to share and access information freely. More contact with peers and lecturer with flexible hours. Gives students the opportunity to learn from each other and discuss uni related issues. It gives a glimpse of how and what other peers are thinking, so any input I make may have a positive impact. Also, to our learning by getting feedback,

	also, group study could be achieved.
Some things that I think would improve future offerings are:	Having a Facebook learning page for each course Clarify more fully the use of this program to enhance the communications between students to ensure their understanding and progress.
What was the most important outcome gained from this initiative?	Communication with classmates Instant feedback on all questions about the course or other subjects from Joy and peers. Extra information from lecturer Closer relationship with lecturer, I felt more at ease and could ask questions any time which helped my learning. It gave opportunity to learn if used properly. I saw it as giving several opportunities to students and their lecturer.
Additional comments	I am not an avid user of Facebook. However, this experience has been a positive experience and has encouraged me to use Facebook as a learning tool, and a tool to further my involvement with groups associated with nursing. Using Facebook for me was excellent as I live away and travel to campus, so this was a quicker way to keep in contact and gain info from other peers and the lecturer. Students submitted their portfolios for perusal which was good but I expected more discussion on topics from peers.

7. Discussion

This paper highlighted the use of ICTs, which is a significant part of the Thalluri-Penman good-practise model for successful learning and teaching of health sciences. The Thalluri-Penman conceptual model is premised on the belief that developing and implementing innovative learning initiatives for commencing and continuing health science undergraduates can significantly contribute to individual student success and positive learning experience. The model embraces electronic learning (e-learning); it provides 'new, interesting, rewarding, exciting and effective' way of learning (Santy & Smith 2007, p. 1). E-learning incorporates ICT to enhance learning and teaching and networking is an essential feature of e-learning. While e-learning is similar with distance learning in purpose, it is different because it uses online communication tools that keep students engaged with fellow students, lecturers, and course content. Best of all is the 24-hour sharing of information and communication between learners and quick access to learning materials.

However, in accordance with university best practice in teaching, it is important that academics continually evaluate each innovation that they undertake. Evaluation of the ICTs is crucial in order to optimise the use of the technology and continue improving on it. It is important also to meet the needs of students and lecturers, gain feedback, minimise expense and enhance course delivery.

8. Benefits of ICTs according to the students

The results of the evaluation of e-learning communities indicated that they were beneficial for various reasons and these could be categorised as intrapersonal and interpersonal benefits. Intrapersonal benefits included:

enabling "learning [to be] deep and meaningful", "[helping] to keep on track", allowing "daily contact with lecturer", receiving "quick responses to any queries", "[providing] challenge" and "personal connection" and making readily available "support and guidance". Interpersonal benefits included: "[allowing] students to share techniques to understand the material" with each other, being "enriched by others' personal experience", "keeping in touch with other students" and providing support "… as sometimes one feels so isolated."

Likewise, there were many personal benefits derived by students in participating in online self-assessments. Their responses were grouped under the following: taking responsibility for their own learning, obtaining feedback on their understanding, contributing to further knowledge development, inspiration to engage with the course readings, and assistance with overall learning and exam preparation (see also Thalluri, Wache & Hiscock 2006 and Thalluri 2007). Students commented:

> *"Great form of independent study where I could see areas I needed to work on without having access to a lecturer."*
>
> *"Excellent for instant feedback and identifies areas that need improvement."*
>
> *"They cover points that I had not thought to read about. By taking the quizzes I have improved my knowledge on subjects."*
>
> "*Very good complement to the readings.*"

The evaluation of virtual classroom revealed that this ICT was workable for the purpose of the mental health course considering the desirable comments gathered. Results showed that learning was enhanced and that the environment created was conducive to learning, understanding, feeling of belonging and enjoyment of the course. The comments from students on the table throw further light on the benefits derived from this ICT. One problem identified however was scheduling the virtual classes to fit the students' itinerary as many were gainfully employed while studying.

The findings from the Facebook evaluation showed that the manner in which Facebook was used for the course impacted positively for the majority of students. Exactly how it benefitted them related to their learning of the course content as Facebook provided students many opportunities for learning (100%). Facebook assisted students' learning about the topics (90%), helped them direct their own learning (80%), and enhanced understanding of disease processes (80%). Most students maintained that it was an innovative (100%) and effective (80%) way to learn. It increased students' interest in the subject (100%), resulting in their being well engaged with the course content (80%).

The most important impact of Facebook was the opportunities it provided for greater interaction with the lecturer (100%), learning with/from peers (100% and 90%), and working with others (100%). Students reported:

> *"More contact with peers and lecturer with flexible hours."*
>
> *"Gives students the opportunity to learn from each other and discuss uni related issues."*
>
> *"Instant feedback on all questions about the course or other subjects from Joy and peers."*
>
> *"Closer relationship with lecturer, I felt more at ease and could ask questions any time which helped my learning."*

9. Issues and concerns

While there may be many benefits derived from using these technologies, there are also several issues and concerns in their use. Many students are limited by their ability to access the technology, while others do not

possess the required technical skills nor devote adequate time and effort for e-learning (Santy & Smith 2007). For e-learning to be beneficial, students need to be active learners; they need to be consistent, disciplined, and organised also. Furthermore, while e-learning enhanced by various ICT applications provides a stimulating learning environment, it requires students to be self-directed and motivated in their studies.

In our evaluation, some students had misgivings about the virtual classroom because they were not able to join classes and because they could not access virtual classroom recordings. This tells us that the use of ICTs must be carefully and strategically planned and implemented taking into consideration the availability of students. Setting up the relevant questions for the online assessments was challenging and time consuming. Staff members involved were overwhelmed with emails from students requesting information about how to access these resources and assessments. Though adequately introduced and designed, a concern about Facebook was the need "to clarify more fully the use of Facebook to enhance the communications between students to ensure their understanding and progress". In addition, Facebook was not a good substitute for classroom according to students.

Moreover, ICT is not necessarily a panacea for improving the quality of teaching and learning; it is important that academics continually evaluate each innovation and appraise their changing practices. The 'high tech' of technological resources and the 'high touch' of human responses to them, to use Naisbitt's terms (Naisbitt 1982), are aspects of learning that academics must strive to achieve. Good technology does not compensate for poor teaching practices (Penman & Ellis 2008). According to Naisbitt, the 'high tech' of technological innovations does not do away with the need for the human aspect – the 'high touch'. In our study, a student observed online assessments negatively stating that: "… the nature of the assessment was that there was no face-to-face contact with students nor lecturers."

The more advanced the technology, the greater the need for supplementing it with the real or virtual presence of keen, caring teachers, along with supportive colleagues, if its benefits are to be maximised. Being aware of this need for 'high touch', future evaluations need to include items that implicitly gauge the success of ICT integration in course delivery.

10. Conclusion

The Thalluri-Penman model provides a structured set of innovative learning initiatives for commencing and continuing health science undergraduates. The conceptual model has significantly contributed to individual student success and positive learning experience at UniSA. It is an evolved approach which reflects the accumulated wisdom and experience of both of these university teachers and addresses contemporary and best practice teaching and learning requirements for diverse student cohorts.

ICT is embedded in the model and the various initiatives implemented have positively impacted on students' experience and performance in studying sciences. From our study, the use of technology that is carefully considered in each stage of the program has been shown to enhance the quality of university teaching and learning, allowing greater accessibility, flexibility and interaction. ICT is beneficial in terms of providing an interesting, rewarding, exciting and effective way of learning and teaching; fostering greater interaction and collaboration amongst students and staff; and effectively engaging diverse student cohorts and minimising student disengagement. However, it is imperative also that academics consider these information and communications technology and electronic learning with caution because of some issues and concerns they raise. They need to carefully and strategically plan their ICT applications and continually evaluate the same.

References

Department of Education, Science and Technology. (2002) "Terms of Reference for the Higher Education Bandwidth Advisory Committee", [online],

http://www.dest.gov.au/sectors/higher_education/policy_issues_reviews/reviews/previous_reviews/higher_education_bandwidth_advisory/terms_of_reference.htm.

Duffy, M. and Cunningham, D. J. (2001) "Constructivism: Implications for the Design and Delivery of Instruction, The Association of Educational Communications and Technology", [online], http://www.aect.org/intranet/publicationd/edtech/07/index.html.

Gonzalez, M.L. and Salmoni, A.J. (2008) "Online problem-based learning in postgraduate medical education – content analysis of reflection comments", *Teaching in Higher Education*, Vol. 13, No. 2, pp. 183-192.

McCarthy, J.W., Smith, J.L. and DeLuca, D. (2010) "Using online discussion boards with large and small groups to enhance learning of assistive technology", *Journal of Computing in Higher Education*, Vol. 22, pp. 95–113.

Metcalfe, J. and Shimamura, A.P. (1994) *Metacognition: knowing about knowing,* MIT Press, Cambridge, MA.

Naisbitt, J. (1982) From forced technology to high tech/high touch. In *Megatrends: Ten New Directions Transforming Our Lives* (pp. 39-53), Macdonald, London & Sydney.

Penman, J. (2005) Preparing for Sciences' workshop: A new initiative for Whyalla nursing students, in A. Brew & C. Asmar (Eds.) *Annual International HERDSA Conference on Higher Education in a Changing World, Sydney, 3-7 July*, pp. 381-388, HERDSA Inc, Milperra, NSW.

Penman, J. and Cook, J. (2009) Off-campus nursing students online for science studies, *Annual International HERDSA Conference on the Student Experience,* Darwin, 6-9 July.

Penman, J. and Ellis, B. (2008) Evaluating technology-based learning: "High-tech" and "high-touch", in J. McConachie, M. Singh, P. Danaher, F. Nouwens and G. Danaher (Eds.), *Changing University Learning and Teaching: Engaging and Mobilising Leadership, Quality and Technology,* pp. 339-358, Post Pressed, Brisbane.

Penman, J. and White, F. (2006) Peer-mentoring program 'pop-up' model for regional nursing students, *Journal of University Teaching and Learning Practice*, Vol. 3, No. 2, pp. 124-136.

Santy, J. and Smith, L. (2007). *Being an E-learner in health and social care*. Routledge, Oxon.

Savery, J. and Duffy, T. (1996) Problem-based learning: An instructional model and its constructivist framework, in B. Wilson (Ed.), *Constructivist Learning Environments: Case Studies in Instructional Design,* pp. 135-148, Educational Technology Publications, New Jersey.

Stripling, B.K. (2003) Inquiry-based Learning, in B.K. Stripling and S.H.H. Westport (Eds.), *Curriculum Connections through the Library (Principles and Practice)*, pp. 3-39, Libraries Unlimited, Connecticut.

Strube, P., Thalluri, J. and Kokkinn, B. (2004) Strategies for success in Human Biosciences, In: H. Calabretto & B. Kokkinn (Eds), *Strategies for Success in Nursing Studies.* 2nd ed. pp. 107-113, School of Nursing & Midwifery, University of South Australia, Adelaide.

Thalluri J (2007) "Course tailored continuous online formative self-assessment tool improves students' academic performance in biosciences", *Focus on Health Professional Education: A Multi-disciplinary Journal*, Vol. 9, No. 2, pp. 97-100.

Thalluri, J., Kokkinn, B. and O'Flaherty, J. (2008) "A Student Coaching Scheme (SCS) for First Year University Students: Positive Learning Experiences and Individual Success in Biosciences", *International Journal of Learning,* Vol. 15, No. 9, pp. 135-144.

Thalluri, J., Wache D. and Hiscock, J. (2006) "Enhancing Student Feedback Satisfaction Level from a large class Using Online Self Assessment Tasks (SAT)", *International Journal of Learning*, Vol. 13, No. 3, pp. 137-145.

University of South Australia. (2009a) "Graduate Qualities", [online]. UniSA, http://w3.unisa.edu.au/gradquals/default.asp.

University of South Australia. (2009b) "Quick reference guide - TellUs2", [online]. UniSA, http://w3.unisa.edu.au/helptellus2/quick-guide.asp.

University of South Australia. (nd) "Virtual Classroom", [online] UniSA, http://resource.unisa.edu.au/course/view.php?id=5873.

Ward, K. and Hartley, J. (2006) "Using a virtual learning environment to address one problem with problem based learning", *Nurse Education in Practice*, Vol. 6, No. 4, pp. 85-91.

Williams, B. (2001) "Developing critical reflection for professional practice through problem-based learning", *Journal of Advanced Nursing*, Vol. 34, No. 1, pp. 27-34.

Zeegers, P. and Martin, L. (2001) "A learning-to-learn program in a first-year chemistry class", *Higher Education Research and Development,* Vol. 20, No. 1, pp. 35-52.