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# Which E-Learning Technology is Right for me?

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**Abstract**—The range of technologies available to support teaching and learning in higher education continues to grow exponentially. There is a growing expectation for educators to be well informed and familiar with the many suitable technologies and systems that are available to be used for delivering courses online, and to complement classroom (face-to-face) education. Detailed evidence of the perceptions and applications of the use of e-technologies is needed to inform not only teaching practice, but also policy development. These e-technologies need to be matched to pedagogical styles in order for online teaching and learning to be successful. Based on 33 semi-structured interviews, this paper presents a study of staff experiences of e-technologies, using Chickering and Gamson's 'Seven Principles of Good Practice' to provide educators with information about the most appropriate e-technology to support their pedagogical aims.

**Index Terms**—e-technologies, e-learning, pedagogical styles, teaching, good practice, higher education.

## I. INTRODUCTION

There are many different definitions of e-learning with Romiszowski[1] counting more than 20 different definitions within 50 articles. In this study the comprehensive definition from Tavangarian, Leypold, Nölting, Röser and Voight's[2] review of the literature has been adopted: E-learning is "all forms of electronic supported learning and teaching, which are procedural in character and aim to effect the construction of knowledge with reference to individual experience, practice and knowledge of the learner. Information and communication systems, whether networked or not, serve as specific media ...to implement the learning process" (p. 274). Throughout this paper the term e-technology is used to describe a technology that supports e-learning.

Brewer, De Jonge and Stout [3] suggest that: "Ideally, technology plays a transparent supporting role in the learning process ... appropriate integration of learning technologies casts technology in the background ... gratuitous and/or awkwardly or inappropriately employed learning technologies can actually juxtapose the role and importance of technology allowing it to compete with the learning process" (p.39).

Doiran and Asselin [4] identified the tendency for educators to limit their uses of digital technologies for course-management and the addition of online resources to their teaching, while resisting any fundamental change in the structure and delivery of course. Educators need to be well informed and familiar with the available technologies if they are to use them effectively for e-learning. However the number of different e-technologies available to educators continues to grow rapidly. Additionally technologies

and devices not originally considered as teaching tools (such as social networking and smart devices) are now permeating teaching and learning spaces. With this extensive portfolio of e-technologies, it is difficult for educators to determine which technology, if any, is most appropriate to support the pedagogical aims of their teaching. There are growing expectations that educators are tech-savvy and familiar with a wide range of technologies. These expectations have placed increasing pressure on educators[5, 6].

There is a need to provide quality assurance and best practice for e-learning captured as follows: "... while e-learning is no longer a novelty, it is now facing the same problems that conventional [higher education institutions] have faced for many years – quality assurance, assessment and the exchange of best practice" [7]. The learners of today "expect more control of their learning situations, prefer active learning and they engage in networked communities for their social and professional lives" [4]. While these learners are committed users of a wide range of digital technologies, they require support in developing their information and critical literacies.

The overall research described in this paper investigated the use of current e-technologies in the literature and used the outcomes to undertake a study within Deakin University, Australia. This study considered the University's focus on providing online learning environments that "are flexible, student-centred and accessible to our diverse range of students, utilising appropriate technology to enhance teaching and learning and providing student support services which are responsive to student needs and responsive to students support needs" (derived from the University Teaching and Learning Plan). This paper reviews staff experiences, challenges and opportunities with e-technologies using Chickering and Gamson's[8] 'Seven Principles of Good Practice' to evaluate which e-technologies are most appropriate in higher education.

## II. THE PROJECT

Detailed evidence of the perceptions and applications of the use of e-technologies is needed to inform not only teaching practice, but also policy development. These e-technologies need to be matched to pedagogical styles in order for online teaching and learning to be successful.

The broad focus of this project enables an improved student experience of e-learning by providing resources for academics to make informed decisions as to the best use of the portfolio of e-technologies. This is achieved by identifying the experts (academic staff users) of the current e-technologies within the University, and capturing their knowledge and expertise of using those technologies through interviews. These expert views are complemented by capturing student perceptions of using

these e-technologies. The ways they are effective for learning is captured through focus groups. Of particular interest in this context are the staff and student perceptions of the enablers of, and barriers to using the e-technologies.

This project has four main phases:

1. A detailed literature review with a focus on articles published in 2009 or later[9]. An annotated Endnote library of 832 articles was created during this process. The 40+ technologies identified from the literature were analysed and classified into 14 categories.
2. A study of the staff experience of e-technologies used for teaching and learning at Deakin University in 2010. Thematic analysis of the collected qualitative data supported by Nvivo software, using first-order and second-order coding strategies outlined by [10]. The outcome of Phase 1 provided a strong basis for the empirical part of this project. Here staff known to use the e-technologies identified from Phase 1 were interviewed. A thematic analysis of the collected qualitative data was undertaken. The outcomes from this phase are the focus of this paper.
3. Identifying student perceptions of these e-technologies; their learning through and with them; and any perceived benefits and shortcomings. Students who were enrolled in classes in which the e-technologies were adopted by the staff were invited by email to participate in focus groups.
4. A report summarising the project with particular emphasis on providing guidelines and exemplars of good practice. The results of this phase will be the subject of future papers. It is expected that the outcomes here will provide educators with information about the most appropriate e-technologies to support the pedagogical aims of their teaching. Exemplars of good practice will be included.

The literature review from Phase 1 [9] produced a list of e-technologies as shown in Table 1. In this review, the broader categories of virtual learning environments (VLE), online learning environments (OLE), and learning management systems (LMS) were excluded. The exclusions include products such as Blackboard, SAKAI, Moodle, Desire2Learn, AJAX and others that were identified as OLE, VLE or LMS. The rationale here is that generally these very large systems are centrally supported within the university environment and have adequate resources, support and exemplars to allow informed decisions to be made about their use to support specific pedagogical requirements, unlike the range of e-technologies being investigated here.

### III. METHODOLOGY

#### A. Interviews

Consultation with staff known to use e-technologies, combined with an investigation of the University's website enabled the identification of educators with expertise in teaching with particular e-technologies representative of the 14 categories identified (see Table I). These e-technology experts, covering the University's four faculties of Arts & Education, Business & Law, Health, and Science & Technology, and four campus locations, were contacted by email and invited to participate in this research. A research assistant conducted thirty-three inter-

TABLE I.  
CATEGORIES OF E-TECHNOLOGIES

	e-technology	Examples
1	<i>Assessment and Survey tools</i>	Respondus, Quiz Builder, StudyMate, Zoomerang, Survey Monkey, Exam-Builder
2	<i>Asynchronous Communication</i>	Email, Announcements, Discussion forum, SMS
3	<i>Digital Repositories</i>	Google Scholar, ePortfolio, Equella, Youtube
4	<i>Management and Administration tools</i>	Turnitin, Gradebook, iGoogle, myYahoo
5	<i>Photosharing</i>	Flickr, Gallery2, Zoomr, Picasa, Photobucket
6	<i>Podcasts, Vodcast- and Streaming</i>	Podcast, iLecture, iTunesU, MyPod, ePodcast
7	<i>Shared Documents</i>	Google Docs, ZohoWriter, SlideShare, Elgg, Clearspace
8	<i>Social Bookmarking</i>	del.icio.us, CiteULike, Simple, Diigo, Connotea, digg, reddit
9	<i>Social Networking</i>	Facebook, MySpace, Bebo, Ning, LinkedIn
10	<i>Subscribed Content Delivery</i>	Google Reader, Bloglines, RSS Feeds
11	<i>Synchronous Communications</i>	Google Talk, iChat, CUworld, ICQ, Skype, Elluminate Live, MSN /Yahoo messenger
12	<i>Virtual Worlds</i>	Second Life (SL), Virtual Graffiti, eSimulations
13	<i>Weblogs and Microblogs</i>	Blogger, Wordpress, Twitter, RAMBLE, Yammer
14	<i>Wiki</i>	PBWorks, Wikispaces, MediaWiki, WikidPad, Zwiki

views of approximately 35 minutes in duration over a period of several months. All interviews were one-on-one and the majority of these interviews (30) were conducted face-to-face in the interviewee's office. Due to geographic constraints the remaining three interviews were conducted via phone. The interviews were semi-structured, and each was recorded and transcribed verbatim. Interviewees were asked to describe the context in which their e-technology was used – the application, the environment and the student cohort; how they used the technology; and challenges, difficulties or failures they encountered during or post implementation of the e-technology. In the interview staff were also asked to provide their rationale for adopting the e-technology and the affordances it offered.

#### B. Qualitative Analysis

Leininger[11] argues that, “the goals of qualitative research are not to ‘measure’ something but rather to understand fully the meaning of phenomena in context and to provide thick accounts of phenomena under study”. One important step in qualitative research analysis is coding, which “involves linking, breaking up and disaggregating the data so that once coded, the data look different, as they are seen and heard through the category rather than the research event” [12].

Nvivo software was used to aid the data analysis; the primary reason is the facility to make the analysis transparent to other researchers in the team who are dispersed geographically most of the time. Another important benefit is the ability to manage the empirical data as well as the large amounts of research literature[13].

The principles of qualitative research apply regardless of whether software is used, and Maxwell provides useful

categorizing strategies for coding; identifying distinctions between “organizational”, “substantive” and “theoretical” categories of concepts [14]. Saldana’s [10] work builds upon Maxwell by providing specific first-cycle and second-cycle coding strategies which help to guide the analysis. Once the empirical data was coded, the model and query functions were useful to look for patterns in the data.

Models were developed for each of Chickering and Gamson’s seven principles (based on the coding) to understand the clustering of theoretical concepts and the associated technologies identified as being most relevant in the interviews. Figure 1 is an example of this. The following section discusses the seven principles and the supporting empirical data, linking the discussion back to the relevant accounts in the literature.

#### IV. THEORETICAL LENS: SEVEN PRINCIPLES FOR GOOD PRACTICE

Although some higher education institutes have demonstrated measurable progress in moving toward a student-centred philosophy in their delivery of courses, many have not. Often their administrative structure, information systems, and approach to the delivery of student services continue to represent the traditional hierarchy experienced by previous generations of students [15]. However “building a new learning landscape for today’s learners will require the embracing of new metaphors and new conceptualizations of teaching and learning in tertiary institutions” [4].

Chickering and Gamson’s [8] ‘Seven principles for good practice in undergraduate education’ was originally written for classroom instruction, and it was subsequently revised to include online educational practice. It is now widely accepted among post-secondary institutions. The list of the Seven Principles was sent out to the interviewees for reflection prior to their interview. During their interview they were asked to identify up to two of the principles the e-technology supported and how.

The widely accepted principles are a useful way to consider the commensurability of these e-technologies for e-learning.

##### A. Principle 1: Encourage contact between students and faculty

This principle refers to the importance of frequent student-faculty contact in and out of classes being a significant factor in student motivation and involvement. Faculty concern helps students get through rough times and keep them on track in their studies. Knowing a few faculty members well enhances students’ intellectual commitment and encourages them to think about their own values and future plans.

According to the experts interviewed in this research, the e-technologies that supported the first principle were (see Figure 1):

- Asynchronous communication
- Social Networking
- Synchronous Communication
- Virtual Worlds
- Shared Documents
- Weblogs and microblogs

##### • Podcasts, vodcasts and streaming

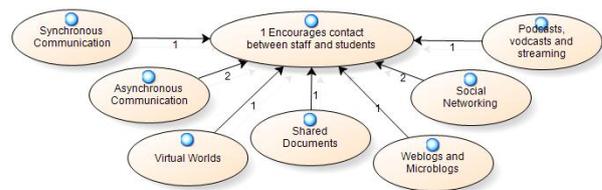


Figure 1. PRINCIPLE 1

NOTE: the numbers in each figure indicate the number of interviewees who felt this principle applied to their e-technology

Meyers, Bennett and Lysaght [16] argue that asynchronous communications are one of the most versatile tools at an educator’s disposal, affording students the opportunity to access education beyond traditional models of education. A public health lecturer found SMS a particularly useful technology when trying to track down students who were not replying to emails “Lots of students came back...that it was a nice thing, it really got quite a lot of response, much more than emails” (Interview 12).

However, Pelowski, Frissell, Cabral and Yu [17] found that the immediacy of synchronous tools like Elluminate Live (known as eLive at Deakin) to facilitate class communications afforded a number of benefits to students that asynchronous communication tools did not achieve. One of the educators using eLive in a counselling course (Interview 4) proved to have significant benefits: “particularly for students who are isolated and need the contact with tutors or lecturers. I think it is a great medium in the sense that it can make the distance closer”.

The use of Facebook as a communication medium within a Law course (Interview 19) was found to encourage contact between students and faculty in a non-threatening way: “It’s been a means between myself and students who find that perhaps, it is a less threatening means of communication”.

While social networking sites such as Facebook, MySpace and Bebo were not developed as educational tools they have been eagerly adopted by some educational institutions seeking new levels of student engagement and interactivity [18]. However some educational institutions are concerned by the possibility of postings which might be considered inappropriate and they address this by blocking access to such tools through their network [19].

Contrary to the negative perceptions of using this very popular technology in an educational context, De Villiers [20] found that the use of Facebook for academic discussions with post graduate distance learning students enhanced students’ learning and insight.

However Twitter was found to be useful in encouraging contact between students and educators in an Industrial Relations course (Interview 29):

“As you can imagine international relations changes on an hourly basis so materials that are printed are often rendered out of date very quickly. So I saw it in particular as an opportunity to do two things. One is to provide students with real time updates of important events and what they should read to keep abreast of it. Most of my Twitter tweets, as they call them, are links to journals, films, magazines, books, so that students can follow that up themselves. I guess it is like a live unit guide which can be manipulated and added to instantaneously. The second

part was really to maintain an ongoing conversation with the students throughout the trimester so that they could see what their Unit Chair was following and it gave them an opportunity, I guess, to peer over my shoulder and see the kind of activities and the things that I have to read to keep up with developments and the kind of research that I do.”

Foulger, Ewbank, Kay, Popp and Carter [21] argue that for educators, social media present a new arena where the scope of their authority and responsibility is not always clear. What is clear is that this topic needs more investigation.

### B. Principle 2: Develops reciprocity and cooperation among students

This principle is based on the premise that learning is enhanced when it is more of a team effort than a solo race. Good learning, like good work, is collaborative and social, not competitive and isolated. Working with others often increases involvement in learning. Sharing one’s own ideas and responding to others’ reactions sharpens thinking and deepens understanding.

E-technologies supporting this principle were identified by the experts as:

- Wikis
- Asynchronous Communication
- Social Networking
- Shared Documents
- Digital Repositories
- Photo Sharing
- Assessment and Survey Tools

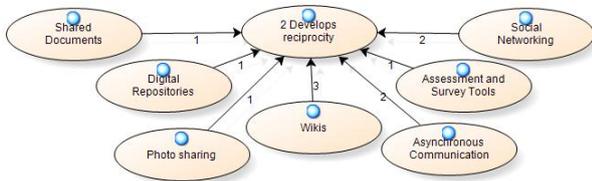


Figure 2. PRINCIPLE 2

In using eLive for group work “[this principle] was also evident because the nature of the unit or the nature of the work that the students needed to do meant they had to develop reciprocity and cooperation” (Interview 4).

Klisc, McGill and Hobbs [22] suggest that when assessment is associated with discussion, there are higher levels of participation and quality of outcomes than when no assessment is used. In using online quizzes within Blackboard Vista (the University’s LMS at the time) for a chemistry course “the cooperation between students is linked to these quizzes through the discussion group where the students can help one another and they are actively encouraged to discuss the specific questions within the quiz” (Interview 1).

The literature argues that accuracy, relevance and verifiability of the content of wikis can be questionable [23, 24]. However O’Leary [25] argues that they can be as accurate as traditional published sources but acknowledges that a lack of peer reviewing does result in a lack of quality assurance and that authors can introduce bias. In using wikis for a Design course staff “developed a piece of software that allowed students to assess each other’s

contribution online and anonymously, which seemed to work quite well in architecture...the tool was tested in units with cohorts of 1000 students and also on multiple campuses with multiple tutors” (Interview 7).

The literature suggests that photosharing websites have the potential to open lines of dialogue, communication, and learning” [26]. Working outside of Blackboard Vista using a Virtual Gallery, the lecturer reported that:

“We had the opportunity to develop up to three new units for photography. One of the things that we wanted to look at was the collaborative [aspects]. Working with photography in a context that was contemporary, the development of social software image exchange is part of youth culture and certainly now more than ever we are sharing on computer and phone sharing of images and things like that so it was really important to put the student experience of photography into that contemporary context - the monitor-based to screen-based shared image, and also the opportunity for students to simply become aware and develop a sense of other, you know working with people in other cultures, other locations, other situations, I think that’s a really important thing in the student’s development - that collaborative process” (Interview 10).

Short message service (SMS) is a method for sending messages to mobile phones and these are becoming more commonly embedded in higher education pedagogy. Anderson and Blackwood [27] report that the widespread adoption of mobile devices together with the increased emphasis on lifelong learning have become key drivers in the development of applications and uses of mobile devices. In running a postgraduate course which is available not only for students of this University, but also three other local universities, those from the other universities had limitations in accessing the system, however they found ways to build reciprocity and cooperation among students “There is an obligation...so it was that shared responsibility for what was going to happen in the unit...so I was engaging them in a way that says ‘you are part of this, it’s not just me standing up the front and the front and giving lectures and you passive, this is about the relationship between us’, and so I was trying to build that reciprocity” (Interview 12).

### C. Principle 3: Encourages active learning

According to this principle, learning is not a spectator sport. Students do not learn just by sitting in classes listening to teachers, memorizing pre-packaged assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences and apply it to their daily lives. They must make what they learn part of themselves.

E-technologies supporting this principle were identified by the experts as:

- Synchronous Communication
- Virtual Worlds
- Social Networking
- Wikis
- Podcasts, Vodcasts and Streaming
- Digital Repositories
- Weblogs and Microblogs

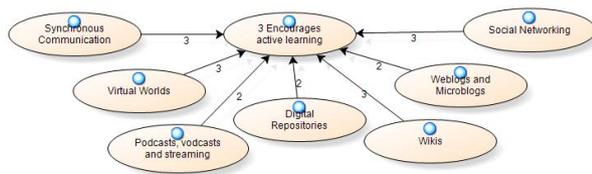


Figure 3. PRINCIPLE 3

Multi-user Virtual Environments are “environments that support learning activities such as experimentation, exploration, task selection, creation, and dynamic feedback” and they “provide opportunities for social interaction, collaboration, an increased sense of shared presence, partially dissolved social boundaries, and lowered social anxiety” [28].

The analysis revealed that virtual worlds appear to be well suited for practical-based courses, “It doesn’t replace the experience they have in placements, it’s to enhance that, it’s complementary. It will never replace the lived experience because of the demand. And not only that, sometimes it is down to chance. I just see the virtual maternity clinic a way of enhancing learning and that is supported by what students were saying to me, that they went back to perhaps one scenario where there is a woman who has abuse and they went back to that because they were fascinated by the role of the midwife and she managed that rather sensitive situation to guide the woman and give her support” (Interview 3).

In using social networking as part of a course related to Law, the lecturer felt that active learning was evident, “That happened quite a few times where someone would write a lot about what was happening in the class and they would go onto Facebook and everyone would join in on the discussion about it, so obviously this is active learning and students are reflecting on their performance” (Interview. 13). Although not traditionally considered a discussion forum, Facebook provides a similar system as discussion boards, which support online communication and collaboration in situations where face-to-face communication is not possible [29].

Application of wikis in the academic context include fostering learning in students [30]; the collaborative writing of a textbook by faculty and students [31]; as a tool to understand artworks [32]; and to improve report writing amongst students [33]. In using wikis in a Design course “Encouraging active learning – absolutely. Because they were having to do some research and think about some of the issues. They had these articles with some questions that prompted them to think about them and they had to really discuss it with each other, do a little bit of research” (Interview 9).

#### D. Principle 4: Gives prompt feedback

This principle encourages a critical reflection on educators’ skills and knowledge. It argues that knowing what you know and don’t know focuses learning. Students need appropriate feedback on performance to benefit from courses. When getting started, students need help in assessing their existing knowledge and competence. In classes, students need frequent opportunities to perform and receive suggestions for improvement. At various points during their studies, and particularly at the conclusion of the course, students need chances to reflect on

what they have learned, what they still need to know and how to assess themselves.

E-technologies supporting this principle were identified by the experts as:

- Assessment and Survey Tools
- Digital Repositories
- Synchronous Communication
- Management and Administration Tools
- Virtual Worlds
- Social Networking

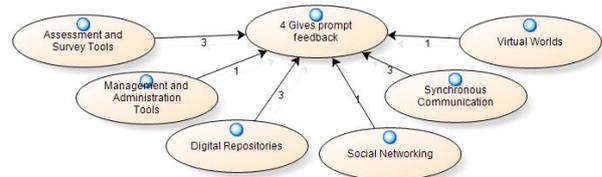


Figure 4. PRINCIPLE 4

Using virtual scenarios within Blackboard Vista were also a useful way to give prompt feedback to students “we have always got workshopping materials and we give them feedback, and we get students to do responses – we have readings each week which are tied in ... to issues of writing and we get them to put them up in a forum, so we use a forum for that as well” (Interview 22). However there are some important concerns about the use of such technologies, in that educators are often ill prepared to take advantage of these new technologies [34], which could seriously complicate student/teacher interactions.

In using the quizzes in Blackboard Vista for assessment, “the prompt feedback is pretty self-evident, they attempt a quiz and as soon as they complete that attempt they get the feedback” (Interview 1). Turnitin software also emphasises prompt feedback to students “Gives prompt feedback – yes it does, that’s an advantage of the tool” (Interview 15).

Hernandez-Ramos [35] suggests that wikis promote the art of reflective writing due to the public nature of these tools. However some students experience feelings of uncertainty if they are not accustomed to writing and publishing their ideas to such a wide audience [35]. In a similar way, the use of online journals are a great learning tool, however using them for feedback on a weekly basis can be overwhelming “I used to have very many more reflections go in and I couldn’t keep up with the feedback; I was... I went barmy. So I have had to limit the number because of the sort of feedback I want to give back to them. So I used to get them to reflect on each topic, pretty well, but now I get them to think about three or four topics at a time” (Interview 23).

Collaboration technologies such as eLivealso support the giving of prompt feedback to students: “some of the sessions ran a little bit differently, some people would ask one question as a practice question and then they would give feedback, group feedback, and then they would ask the next question. Other people, perhaps career advisors, might ask one question and give individual feedback. I thought it was very important that individual feedback was given to each student” (Interview 32).

### E. Principle 5: Emphasizes time on task

According to this principle, time plus energy equals learning. Some feel strongly that time on task is important, and that such emphasis needs to be built into any e-technology chosen. “There is no substitute for time on task. Learning to use one’s time well is critical for students and professionals alike. Students need help in learning effective time management. Allocating realistic amounts of time means effective learning for students and effective teaching for faculty. How an institution defines time expectations for students, faculty, administrators and other professional staff can establish the basis of high performance for all” (Interview 33).

E-technologies supporting this principle were identified by the experts as:

- Digital repositories

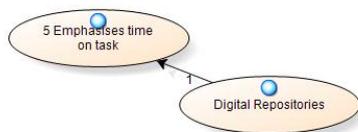


Figure 5. PRINCIPLE 5

The e-portfolio is a type of digital repository where the focus is on an individual’s collection of artefacts. It is argued that the use of e-portfolios can help students better understand learning goals and reflect on the knowledge and skills they have developed [36, 37]. E-portfolios facilitate “the process of collecting, reflecting on, sharing, and presenting learning outcomes and other professional accomplishments via a digital medium” [38]. Some staff allow students some flexibility in how they spend their time, particularly in courses where the assessment is an online portfolio. They feel that as long as assessment items are submitted by the required date, then some flexibility is useful for the student “there is also this thing about time on task, well they have to spend time creating stuff but they also need to learn how to plan and so there are general deadlines. I don’t say ‘Week six you have got to have done this, and do this’ but I will say ‘The assignments are due at these times and there is a presentation at a particular period of time’. So they have to work towards those things and how they do it is up to them” (Interview 28).

Some however, feel that time on task is not so important when using online journals for Reflective Journaling as their e-technology of choice “we always have an end date when all seven posts have to be in, and then they have to apply for an extension, a proper official extension, but in between that we let it be a little bit flexible on the day that they submit. It might end up that one student might do a post and do the next post in three days and then not do another one for two weeks because they have been sick or something, and then they catch up – you just have to be flexible” (Interview 27).

### F. Principle 6: Communicates high expectations

This principle suggests that if educators expect more from their students, they will get it. High expectations are important for everyone – for the poorly prepared, for those unwilling to exert themselves, and for the bright and well motivated. Expecting students to perform will become a self-fulfilling prophecy when teachers and institutions

hold high expectations of students, faculty, administrators, and other professional staff.

E-technologies supporting this principle were identified by the experts as:

- Assessment and Survey Tools
- Virtual Worlds
- Podcasts, Vodcasts and Streaming
- Management and Administration Tools

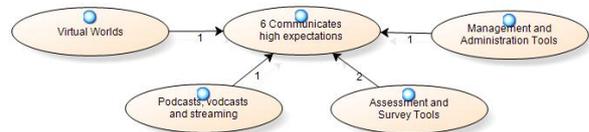


Figure 6. FPRINCIPLE 6

It was found that using an audience response system (like a clicker but replaced with a mobile phone) was useful for students to see their ranking amongst the rest of the class, which would in turn communicate whether they were meeting expectations or not. “Once they know their ranking they can see that people have a higher ranking than themselves or better skills and some students will be attracted to that. If that’s not presented nobody knows their position in the class and they might think they are the best student, and they’re not. They might think they’re the worst student, and they’re not as well” (Interview 17). This finding fits with the literature which argues that audience response systems (aka clickers) help motivate and engage students while simultaneously providing feedback on students’ understanding of material [39].

In using the quizzes for assessment in Blackboard Vista it was found that “it communicates high expectations because I expect them to revise and keep up to date with their revision and to constantly push to improve their performance” (Interview 1). One course focused on design using a combination of Skype, Facebook and YouTube to showcase students work, and to link to other examples of work in the field. “You are communicating high expectations I think, by having an on-line virtual gallery we can show students what is good, bad and ugly in terms of design” (Interview 21).

Neumann and Hood [33] suggest that using a wiki can improve student engagement with content but they found no evidence that students’ performance was also enhanced. Similarly Cole [40] did not find an increase in student engagement amongst her students though this may have been due to an unattractive course design. Wikis also tend to communicate high expectations “Communicates high expectations - I think it does because each teammate can see the evidence of the strongest team member and that raises the bar” (Interview 8).

Through the use of narrated PowerPoints, the lecturer reflected, “I am able to push students to do things that are far more complicated than I did a couple of years ago, and I am very comfortable doing that. I have students now that will have done a second year assessment that I used to set for post graduate level, you know something similar, and the students can now... when they go out on placement, they will say to me, you know, I had to do something almost like that but instead of feeling anxious about it or under-prepared I knew what was required and I was confident and I did a good job. So I am able to set much

higher expectations because it can be explained in a meaningful way” (Interview 16).

#### G. Principle 7: Respects diverse talents and ways of learning

This principle refers to the way that people bring different talents and styles of learning to educational environments. Students need the opportunity to show their talents and learn in ways that work for them. Then they can be pushed to learn in new ways that do not come so easily.

E-technologies supporting this principle were identified by the experts as:

- Weblogs and Microblogs
- Photo Sharing
- Digital Repositories
- Synchronous Communication

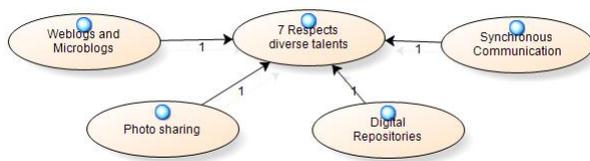


Figure 7. PRINCIPLE 7

Pena-Shaff, Altman and Stephenson [41] suggest that the use of online technologies in education have the potential to increase students' participation and interaction when used as a supplement to face-to-face learning activities. Using eLive brought about opportunities for addressing different ways of learning

*“[the rationale] was an opportunity to deliver material in a different way that we hadn't had at the previous university... the thing with it was that a number of those students come from rural Victoria so they will come up to the university and drove a couple of hours each way, and for them it meant that they could stay at home and not have four hour drive on the Wednesday or whatever and still access the learning. The other cohort that it seems to suit very well is those that are working part-time. Because instead of packing up work at 2.30pm to come to the university for a 4pm lecture they can actually stay at their desk and at 4pm they just log in and at 6pm they will go home. So it does suit those groups” (Interview 11).*

Online plagiarism detection software is used as a way of encouraging students to reference correctly and to write assignments in their own words [42]. For teachers it is a detection tool to ensure that work submitted by students is their own. Online plagiarism software can also be used purely as an assignment submission tool [43]. It is perceived by those using it that Turnitin respects diverse talents and ways of learning, however this can result in making more work for educators.

*“I think what Turnitin does is help the students understand or contextualise their skill level against the expectations of the university [but] I think the tool itself ... doesn't respect diverse talents and ways of learning, it enforces just one type of way of learning... One example I have was a young student who was from Arts and he had no experience before of referencing and constructing scientific argument and Turnitin did not show him how to do that it just flagged that there was a problem so it was*

*up to me and the others teaching first-year students to support scientific writing in our students” (Interview 15).*

Considerable research has been undertaken into the use of both teacher-generated and student-generated podcasts in learning environments. Hew [44] reports that the most common use of podcasts is for delivery of lectures and supplementary recordings. Middleton [45] highlights lack of technical support and technical confidence as barriers to institutional scalability of podcasting. However Sutton-Brady, Scott, Taylor, Carabetta and Clark [46] suggest that “the majority of students believe they gained learning benefits from podcasts and appreciated the flexibility of the medium”. In using podcasts and vodcasts within a marketing course, students may choose whether to use the online mode of learning or not “if we were serious about that you would say right you may do a wholly online unit here or you may do it there or you don't have to do it at all, I don't know, but the fact is give them choice, let them choose. Let them come to lectures this week but not next week. Why have we got on campus? Get rid of it just call it ON (online), X (off campus). If you need to be able to differentiate between them just I mean that will do. And the rest are either D or E – day or evening” (Interview 6).

The use of virtual worlds in teaching provided choices for students to suit their learning style. “Some would go in repeatedly and some would just quickly scan and obviously that would relate to how they learn. We may perceive that they are not really learning but they may be, we can't say that they are not because everyone has a different learning style. I just believe that everyone learns very differently” (Interview 3).

#### V. DISCUSSION AND CONCLUSIONS

The rate at which new e-technologies are emerging is rapid and hence any list which attempts to capture them will soon be out of date. For example since undertaking this review the researchers have encountered the Bliki, a combination of a blog and a wiki [47], the SNAG, a suite of mobile phone and internet games to facilitate networking between group members, and Google+ a tool for sharing and communicating which has acquired an estimated 20 million users within three weeks of its launch [48]. Other tools such as Google Wave, a combination of synchronous and asynchronous communication, showed much promise [49], though support for continued use of this application has recently been withdrawn by Google.

The technologies which are most likely to impact teaching and learning in higher education in the future are listed in the latest Horizon Report [50]. The report suggests that cloud computing and collaborative environments will have a significant impact on teaching and learning over the next 12 months, however with recent reports of ‘clouds’ being hacked, such as Sony's Playstation network in April 2011, such technologies are not immune from misuse and negative consequences. The report suggests that in the medium term (two to three years), game-based learning and mobile devices will be key drivers in pedagogical developments. In four to five years, the report suggests that augmented reality and flexible computer displays will be used, even though realistically these may only be adopted by a few in the mainstream, with specific requirements and substantial funds and infrastructure to support them.

To put this discussion into context, it is important to consider the key trends that are driving the adoption of technology in the classroom[50]:

- Technology as a means for empowering students, a communication and socializing tool that is ubiquitous and transparent.
- Technology is continuing to impact workplaces and elsewhere.
- The value placed on innovation and creativity is increasing.
- There is a move to just-in-time, less formal, modes of learning.
- Perceptions of the learning environment are changing.

The popularity of emerging digital technology presents new opportunities and challenges for educators. Farnan, Paro, Higa, Edelson and Arora[51] argue that educators need to familiarize themselves with the advances in digital media, not only to take advantage of the educational opportunities they provide, but also to encourage safe practices and professional behavior by students using these technologies. How or when this professional development takes place has not yet been addressed in an environment where academics, like students, are time poor. Further, if the academic is not already tech-savvy then there is no framework in which they can make any sort of informed decision about the efficacy of an e-technology to support their teaching goals.

This paper argues that it is difficult for educators to determine which technology, if any, is most appropriate to support the pedagogical aims of their teaching. We have presented a study of staff experiences in using a range of e-technologies across a variety of disciplines in higher-education with a view to providing exemplars of good practice. The interviews were invaluable in gaining insight into which e-technologies are most appropriate to support differing pedagogies and teaching and learning environments.

The findings of this paper go towards providing the scaffolding that academics need to make informed choices particularly in the case that technical knowledge is limited. This study will now move to phase 3 to further explore the fact that there is no single solution to support a pedagogical or learning style, as has been demonstrated through the exemplars presented here. Educators have to consider many factors when selecting one or more e-technologies to support their students. Reviews such as that undertaken here are not the whole answer to the selection process but rather will inform the decision making process.

As part of ongoing research, a future project will seek to expand the number of e-technologies reviewed and provide dissemination of best practice and exemplars via the web as well as providing the mechanism for ongoing updates. Current rates of development and release of new e-technologies suggest that this could well be a long-term undertaking.

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PAPER  
WHICH E-LEARNING TECHNOLOGY IS RIGHT FOR ME?

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