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What works and Why?
**Understanding successful technology enabled
learning within institutional contexts**

Final report 2016 (Part A)

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Griffith University

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[<http://bit.ly/TELwhatworksandwhy>](http://bit.ly/TELwhatworksandwhy)



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What works and Why?

Understanding successful technology enabled learning within institutional contexts

Final Report 2016

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List of acronyms used

LMS	Learning Management System
MeLTS	Monash eLearning Tools System
MOOC	Massive Open Online Course
OLT	Office for Learning and Teaching
SNS	Social Networking Service
TEL	Technology Enabled Learning

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Executive summary

This project was designed to contribute to the evidence base that identifies how technologies are *actually* being used successfully and effectively in universities. Specifically, this project was tasked with addressing the question ‘What Works and Why?’ Therefore, **the project focused on the following key issues:**

- ISSUE #1 - What is the current impact of digital technology on the student experience and student learning outcomes?
- ISSUE #2 - Why are some forms of technology enabled learning successful?
- ISSUE #3 - How can student learning outcomes be technologically-enhanced on a widespread and sustained basis in the near future?

Of course, these aims relate to a set of complex issues. This project offers a view of university technology use that is ‘state of the actual’ rather than ‘state of the art’. These are not accounts of the *most* cutting edge aspects of educational technology. Instead, these are explorations of the uses of digital technology that are *actually* taking place ‘on the ground’.

The project was conducted from January 2014 through April 2015 and was designed as an iterative **mixed method investigation** conducted over three phases:

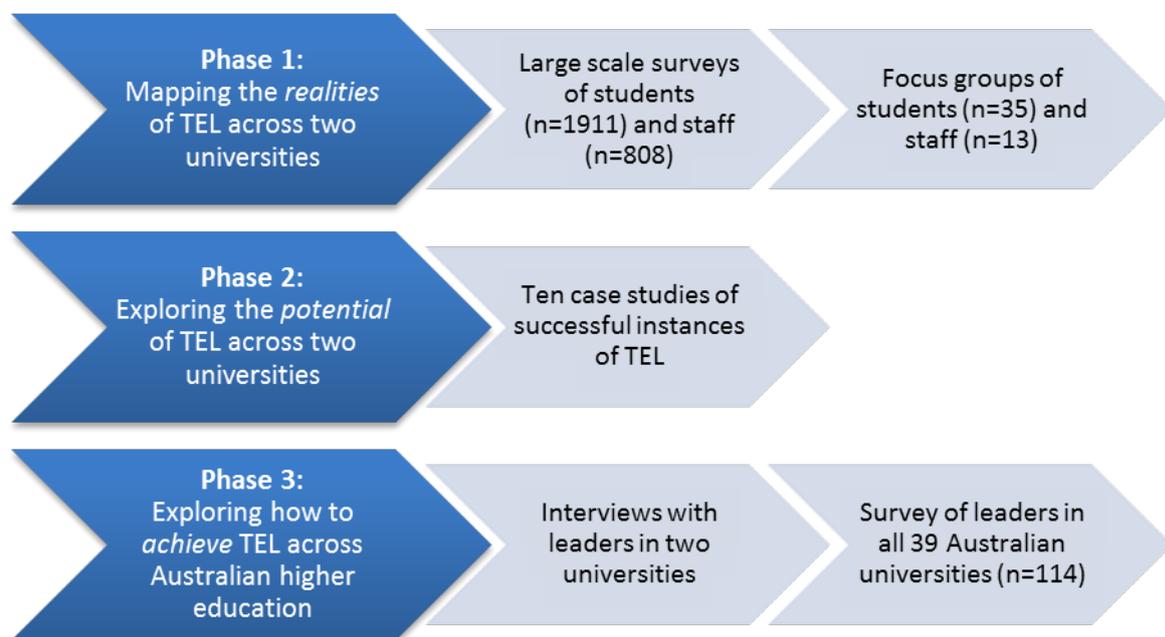


Figure 1. Project data collection phases

The evidence obtained from Phase One identified ways in which staff and students use digital technologies for learning. These illustrated the ambiguous nature of TEL in contemporary higher education.

The **survey data** highlighted the largely perfunctory ways in which digital technologies are used to support student learning in universities. In particular, the student survey highlighted the following trends:

- Students most value those digital technologies that help them do their ‘job’;
- often, the job of being a student relates to managing the logistics of university study;
- usually, learning is approached by students in terms of consumption of information and content.

Similarly, staff were most likely to perceive digital technologies as ‘working’ in relation to the logistics of university teaching and learning. In particular, digital technologies were highly valued as a source of supplementing the core curriculum rather than fundamentally changing the nature of the teaching and learning activity.

In Phase Two, ten case studies of ‘promising practice’ were used to identify a number of over-arching ‘**conditions for success**’ that appeared to stimulate, support, and/or sustain successful TEL. These conditions relate to different aspects of the ‘ecology’ of higher education from individual skills and attitudes through to institutional policymaking:

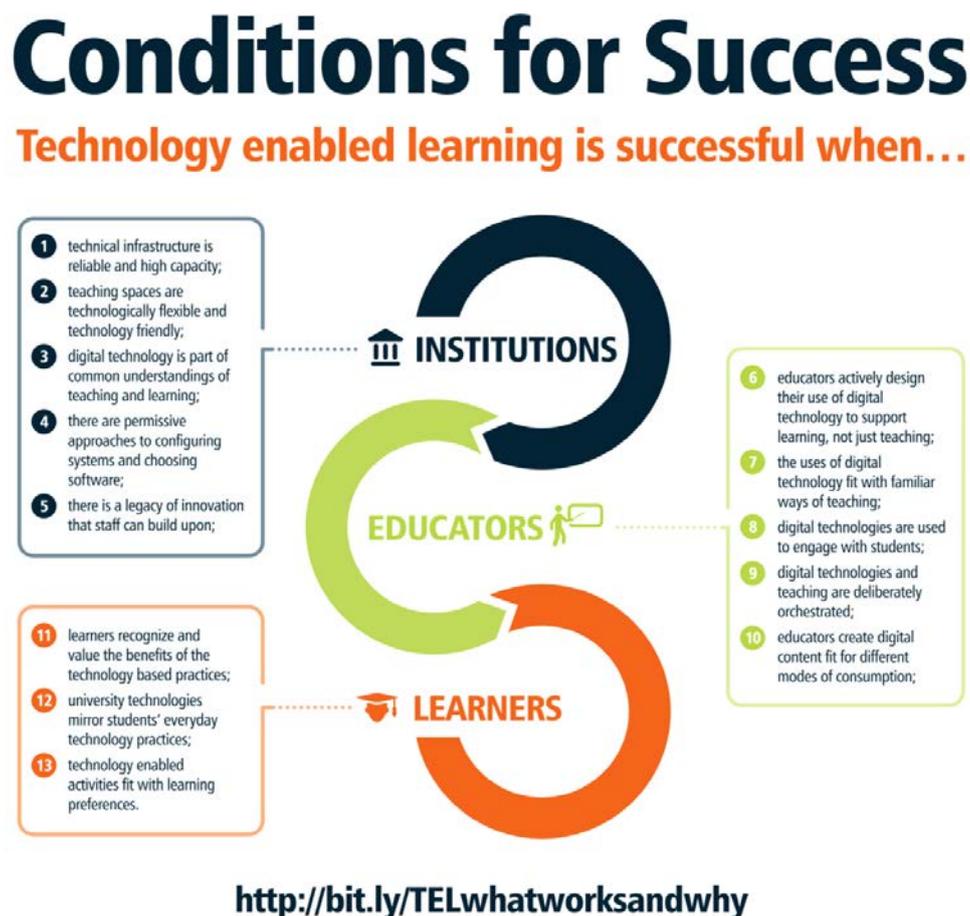


Figure 2. Conditions for success

Phase Three of the project then focused on the challenges to achieving these ‘conditions for success’ across Australian universities. Our survey of senior leaders from across the 39 Australian universities indicated that, in their institutions, most of the conditions for success are at least two or more years away from being achieved. In addition, the leaders reported a number of challenges to ‘successful’ technology enabled learning being sustained on a mainstream basis. The dominant institutional concerns were:

- Financial prudence particularly in relation to limited budgets
- Working with a large and costly infrastructure, including technology and services
- A highly diverse workforce that is difficult to change in terms of attitudes and skills
- The need for managing risks, and ensuring standards and quality of service across the large institution and
- Satisfying a perceived need for innovation that precludes more obvious or familiar ways of engaging in TEL.

There is clearly a tension between the need to balance the diverse needs, requirements and demands of different sections of a ‘university’. Moreover, a one-size-fits-all approach to TEL is also inappropriate. Therefore, any response to the ‘conditions for success’ might be different according to ‘ecological’ variations within and across universities, including disciplines, locations and other contexts.

As such, this project provides guidance in identifying **areas that universities need to address** when working towards sustaining effective use of technology to support student learning. Aligned with the ‘conditions for success’, these areas are presented in relation to institutions, educators and learners.

Laying the foundations within institutions:

1. Establishing TEL expectations as an integral part of the university culture;
2. Providing teaching spaces that are technologically flexible and technology friendly;
3. Good resourcing;
4. Seeding successful forms of TEL.

Working with educators:

5. Moving beyond the ‘usual suspects’ to promote TEL principles and practices to staff;
6. Developing forms of TEL that are relevant to current ways of teaching;
7. Working with staff to develop their own understanding of how students learn;
8. Finding ways to cede control to educators who want to try something different.

Working with learners:

9. Working directly with learners to develop appropriate and effective forms of TEL;
10. Working directly with learners to help them ‘learn how to learn’ with technology.

Project Rationale

This project has two aims:

1. to find out what uses of digital technology are seen by students and teachers as successfully enabling learning;
2. to explore the different factors within the 'ecology' of the university that contribute to these successful uses of digital technology.

Of course, these aims relate to a set of complex issues. Therefore, this project takes a 'realistic' perspective on technology enabled learning (TEL). It recognises that technology use is shaped by all aspects of higher education – ranging from the everyday lives of students through to institutional policies and infrastructure (for example see Zhao & Frank, 2003).

This final report offers a view of university technology use that is 'state of the actual' rather than 'state of the art'. These are not accounts of the *most* cutting edge aspects of educational technology. Instead, these are explorations of the everyday uses of digital technology that are *actually* taking place 'on the ground'.

The project provides a useful counterpoint to other OLT work that is concerned with exploring the promise of technology. This is an investigation of digital technology and higher education *in practice*.

Technology use is shaped by all aspects of higher education from the everyday lives of students' through to institutional policies, infrastructure and culture.

Background to the project

This project addresses the long-standing gap between the rhetoric and the realities of TEL. For example, it examines the disparities between the educational *potential* of technology in comparison to what takes place *in practice*. This is a tension that recurs throughout much of the research and practitioner literature on technology use within higher education.

On the one hand, there is evidence for the potential of digital technology to support and sustain meaningful and effective forms of learning. Networked digital technologies have undoubtedly transformed the generation and communication of knowledge and, it follows, that this has influenced the ways in which learning takes place (DeSchryver, 2015). Consequently, the potential to ‘support’, ‘enable’, or even ‘enhance’ learning has therefore been associated with every significant development in digital technology over the past twenty years or so.

Recently, this has involved discussions over the educational benefits of podcasting; blogs and micro-blogs; social networking sites; and other forms of social media (Brady, Holcomb & Smith, 2010; Dale & Pymm 2009; Ebner, Lienhardt, Rohs & Meyer, 2010; Veletsianos & Navarrete, 2012). There has been much written about the ways in which digital technology can support creative, connected and collective forms of learning and study (see Buzzetto-More, 2012). New technologies are widely seen to support students in the co-creation of knowledge with peers, engagement in interest-driven informal learning practices, and the personalised engagement with education on an ‘anytime, anyplace, any pace’ basis.

On the other hand, concerns remain over the less spectacular realities of digital technology use within university teaching and learning (see Losh, 2014). While many commentators talk of collaborative communities of content creators, in reality many students engage with technology in far more passive, sporadic and solitary ways; both for educational *and* non-educational purposes (Kennedy, Judd, Dalgarno & Waycott, 2010; Yilmaz, Yilmaz, Öztürk, Sezer & Karademir (2015). For instance, recent studies have found that university students often are ineffective in their use of the Internet and other digital research tools. As the recent ‘Net Generation’ study of UK universities concluded, students report varying levels of digital confidence and skills often resulting in “surprise or confusion at the array of [educational] technologies that were available” (Jones, 2012).

Similar shortfalls in engagement have been reported with many of the applications and devices presumed to be integral to the lives of current cohorts of students. As another recent study of university students’ use of social networking sites concluded, educators need to “proceed with caution when using technology-enhanced learning, to avoid over-generalising the needs of the so-called Gen Y students” (Lichy, 2012, p.101).

Project challenges

Given these considerations, the present project was designed to contribute to the evidence base on how technologies are *actually* being used successfully and effectively in Australian universities. Specifically, this project was tasked with addressing the question ‘What Works and Why?’ Therefore, the project focused on the following key issues:

- ISSUE #1 - What is the current impact of digital technology on the student experience and student learning outcomes? What TEL opportunities are being made available to students within higher education contexts, and how are they being taken up? What are the key drivers for students within the university ‘ecology’ to adopt different types of learning? What forms of learning are these technologies enabling and with what outcomes?
- ISSUE #2 – Why are some forms of TEL successful? What current forms of TEL are distinct in terms of their variety of outcomes and ‘value-added’? What are the characteristics and contexts of successful TEL? Why do these innovations ‘work’ from a wider social and institutional perspective?
- ISSUE #3 - How can student learning outcomes be technologically-enabled on a widespread and sustained basis in the near future? How can the circumstances of successful TEL be replicated and sustained across and within Australian universities? What longer-term strategic change in higher education institutions is required?

Project approach

The project was conducted from January 2014 through until April 2015 and was designed as an iterative mixed method investigation conducted over three phases as shown in Figure 1; namely Phase One - focusing on how TEL was taking place in two large universities; Phase Two - identifying examples of 'promising practice' within the two universities; and Phase Three - exploring how these uses might be sustained across 39 Australian universities in the Australian higher education sector.

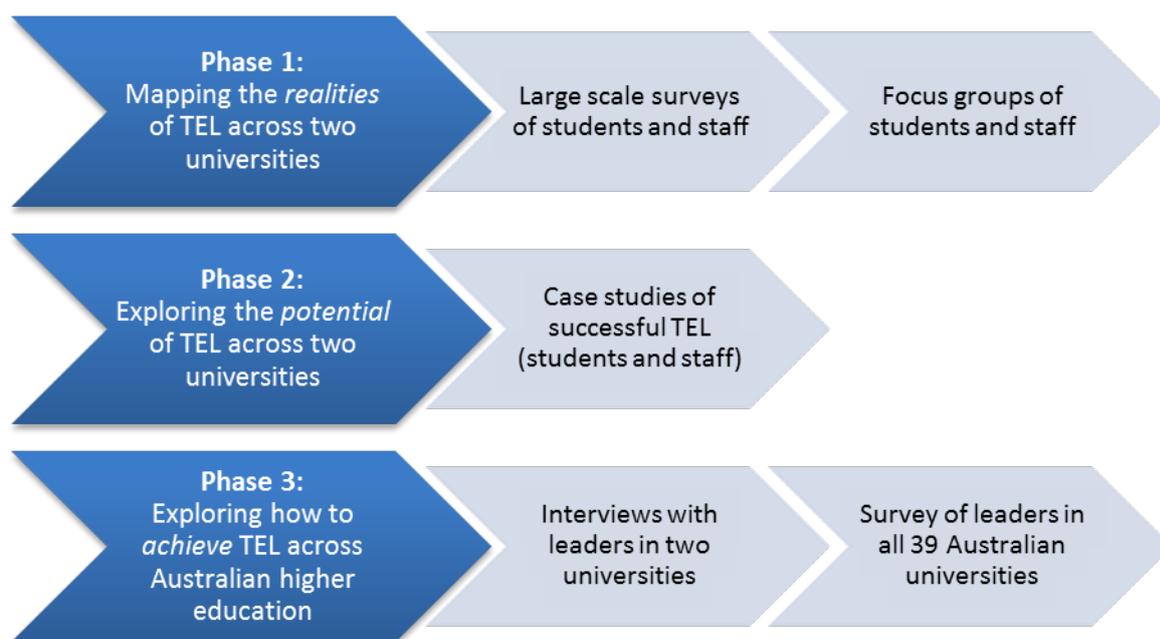


Figure 1. Project data collection phases

The first two phases of the project involved large-scale quantitative and detailed qualitative examinations of the realities of TEL and was designed to generate a set of recommendations that would fit well within the realities of university contexts. These were designed to result in a genuinely evidence-based and evidence-led picture of the practices and conditions required to realize the potential of TEL. The final phase was seen as a valuable feed-forward mechanism to disseminate the findings of the first two phases, and an important step in helping to develop potential ways in which the 'conditions for success' could be implemented or adapted across other higher education institutions.

Phase One - Mapping the *realities* of TEL

In Phase One, large-scale online surveys were administered to students (see Appendix D) and staff (see Appendix E) in both universities. The surveys were designed to elicit details about what digital technologies students used in relation to their studies, and their

experiences of TEL. The surveys also helped to identify successful instances of TEL. The self-selecting samples of survey respondents comprised:

- 1658 undergraduate students;
- 253 masters and postgraduate diploma/ certificate students;
- 507 academic staff (involved in teaching);
- 301 professional staff (involved in supporting teaching or learning).

Follow-up group interviews were subsequently carried out with students and staff who responded to the surveys. The focus-group interviews were designed to explore in depth issues and themes arising from the large-scale surveys as well as to validate our interpretation of the large-scale data and to provide an opportunity for new lines of inquiry to emerge. The group interviewees comprised:

- five follow-up group interviews with 35 students;
- two follow-up group interviews with 13 staff.

Phase Two - Exploring the *potential* of TEL

In Phase Two, the project then explored different examples across the two universities where students and teachers identified successful instances of TEL. From the findings arising from Phase One of the project, ten diverse examples of 'promising practice' were identified across the two universities, and examined in detail as stand-alone case studies. 'Promising practice' are understood to be programs, activities or strategies that have "worked within one organization and shows promise ... for becoming a best practice with long term sustainable impact [and] potential for replication among other organizations" (OACF 2013, n.p).

The cases were not chosen according to the most 'interesting', 'innovative' or 'cutting-edge' examples of technology use, but rather were chosen to demonstrate sustainable examples of TEL. The Phase One survey data identified patterns of successful TEL, such as the use of supplementary media themes and, coupled with the rich descriptions and examples provided by the focus groups, identified specific instances of successful TEL.

Each case study of 'promising practice' was drawn from:

- technical examination: of the pedagogic/ instructional design elements of these technologies/ technology-based practices;
- interviews with 45 students: relating to the impact of the technology on their learning outcomes and learning experiences;
- in-depth interviews with 12 educators / instructional designers relating to the course design and implementation;
- observation (in-person and online) of the TEL in practice.

The purpose of the case studies was two-fold. First, to provide a record of ‘promising practice’ that other educators and institutions may choose to adopt. With this in mind each of the full case study reports includes a brief literature review as well as guidance in terms of implementation and challenges. Second, to provide a rich source of data for analysis, in conjunction with Phase One data, to develop a series of propositions regarding the ‘ecology’ of the TEL, which we have termed ‘conditions for success’.

The development of the ten case studies and the identification of the ‘conditions for success’ are key outcomes of the project.

Phase Three – Exploring how to *achieve* TEL across Australian higher education institutions

Finally the project considered ways that current ‘promising practice’ examples of TEL might be leveraged on a widespread and sustained basis across Australian universities. This involved two activities:

1. Expert-group consultations were held within each of the case study universities, whereby 14 teaching and learning university leaders were presented with each of the ten ‘promising practice’ examples, and asked to critically engage with the proposed ‘conditions for success’ required for this technology use to be adopted on a more widespread basis in their institution. This process resulted in a refinement of the phrasing of the ‘conditions for success’ and informed the design of the survey in the next step.
2. A ‘feed-forward’ consultation exercise was then conducted across the 39 universities in Australia. Teaching and learning experts and leaders in each university were contacted and informed of the ‘promising practice’ case studies, and asked to complete brief responses to the ‘conditions for success’ required for the types of TEL identified in this project being adopted on a wide-scale basis. This process was highly successful with responses from 85 senior leaders from all 39 universities, along with 29 other leaders. This process then led to a further refinement of the ‘conditions for success’, and the development of conclusions for ‘moving forward’.

The *realities* of TEL [Phase One]

How students are using digital technologies

This section of the report focuses on the survey of undergraduate students (postgraduate data largely follows the same patterns; see the publication list at the end of this report).

Students were found to be using a variety of digital devices in their everyday lives, with these devices often – but not always – supporting their university studies. The most commonly used devices for university work were personally owned desktop/laptop (used by 94 percent of students as part of their university studies). 71 percent of students were using smartphones to support their university studies. Tablets/iPads were being used by 53 percent of students with just under three-quarters of these being used for university work. Amidst this growing trend to ‘bring your own device’, it was notable that over 60 percent of students were continuing to make regular use of shared computers provided by the universities.

In terms of what these digital devices were being used for, the distinction emerged between ‘official’ digital resources and practices (i.e. those provided and/or mandated by universities) and ‘non-official’ digital resources and practice (i.e. resources that are not part of university-provided systems and services). In terms of ‘official’ digital resources, the survey data confirmed the predominance of learning management systems (LMS) and online library resources (Table 1). Use of all the ‘official’ resources reported in the survey was remarkably consistent across the sample (regardless of subject discipline, level of study, or other individual characteristics).

Table 1. Students’ most used ‘official’ digital technology resources

	%
Learning Management System	100
Library website	98
Use of library online resources to find information	97
Other university websites	84
Software specific to individual study area	57

Note. Data are percentage of sample using this technology as part of their university studies.

More variation was apparent, however, with regards to use of ‘non-official’ digital resources. As can be seen in Table 2, large proportions of students unsurprisingly reported making use of general Internet search engines (such as *Google*) and specialised academic search services (such as *Google Scholar* and *Web of Science*). However, other prevalent practices included: accessing subject-related videos and audio recordings on content sharing websites such as *YouTube*; communicating and/or collaborating with other students through *Facebook* and other social networks; as well as finding information related to university studies on *Wikipedia*.

89% of students use social networking sites such as Facebook to work with fellow students.

Table 2. Students’ most used ‘non-official’ digital technology resources

	%
Use of Internet search engines to find information	99
Watch or listen to audio recordings or videos about subject/ discipline (e.g. YouTube, Vimeo)	93
Search for papers/journals on non-university provided scholarly websites	92
Use of social networking sites to work with other students on courses (e.g. Facebook)	89
Finding information through Wikipedia	88

Note. Data are percentage of sample using this technology as part of their university studies.

While there were no overarching trends in the use of all these technologies, some specific differences were apparent. For example, collaboration with other students through Facebook was more prevalent for fulltime as compared to part-time students, and for younger rather than mature aged students. International students were notably more likely to be users of a range of ‘non-official’ applications in comparison to domestic students – examples of ‘non-official’ applications include *Wikipedia*, free and ‘open’ resources such as MOOCs and Open Educational Resources; and collaborative Wiki/Google docs.

“Often when studying a new concept, I’ll struggle to understand it fully simply using the resources that are provided by the lecturer or in tutorial classes. With YouTube, I can easily search key terms and a whole host of videos will be supplied to me with different examples.” (Social Sciences, Second year, Female)

What students find useful

The technology reported by most students as 'very useful' was the use of general Internet search engines (e.g., Google) to find information. This was followed closely by the use of university library online resources to find information and the use of their institutional LMS. Also rated highly was the use of academic search services such as *Google Scholar* and *Web of Science*, the viewing of subject-related videos on content sharing websites such as *YouTube*, and the use of other university library resources.

Table 3. Students' perceived usefulness of digital technology resources

	% Reported as 'Very Useful'
Use of Internet search engines to find information	68
Use of library online resources to find information	66
Learning Management Systems	58
Search for papers/journals on non-university provided scholarly websites	46
Watch or listen to audio recordings or videos about subject/ discipline (e.g. YouTube, Vimeo)	41
Library websites	40
E-books or e-textbooks	38
Use of social networking sites for working with other students on courses (e.g. Facebook)	37
Use web-based document for working with other students on your courses (e.g. Google Docs, Wikispaces)	34
Web-based citation/bibliography tools	31

Note. Data are percentage of sample that reported making use of the technology.

Why technologies ‘work’ – student perspectives

The survey asked students to nominate and justify the digital technologies that they found to be ‘most useful’ during their university studies. Over 4500 examples were nominated, providing rich insights into what students were using digital technologies for, and what meanings were being attached to these practices.

The most prominent ways in which digital technologies were perceived as ‘working’ for students related to the logistics of university study. These practices and activities included: organising schedules and fulfilling course requirements; time management and time-saving; and being able to engage with university studies on a ‘remote’ and/or mobile basis.

The most prominent ways digital technologies were perceived as ‘working’ for students related to the logistics of university study, not learning *per se*.

Examples related directly to learning were reported less frequently. One of the most prominent learning-related practices was using digital technologies to ‘research information’. ‘Reviewing, replaying and revising’ digital learning content (most notably accessing lecture materials and recordings) was also reported at relatively high levels.

While nominated less frequently, the survey confirmed the practice of ‘looking elsewhere’ for supplementary materials to corroborate or clarify what had been learnt at university. Also nominated was the use of digital technologies to engage with information in more ‘visual’ forms.

Table 4. How are digital technologies a ‘useful’ part of your university studies?

Practice	Description	%
Organising & managing the logistics of studying	Managing schedules, timetables, fulfilling deadlines and course requirements; ‘keeping in the loop’ regarding course information and university news.	47
Flexibility of place & location	Flexibility of location; ability to engage ‘remotely’ with academic work off-campus; engaging at a distance and not having to be ‘present’; being able to be mobile; portability of university work.	33
Time-saving	Reducing time spent studying; quicker processes, more immediate outcomes; convenient scheduling of activities.	31
Researching information	Researching information for assignments; quantity and quality of information access.	28

Practice	Description	%
Reviewing, replaying & revising	Catching up on missed material; repeating viewing of materials to improve understanding.	28
Supporting basic tasks	'Easier' writing of assignments; 'easier' and 'helpful' information management and retrieval of resources.	26
Communicating & collaborating	Asking questions and exchanging information; working with other students; sharing ideas; preparing group work.	17
Augmenting university learning materials	Watching lectures, tutorials and talks outside university; cross-checking and comparing with other sources; 'going elsewhere'.	15
Seeing information in different ways	Visualising concepts through video, animation or annotations; allowing real-time lecturer demonstrations and problem-solving.	12
Cost saving	Saving money.	4

Students clearly use and value digital technologies in their studies. However, the most common and valued practices tend not to be the frequently claimed creative, collaborative, and participatory learning practices often foregrounded in discussions of digital education and learning technology. While TEL is featured in the students' responses, it is important to position the current project within this much more circumspect view of the technological practices of students and TEL.

Why technologies 'work' – staff perspectives

As with the student survey, some of the most frequently nominated ways in which staff perceived digital technologies as 'working' related to the logistics of university teaching and learning. These included being able to co-ordinate students, resources and interactions in one centralised place. This reveals a frequently encountered 'reality' of digital technologies in this project: technologies are *currently* perceived by staff and students to have a large, if not primary role to enable the act of being a teacher or student, rather than enabling the learning.

Staff confirm the usefulness of technologies to engage with students, cater for learning preferences, and facilitate effective feedback.

Table 5. Staff perceptions of how digital technology is ‘useful’ for student learning

Reason	Description	%
Supplementing lectures, tutorials, practicals and labs	Providing students with additional resources which can be accessed at their own pace; to preface/complement face-to-face teaching.	42
Organizing and managing the logistics and the ‘labour’ of teaching	Saving time by having everything in one place; allowing broadcast communications and centralising interactions with students; cutting down on the duplication of work.	41
Accessibility	Allowing students to engage at a time and place convenient to them, allowing teachers to teach remotely and/or outside of office hours.	30
Most appropriate way of presenting knowledge	Presenting complex topics through visual/auditory means; allowing lecturers to illustrate and annotate.	30
Increasing student engagement and involvement	Offering students alternate means of engaging and contributing; more familiar/comfortable means of students to contribute to group activities.	24
Feedback and/or diagnosis	Providing timely and concise feedback on student work; offering instant feedback during learning activities; means of gauging student understanding.	14
Making learning more public and visible	Making discussions and interactions public; ability to track back over previous activities and discussions; monitoring student engagement and interactions online.	14
Bringing the outside world into the classroom	Using materials produced by outside sources; video resources to provide practical illustrations and demonstrations; adding ‘outside’ voices and perspectives to classroom debates.	9
Immediacy	Immediacy in sharing content, communicating and interacting with students.	8
Curation	Organising, arranging and editorialising a range of learner materials; guiding students’ engagement with a large volume of learning resources.	5

Nevertheless, the staff survey did demonstrate that technologies were valued as a way to provide support for learning, including delivering instructional content and information to students in accessible and differentiated forms. This was seen to support 'visual' learning, and benefit students who wanted to access content at different times and/or different places.

While technologies are seen to play a valued role in the logistics of education, it is encouraging that several themes of usefulness pick up on contemporary understanding of effective use of technologies for learning, such as: increasing student engagement and involvement; feedback and/or diagnosis; and bringing the outside world into the classroom.

The *potential* of TEL – ten case studies of ‘promising practice’ [Phase Two]

In Phase Two, the project subsequently moved on to consider when and where digital technologies were successfully enabling learning. This involved identifying examples of learning using technology across the two universities that were distinct in terms of their variety of outcomes and being ‘value-added’.

The findings from Phase One of the project identified ten examples of ‘promising practice’ from different subjects and courses across the universities. ‘Promising practice’ was taken to be practices, activities or strategies that have “worked within one organization and shows promise ... for becoming a best practice with long term sustainable impact [and] potential for replication among other organizations” (OACF, 2013).

Each case study of ‘promising practice’ included three main sections:

- *What worked*: including a description of the ‘successful’ TEL including how the staff and/or students came to engage with those technologies and practices.
- *Why it worked*: including a description of the enablers, challenges and reference to what the research literature says about the key practices involved.
- *Moving Forwards*: including participant advice, implications for institutions, and additional resources for exploring including guides, cases and readings.

The ten cases are (the full cases can be found in Appendix B):

1. Immediate feedback in classes: live polling for motivation and learning The use of **live polls** in lectures enabled immediate feedback from students on their understanding of a topic or other points of interest with the explicit goal of helping the lecturers to better shape their teaching during class to meet student learning needs. In addition to promoting engagement of students in a lecture, it also promoted discussion by the students. The practice also served a valuable function of pausing the flow of lecture content, particularly ‘teacher talk’ to allow space for student reflection and encouraged an action based on the reflection (i.e. voting).

2. Illustrating the problem: digital annotation tools in large classes

The use of **digital annotation tools** (also known as inking tools) by lecturers to build visual explanations in class to promote an increased level of class interactivity. The activity was not simply to draw, but rather to explain an idea while prompting or eliciting student interaction. This required the lecturer to not only model discipline specific thinking and problem solving but also to adapt the lecture, including the content, according to student interaction. Student's valued being able to 'see' the problem or concept being built.

3. Orchestrating teaching: the implications of flipped classroom

The use of a **flipped classroom** approach to allow greater freedom in the delivery design of lectures. This involved teaching theoretical concepts via online videos and then using the face-to-face classes for increased student-teacher interaction. This required considerable orchestration of the technologies, content, delivery as well as the interaction with students. A consequence of an 'active learning' approach to lectures was that they were largely 'unscripted' in nature. The lectures therefore were more relevant and responsive to students' needs while also demanding greater active participation.

4. Supporting community and learner preparedness through online forums

First year arts students in large classes with diverse enrolments have reported feeling a sense of disassociation from their peers. In this case study, **online forums** were used to address this issue by enhancing student learning by structuring student preparation for classes. This included preparation of the required knowledge, as well as being better prepared to interact with classmates. The online forums generated a sense of community that influenced student engagement both online and in class.

5. Enriching the curriculum with supplementary media

Enhancing student learning through the use of **supplementary videos** to demonstrate or illustrate concepts or ideas. This was highly valued by students as a way to 'rewind, replay and review' information as often as required. It was felt to support visual learning preferences. It was valued by staff as a way to alleviate pressure for 1:1 learning support by providing supplementary video and other media to cover common concerns, skills and knowledge.

- | | |
|--|--|
| 6. Enhancing student learning through rapid prototyping and testing: 3D printing technologies across disciplines | The use of 3D printing technologies to support student learning in design processes and products. The ability to design and create prototypes in relatively rapid iterations increased conceptual understanding as students could see the problems in their designs. In addition, it sustained student motivation and enabled them to experiment with their thinking, producing highly innovative products. This case was also distinguished by a multidisciplinary approach with students coming together across disciplines, thereby facilitating the pollination of new ideas across traditionally siloed domains. |
| 7. Authentic learning experiences through technology enabled simulations | The use of technology enabled simulations to enhance practice-based teaching and learning. Students participate in computer enhanced simulation activities such as clinical role-plays that are video recorded and involve computer-controlled mannequins or diagnostic equipment. The conditions are felt to be authentic, with students from different disciplines participating (e.g., nursing, medicine, and pharmacy) in the same simulations to represent the multidisciplinary nature of work, and solving complex problems. The combined use of computer-controlled high-fidelity simulation mannequins, digital video recorded observations and the adaptive release of information in the LMS provided carefully structured and ongoing experiences and feedback. |
| 8. Enabling flexibility where and when learning occurs: learners becoming mobile | The flexibility of where and when learning takes place was enhanced by providing agency to the learner through an emphasis on the learner being mobile. Through the use of personal digital devices , lecturers and students designed and enacted learning activities which were multimodal through visual, sound and touch screen attributes. |
| 9. Enhancing courses: online technologies for managing, collaborating, reviewing and | The redesign of face-to-face courses through online enhancements has resulted in improved learning experiences (reflected in student feedback), and outcomes (reflected in their results). In particular, this redesign has resulted in online learning tools being used for managing, collaborating, |

assessing student learning

reviewing and assessing student learning. There is improved flexibility to support student learning through accessing resources, collaborating with other students and teaching staff.

10. Connecting, communicating and learning through social networking sites

Students are self-organising the use of **Facebook and other social networking sites** to enhance their learning and to connect with other students in their courses and across cohorts. These sites enable students to 'friend' other students; join groups; communicate with individuals or whole groups; and share resources including with peers beyond their university. They use the media to pose questions, and to comment and coordinate activity outside of the lecturer's view.

Not all of these are 'cutting edge' or 'text book' examples of how digital technologies could be used. Nevertheless, these are all instances of where digital technologies were clearly leading to learning gains and improved outcomes. These are instances of digital technology that were valued by students and staff. In short, these are instances of TEL that were 'working' in practice and were likely to be sustainable in the future.

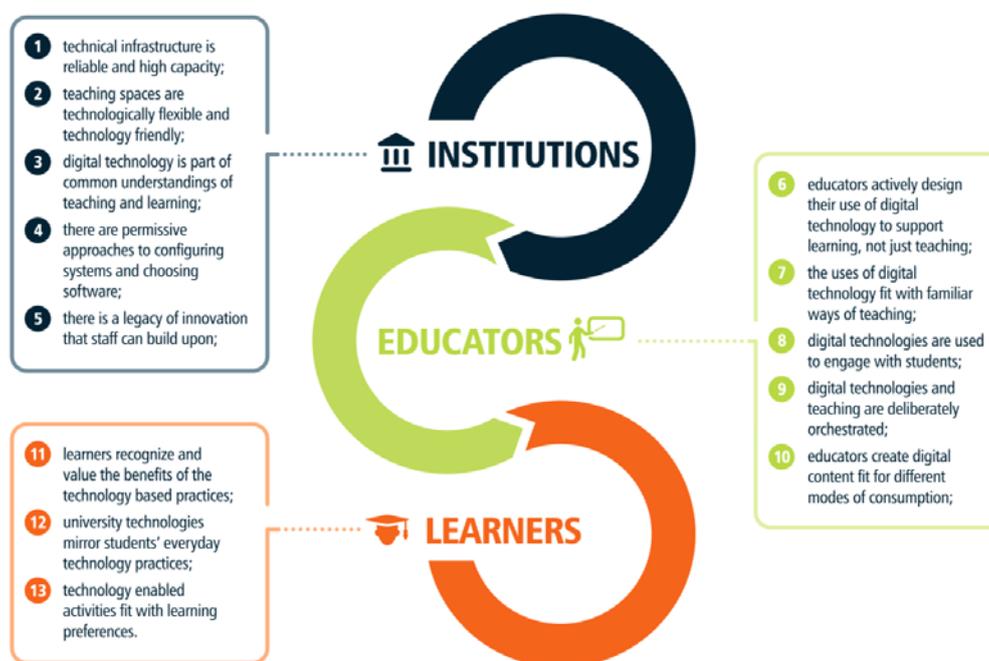
Conditions for success

A number of overarching issues can be identified throughout these different instances of promising practice. These can be described as ‘conditions for success’ that appeared to stimulate, support, and/or sustain these specific success stories. These conditions relate to different aspects of the ‘ecology’ of higher education – from individual skills and attitudes through to institutional policymaking.

The ‘conditions for success’ arose from the case studies. The histories, practices, enablers and challenges highlighted by the rich data of the case studies were triangulated with the Phase One survey and focus group data until the project team felt there was theoretical saturation. These initial ‘conditions for success’ were then presented, in Phase Three, to teaching and learning leadership teams from both universities. Out of this process the ‘conditions for success’ were refined to better communicate the key messages. This refined version was then used in the subsequent feed-forward process with all 39 universities. Their feedback led to further refinement and re-organisation to better convey the key messages. The final version of the ‘conditions for success’ is described below.

Conditions for Success

Technology enabled learning is successful when...



<http://bit.ly/TELwhatworksandwhy>

Figure 2. Technology enabled learning: Conditions for success

Importantly, TEL is a broad term and cannot usefully be understood as a single practice, process or outcome. Therefore the ‘conditions for success’ revealed by this project are not necessarily applicable to all instances of TEL, nor are they an exhaustive list. However, they do describe a series of significant contributing factors to the ‘success’ of TEL. Conceptually, they have been organised according to those conditions attributable to institutions, educators and the learners themselves.

In this project the success of TEL was largely dependent on a series of conditions or factors relating to all three actors: institutions, educators & learners.

Institutions

Clearly, the ***access to, and reliability of, the technology*** was a key issue in leading to successful instances of TEL. In particular, it was observed in this project that successful TEL occurred when:

1. **technical infrastructure is reliable and high capacity.**
University systems require sufficient bandwidth and generous capacity for streaming videos and storing large files. This also includes teaching spaces being able to support large numbers of simultaneous wireless connections.
2. **teaching spaces are technologically flexible and technology friendly.**
Providing confidence to educators and students that TEL could occur wherever teaching is scheduled to take place. Many of our examples highlight the need for lecture theatres and seminar rooms that are flexible and reliable; set up for lecturers to simply walk up, plug-in and play; had intuitive interfaces and control technologies; appropriate display and recording technologies; and supported ‘bring your own device’.

The data from Phase One and Phase Two also highlighted the issue of how ***successful TEL is influenced by wider cultures within the university***. This includes officially sanctioned TEL activities that have evolved from institutional histories, policies, and practice, but also the use of technologies and activities that are seen as working around the perceived constraints of the institution. The following propositions are key ‘conditions for success’ in relation to institutional culture. Successful TEL occurred when:

Successful TEL is influenced by wider cultures within the university.

3. **digital technology is part of common understandings of teaching and learning.**
Many of the successful TEL examples were built into the dominant structures of a course (e.g., curriculum and assessment), and presented as an expected mode of teaching and learning. These were not presented as non-standard and/or exceptional ‘innovations’.

4. **there are permissive approaches to configuring systems and choosing software.**
Successful instances of TEL all depended upon the university technical and support systems being configured in ways that allowed (either actively supported or at least did not exclude) staff and students to pursue what were often non-standard uses of technology. Often staff were using a number of *ad hoc* 'work arounds'.
5. **there is a legacy of innovation that staff can build upon.**
Many of these projects were the legacy of institutional seed-funding and pilot projects. Some of the 'successes' from our case studies were the 'Nth generation' results of previous university funded projects that were considered to have failed at the time, or simply were discontinued. These projects seeded ideas that were being later realized in local iterations. Evidently, the success of TEL initiatives should not be measured in the short term, suggesting the value of a culture of seed funding and grass roots innovations and acceptance of 'failure' as a legitimate process of innovating practice.

Educators

Successful instances of TEL were largely mediated by the educators themselves. In some instances, these individuals were clearly some of the 'usual suspects' when it comes to technology use, in other words, those with personal interests, skills, passions, confidence and/or curiosity when it comes to using technology in their teaching. Yet not all the case studies were being driven by 'early adopters'. In this project it was observed that successful TEL occurred when:

6. **educators actively design their use of digital technology to support learning, not just teaching.**
Technologies are often celebrated for the ways they can enhance the 'delivery' of the curriculum such as videos, content management systems, and visually appealing presentations. However, such focus on technology enabled teaching should not distract attention from the purposeful use of technologies to support learning. Importantly, this involves educators having a clearly articulated understanding of how students learn so that they can design appropriate technology enabled situations.
7. **the uses of digital technology fit with familiar ways of teaching (and learning).**
Many of the examples of technology 'working well' were interventions that had obvious continuations with well-established practices and products. These were forms of technology that worked with, rather than worked against, well-established cultures, traditions and routines of teaching.
8. **digital technologies are used to engage *with* students** - Many of our case studies involved staff making explicit efforts to 'connect' and meaningfully interact with

their students. For instance, polling, annotation, and flipped classroom strategies were a part of lecturers' attempts to be reflexive to student learning needs. Such approaches signify a changing understanding of the teacher in higher education, recognising the value and need to identify-with, engage and respond to students who are no longer understood as passive recipients of knowledge, but rather as people who need to actively assimilate or accommodate new ideas into their individual mental models.

9. digital technologies and teaching are deliberately orchestrated.

Obviously, staff and students need some degree of technical skills to use the digital technologies. However, it was clear from an analysis of the data collected that successful application of TEL required the ability for educators to not only perform with technologies, but also to orchestrate the technologies (often multiple technologies simultaneously such as PowerPoint, video and polling) in meaningful conjunction with teaching (including delivery, student activities, responding to student needs, etc.).

10. educators create digital content fit for different modes of consumption.

There is an increasing awareness of teaching as performance 'in the moment', as well as producing oneself for on-line consumption. Teachers were mindful that teaching is no longer a temporary condition. For instance, synchronous face-to-face teaching is often recorded and has an asynchronous 'after life' with students wanting to revise and rewind. Similarly, posting videos, engaging in webcasts, replying to forums, and making broadcast announcements can all be consumed by students in non-linear and asynchronous ways to meet students' needs. Staff were planning and producing teaching events, activities and resources that support both the immediate goals and these different modes of consumption.

Learners

In the case studies of successful TEL, students were highly engaged with the digital technology practices. As indicated in the Phase One survey and focus groups, and confirmed in the Phase Two case studies, simply embedding digital technology into the curriculum does guarantee student engagement. In this project, it was observed that successful TEL occurred when:

11. learners recognize and value the benefits of the technology based practices.

These successful instances of TEL were all accepted by students as part of the mainstream course culture. Students saw these technologies as having clear, practical use in terms of understanding content, and of the longer-term benefit in producing assignments and gaining better grades.

12. university technologies mirror students' everyday technology practices.

TEL seems to 'click' with students when it fits with their wider digital media practices, that is, when the technologies and their uses are familiar and intuitive. Viewing short videos is a familiar use of digital technology that translates easily over into academic study. However, while the technology may seem familiar, the learning purpose and context can make it new or strange. Assumptions of digital natives valuing, seeking and being expert at new media practices in the context of formal learning needs to be questioned. Consuming short videos for leisure or informal learning can involve significantly different processes to engaging with, for instance, lecture recordings. The issue here is that TEL should be considered in terms of whether or not it involves familiar technologies and practices that can be intuitively applied to the learning context. However, this needs to be critically balanced against making assumptions of learner affinities for, and expertise with, technologies.

13. technology enabled activities fit with learning preferences.

This was particularly evident in recurring themes of visual learning. There is clearly a shift in the minds of many students that they are 'visual learners'. A number of these examples of promising practice related to this mode of encountering content and engaging with learning. These were uses of technology that framed teaching and learning as an image-based - as well as a text and speech-based - event.

Exploring how to achieve TEL across Australian higher education [Phase Three]

In this phase, the project explored the feasibility of these ‘conditions for success’ on a widespread basis across Australian universities. Expert-group consultations were conducted with teaching and learning experts and leaders in both universities. These consultations informed the refinement of the ‘conditions for success’ and provided useful ideas for how they could be addressed by institutions which in turn influenced the design of the nationwide survey.

The survey was designed for leaders across all Australian universities. Accordingly, it was recognised that it needed to convey and get feedback on the key messages from the report as succinctly as possible. To do this, the ‘conditions for success’ were pitched in a form that could be operationalized by university leaders. Respondents were asked to comment on:

- how essential each of these conditions was to achieving successful TEL;
- how close their institution was to achieving these conditions; and
- barriers to achieving these conditions from an institutional perspective.

In total, 114 survey responses were received from university leaders and managers. This included 85 senior leaders (ranging from Pro Vice-Chancellors through to Faculty Deans) across all 39 universities in Australia. Only the senior leaders’ responses have been used in this report. They offer both a useful rejoinder to our previous discussions of ‘promising practices’ and a useful understanding of the ‘state of play’ across the sector in terms of priorities and perceived barriers.

It was notable how conditions relating to ‘Resourcing’ and ‘Culture’ conditions were rated most frequently as ‘essential’ elements of achieving successful TEL (see Table 6). These included the importance of robust and high capacity technical infrastructure, coupled with positioning TEL as an integral element of institutional cultures and conversations.

Table 6. Percentage of senior leaders ranking each condition for success as 'essential'

Condition for success	%
Robust and high capacity technical infrastructures	98
Establishing TEL as an integral part of the university culture	83
Changing the focus of conversations about TEL from the technology to the learning.	82
Stimulating TEL interest amongst staff other than the 'early adopters'	73
Lecture theatres / seminar rooms are flexible & reliable spaces for different technology use	71
Working directly with students to help them learn how to learn with technology	68
Teachers who explore/experiment with varied teaching strategies and take on varied roles	65
Varied learning content to meet different student preferences	60
Working closely with students to identify and develop better use of TEL	52
Developing/using forms of TEL that mirror familiar everyday uses of technology	40
Using forms of TEL that fit with established ways of teaching	36
Taking a start-up / incubator approach to TEL innovation	17
Permissive systems	14

Note. Each item was optional, with some senior leaders choosing not to respond. However each item had between 82 and 85 responses. Percentage is based on completed responses.

Conversely, conditions relating to fitting technology to familiar uses of technology and ways of teaching were less frequently rated as essential. Notably, the least rated conditions were

those that involved reductions in institutional control of TEL, for example, permissive systems and funding TEL innovation on a “fail fast and fail often” basis.

Resourcing and institutional culture were rated most frequently as ‘essential’ conditions for achieving successful TEL. In contrast, the least rated conditions were those that involved reductions in institutional control.

Senior leaders were then asked how close they felt their institutions were to achieving these conditions (Table 7). The majority of respondents felt that all these conditions were achievable *except* for the establishment of permissive systems (judged by 55 percent of respondents as likely to be unachievable).

Table 7. How close is your university to achieving this?

	% already achieved this	% will have achieved this			% not sure this is achievable
		within a year	2-4 years	5+ years	
Teachers who explore/experiment with varied teaching strategies and take on varied roles	45	6	35	9	5
Using forms of TEL that fit with established ways of teaching	37	16	32	9	5
Robust and high capacity technical infrastructures	35	8	35	11	11
Developing/using forms of TEL that mirror familiar everyday uses of technology	30	8	45	11	7
Establishing TEL as an integral part of the university culture	27	5	45	13	11
Varied learning content to meet different student preferences	26	8	46	10	10
Changing conversations about TEL from the technology to the learning.	21	15	43	13	9

	% already achieved this	% will have achieved this			% not sure this is achievable
		within a year	2-4 years	5+ years	
Flexible & reliable teaching spaces for different technology use	19	10	36	27	9
Permissive systems	18	4	21	3	55
Taking a start-up / incubator approach to TEL innovation	18	16	25	4	37
Working directly with students to help them learn how to learn with technology	15	9	52	17	7
Stimulating TEL interest amongst staff other than the 'early adopters'	10	5	56	16	14
Working closely with students to identify and develop better use of TEL	6	12	51	13	17

Note. Each item was optional, with some senior leaders choosing not to respond. However each item had between 72 and 83 responses. Percentage is based on completed responses for each item.

A few conditions were judged by a majority of respondents as being achievable imminently, if not already achieved. These included having teachers within the university who were willing and able to be varied in their teaching strategies and teaching roles, and using technology in ways that fitted with established ways of teaching.

However, other conditions were generally judged as requiring more time before being achieved. Significantly, this related to some of the conditions rated previously as most essential. These included issues related to changing university infrastructure and resourcing, such as establishing teaching spaces that are flexible and reliable spaces for different technology use. Other longer-term conditions related to changes in staff and institutional culture, for example, stimulating interest in TEL amongst staff other than the 'early adopters'.

In response to each of the survey items, the leaders were asked to identify if there were challenges to achieving each of the conditions. An analysis of the 402 responses to the

open-ended question revealed five main challenges from an institutional point of view (see Table 8).

Table 8. Challenges to conditions for success

Issue	Example quotes
Financial prudence:	<p>“Limited budget allocations”</p> <p>“Responsibility to manage overall costs”</p>
Working with large and costly infrastructure:	<p>“Working with dispersed and multiple campuses, and remote groups of students”</p> <p>“Maintaining the sustainability and functionality of systems”</p> <p>“Maintaining the main operational backbone”</p>
Workforce complexity:	<p>“Academic resistance, ignorance, attitudes”</p> <p>“Variable digital literacy amongst staff”</p> <p>“Lack of time for teachers to 'explore' digital learning”</p> <p>“The 'what's in it for me?' question for academic staff”</p> <p>“High numbers of sessional staff responsible for teaching”</p>
Quality assurance:	<p>“Achieving consistency and common practice across the university”</p> <p>“Reducing/ managing risks”</p> <p>“Duty of care for students – especially regarding experimenting with risky technology”</p>
The pressure to innovate can distract attention from current successful strategies:	<p>In response to ‘conditions for success’ that call for forms of TEL that draw on familiar technologies and educational practices leaders stated:</p> <p>“Need to move beyond 'old wine in new bottles' – using TEL to enhance T&L or do something innovative”</p> <p>“We should not constrain thinking by what we have now”</p> <p>“TEL should transform the way we work, rather than fit with the old ways of doing things”</p>

Underpinning many of these responses was the notion of balancing diverse needs, requirements and demands of different sections of a 'university'. In particular there was a tension between the desire to support diverse TEL, while also acknowledging constraints. For example one senior leader noted:

As a whole institution approach, we simply can't cater to every demand, etc. At some point, a good suite of representative materials and services/approaches may be sufficient to cater to individual preferences, etc.

Thus, universities cannot address every technological possibility and potential. However, another senior leader pointed out that one size does *not* fit all:

Many of these issues are not homogenous across a large comprehensive university. Different disciplines have different forms and levels of infrastructure, different teaching and learning, different leadership cultures influencing innovation, different signature pedagogies. There is a need to work at different levels on different aspects.

The notion of signature pedagogies according to university, discipline, location and other 'ecological' contexts of the institution is perhaps a useful way to move beyond the one size fits all approach to that of a more localised and strategically focussed approach to TEL.

Conclusions

This project has highlighted the ways in which digital technologies are used to support student learning in universities. At the moment, the ‘state of the actual’ is rather low-level and low-key in comparison to the enthusiasms that often surround TEL. Related to this is the way in which students currently view the role of digital technologies in higher education:

- Students most valued those digital technologies that helped them do their ‘job’;
- Often, the job of being a student relates to managing the logistics of university study; and
- Usually, learning is approached by students in terms of consumption of information and content.

As with the student survey, some of the most frequently nominated ways in which staff perceived digital technologies as ‘working’ related to the logistics of university teaching and learning. Digital technologies were also highly valued as a source of supplementing the core curriculum rather than fundamentally changing the nature of the teaching and learning activity.



Nevertheless, the project has also highlighted a number of conditions that support ‘successful’ instances of TEL. These include conditions at different levels: institutions, educators and learners. Table 9 re-presents the 13 ‘conditions for success’ as depicted in Figure 2 (page 21).

Table 9. Technology enabled learning: Conditions for success

Technology enabled learning is successful when...	
Institutions	<ol style="list-style-type: none"> 1. technical infrastructure is reliable and high capacity; 2. teaching spaces are technologically flexible and technology friendly; 3. digital technology is part of common understandings of teaching and learning; 4. there are permissive approaches to configuring systems and choosing software; 5. there is a legacy of innovation that staff can build upon;

Technology enabled learning is successful when...

Educators	<ol style="list-style-type: none"> 6. educators actively design their use of digital technology to support learning, not just teaching; 7. the uses of digital technology fit with familiar ways of teaching; 8. digital technologies are used to engage <i>with</i> students; 9. digital technologies and teaching are deliberately orchestrated; 10. educators create digital content fit for different modes of consumption;
Learners	<ol style="list-style-type: none"> 11. learners recognize and value the benefits of the technology based practices; 12. university technologies mirror students' everyday technology practices; 13. technology enabled activities fit with learning preferences.

Obviously, these 'conditions for success' are not necessarily applicable to all instances of TEL, nor are they an exhaustive list. In addition, the conditions are difficult to achieve. Senior leaders from across the 39 Australian universities indicated that in their institutions most of the 'conditions for success' are at least two or more years away from being achieved. In addition, the leaders have reported a number of challenges to 'successful' technology enabled learning being sustained on a mainstream basis. The dominant institutional concerns were:

- Financial prudence particularly in relation to limited budgets;
- Working with a large and costly infrastructure, including technology and services;
- A highly diverse workforce that is difficult to change in terms of attitudes and skills;
- The need for managing risks, and ensuring standards and quality of service across the large institution; and
- Satisfying a perceived need for innovation that precludes more obvious or familiar ways of engaging in TEL.

Leaders clearly revealed a tension in managing these concerns while also balancing the diverse needs, requirements and demands of different sections of a 'university' where a one-size-fits-all approach is inappropriate. It seems reasonable therefore to suggest that any response to the 'conditions for success' may be different according to 'ecological' variations within and across universities, including discipline, location and other contexts. In this vein, the notion of 'ecology' can be usefully employed to drive a more localised and strategically

focussed approach to TEL. This encourages us to think bigger than single subject implementation of TEL, and more localised than broad institutional initiatives such as policy and resourcing provision.

Moving forward

This project points to a number of areas that universities need to address when working towards sustaining effective use of technology to support student learning.

The focus of this concluding section is to consider the ‘conditions for success’ in light of the institutional priorities and constraints. In all of the following proposals for moving forward, these are broad suggestions relating to areas of clear importance that underpin successful TEL. Aligned with the presentation of the ‘conditions for success’, these are presented in relation to institutions, educators and learners, while acknowledging that these interact and overlap to create effective TEL. However, these are provided with the caveat that there is no specific ‘road map’ to success, as each institution needs to frame specific responses within their own contexts.

Laying the foundations within institutions

- 1. Establishing TEL expectations as an integral part of the university culture:** Many of these examples of ‘what works and why’ are currently ‘exceptions to the rule’ rather than mainstream practices. If the university believes in principles such as ‘flipped classroom’ then this needs to be built into dominant structures (e.g., curriculum, assessment, resourcing), and presented to teachers and staff as an accepted and/or expected mode of teaching and learning. Considering TEL strategies such as polling, 3D printing, or social networking as “innovations” signals them as non-standard or exceptions. This can also indicate to staff that such technology use is a lower institution-wide priority.
- 2. Providing teaching spaces that are technologically flexible and technology friendly:** Lecture theatres and seminar rooms remain key places where TEL takes place. They need to be flexible and reliable – set up for lecturers to simply walk up, plug-in and play. This is now the era of lecturers and students ‘bringing their own devices’. Spaces need to be designed with less emphasis on the lecturn-based PC in the corner and, instead, expectations of wireless connectivity and high specification display technology. The aim here is to give confidence that TEL can occur wherever teaching is scheduled to take place.
- 3. Good resourcing:** This is clearly essential to supporting technology use. These are issues that universities are clearly aware of, but should not be forgotten about and requires an understanding of the institution provision and the student provision of these digital resources which constitute the digital ‘ecosystem’ for staff and

students. The primary area for attention is sustaining reliable and high capacity technical infrastructures - including sufficient bandwidth and capacity for streaming videos, storing large files, and large numbers of simultaneous wireless connections.

4. **Seeding successful forms of TEL:** There is a clear tension between universities wanting TEL to be a process of change and innovation, *and* wanting to retain control over how technologies are used. Many of the successful forms of technology use in this project were organic and 'bottom up' in nature – the result of gradual changes and evolutions, rather than imposed change. Evidently, the success of TEL initiatives should not be measured in the short term, suggesting the value of a culture of seed funding and grass roots development and acceptance of 'failure' as a legitimate process of changing practice.

Working with educators

5. **Moving beyond the 'usual suspects' to promote TEL principles and practices to staff:** There is clearly a role for central university agencies to better establish TEL principles and practices in the collective consciousness of students and staff, not just the 'usual suspects', 'early adopters' and the 'already converted'. Educators who engage with teaching and learning initiatives and events are likely to be willing converts or early adopters and do not necessarily further disseminate practices to others.
6. **Developing forms of TEL that are relevant to current ways of teaching:** TEL works best where there is continuity with familiar ways of teaching and using technology. TEL also works best where there is obvious relevance to the 'job' of being a student. Doing the simple things well is likely to build confidence and eventually encourage more radical uses and changes.
7. **Working with staff to develop their own understanding of how students learn:** Successful instances of TEL in this project were founded on purposeful implementation of digital technologies to support specific learner needs. This often included the educators having a clearly developed sense of the need to engage with students, rather than simply produce content (or oneself) for consumption.
8. **Finding ways to cede control to educators who want to try something different:** This might include taking a permissive approach to allowing staff to install applications and programs of their choice, or at least being able to choose to use non-enterprise services. This could take the form of authorities "looking the other way", but also providing limited funding and technical support for non-enterprise services (e.g. polling systems, blogging, etc.).

Working with learners

9. Working directly with learners to develop appropriate and effective forms of TEL.

Many of the TEL activities of universities focus on staff. Closer attention should be paid to students. Students are perhaps the best source of identifying and championing best practice of TEL – and could be a key source for creating demand for the spread of better TEL practices. Students also need to be better informed of TEL planning and proposals. TEL should not be something that is ‘done to’ students – rather it should be ‘developed with’ students. This is likely to result in effective and readily accessible forms of TEL. It may also facilitate student recognition of the benefits and purpose of the TEL practices that are implemented.

10. Working directly with learners to help them ‘learn how to learn’ with technology.

Students need to be aware of the practices, implications and expectations related to TEL as much, if not more than educators. They need support to use the technology but, more importantly, how to learn with the technology.

Impact: dissemination and engagement

This is an exploratory project with the intention that the results have an impact on current and future debates over the future of TEL in higher education. In order to facilitate this, we have concentrated on developing high quality findings disseminated through project activities, products, and the media. This process is ongoing with highly positive engagement with the sector to-date.

Project deliverables

Impact building will continue with the **on-going dissemination** of the following project deliverables:

- Final report – including project findings and recommendations;
- High level summary document (3 pages);
- One page infographic/summary sheet;
- 10 full and abbreviated case studies of TEL – including guidance for educators and leadership; and
- TEL ‘conditions for success’ infographic.

These deliverables are hosted by the project website (<http://bit.ly/TELwhatworksandwhy>). In addition to the above deliverables the website hosts other project outcomes including links to media coverage, journal articles, seminars, conference presentations, findings infographics and other ‘snap-shots’. While many of the deliverables have been produced for the end of this project, the engagement with the initial website has been promising. For instance, in the first two months of it being available, the case studies landing page has been visited by 311 unique browsers (other than automated indexing systems).

Engaging the sector: students, staff and leaders

The project activities have ensured that a large number of stakeholders (institutions, educators and learners) were not only consulted in developing the findings, but were also engaged with the substantive and critical question that faces Higher Education: when and why does TEL occur? Asking students, staff and leaders to critically consider the role of technologies in learning raises the collective consciousness of this complex issue. This is particularly the case when the surveys, focus groups and interviews directed them to think about when TEL was successful, what was needed for success, and how that can inform future ways of doing things. Figure 4 summarises the number of people who completed surveys or participated in interviews (focus groups, individual interviews, and expert group

consultations). This does not include the additional 1013 students, 346 staff, and 54 leaders who began, but did not complete, the surveys.

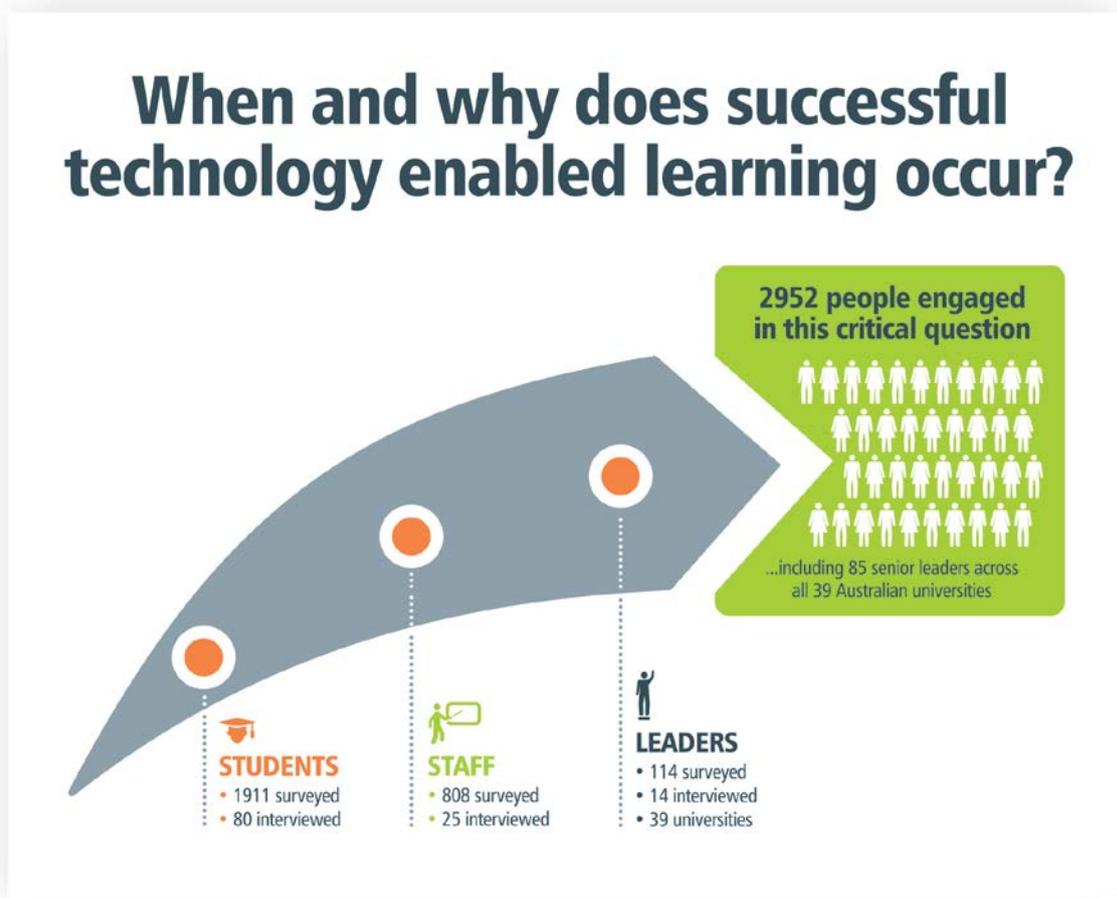


Figure 3. Project participants asked to critically consider TEL

It is particularly significant that, in Phase Three 85 senior leaders (e.g., Pro-Vice Chancellors and Deans) from all 39 Australian universities. This is in addition to a further 29 university leaders (e.g., Directors and Managers) engaged with a feed-forward consultation exercise. This involved (a) being notified of the project outcomes to-date including the 10 case studies and the second iteration of the ‘conditions for success’, and (b) completing a survey that sought responses to a series of propositions based on the ‘conditions for success’. As a consequence, members of the senior leadership from all Australian universities have not only been made aware of this project findings but have been engaged in a task of reflecting on those findings in terms of their own institution.

The project drew on the experience of the external project evaluator, Dr Grace Lynch, and an invited international reference group who gave valuable feedback:

- Professor Peter Albion, University of Southern Queensland
- Mr Tony Brandenburg, International Society for Technology in Education
- Dr Michael de Raadt, Moodle HQ
- Professor Toni Downes, Charles Sturt University
- Professor Margaret Lloyd, Queensland University of Technology
- Professor Martin Oliver, University College London
- Mr Garry Putland, Pearson

Finally, university leaders from all 39 universities were then invited, along with their teams, to attend a webinar in which the key findings were presented from each phase of the project. The webinar was attended by 53 people. At the request of those who could not attend, the webinar was recorded and is hosted on the project website. In addition, 187 leaders and academic developers have requested copies of the final report.

Seminars and conference presentations

Emerging project findings have been disseminated through a number of local, national and international conferences and seminars – in particular:

1. Henderson, M. (2015, March). *Conditions for success: technology enhanced learning*. Paper presented at Innovations in Teaching and Learning seminar series, The Centre for the Study of Higher Education, Melbourne University.
<https://vimeo.com/124486784>
2. Finger, G. (2014, December). *What works and why: Understanding successful technology enabled learning in Australian higher education*. Paper presented at BETT Asia Leadership Summit, Singapore.
3. Smart, V. (2014, November). *What works and why: Understanding successful technology enabled learning within institutional contexts*. Paper presented at the Ascilite conference, Dunedin, New Zealand.
4. Henderson, M., Selwyn, N. & Finger, G. (2014, September). *Mapping the realities of technology enabled learning in universities*. Paper presented at British Educational Research Association Annual conference, London.

Media coverage

These activities resulted in a range of international press coverage in Australia, UK and India. A full range of media releases will accompany the publication of this end-of-project report:

1. *The Sydney Morning Herald* (2015). 'Time to ask students about use of digital technologies in lectures', 21st June
2. *Times Higher Education* (2015). 'Digital aids: students reveal 'benefits' of technology' 9th April.
3. *The Australian* (2015). 'Twitter the least used resource' 18th February.
4. *The Hindu* (2015). 'Don't be ashamed of using Wikipedia!' 18th February [India].
5. *Times of India* (2015). 'Need to find better ways to integrate Wikipedia in higher education' 12th February [India].
6. *Times Higher Education* (2015). 'Wikipedia should be 'better integrated' into teaching' 11th February.
7. *The Australian* (2015). 'Wikipedia is not destroying education as we know it' 11th February.

In addition to the news media we have had some interest in our work through our social media outlets. For example, the initial release in September 2014 of 'Headline Findings' infographic from our student survey was distributed to 940 'followers' via Twitter and retweeted 30 times by followers to their extended networks.

International peer-reviewed journal articles

In addition to these deliverables, the project team continues to produce a number of research articles based on the different stages of the project. The following articles have already been accepted and are in press:

1. Henderson, M., Selwyn, N., Finger, G., & Aston, R. (2015). Students' everyday engagement with digital technology in university: exploring patterns of use and 'usefulness'. *Journal of Higher Education Policy and Management*.
<http://dx.doi.org/10.1080/1360080X.2015.1034424>
2. Henderson, M., Selwyn, N. & Aston, R. (2015). What works and why? Student perceptions of 'useful' digital technology in university teaching and learning. *Studies in Higher Education*. Advance online publication.
<http://dx.doi.org/10.1080/03075079.2015.1007946>
3. Henderson, M., Finger, G. & Selwyn, N. (in press). What's used and what's useful? Exploring digital technology use(s) amongst taught postgraduate students. *Active Learning in Higher Education*.

Two other articles have been written, submitted and are currently under review:

4. Selwyn, N. (2015). *Digital downsides: exploring university students' negative engagements with digital technology*. Manuscript submitted for publication.
5. Selwyn, N. & Gorard, S. (2015). *Students' use of Wikipedia as an academic resource - patterns of use and perceptions of usefulness*. Manuscript submitted for publication.

Additional articles are in preparation.

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Appendices

For all of the *What works and Why?* final report appendices (Part B) please refer to the following link <<http://www.olt.gov.au/project-what-works-and-why-understanding-successful-technology-enabled-learning-within-institutional>>.

Appendix A. Certification by Pro Vice-Chancellor

Appendix B. Case studies

Case study 1. Immediate feedback in classes: live polling for motivation and learning

Case study 2. Illustrating the problem: digital annotation tools in large classes

Case study 3. Orchestrating teaching: the implications of flipped classroom

Case study 4. Supporting community and learner preparedness through online forums

Case study 5. Enriching the curriculum with supplementary media

Case study 6. Enhancing student learning through rapid prototyping and testing: 3D printing technologies across disciplines

Case study 7. Authentic learning experiences through technology-enabled simulation

Case study 8. Enabling flexibility where and when learning occurs: learners becoming mobile

Case study 9. Enhancing courses: online technologies for managing, collaborating, reviewing and assessing student learning

Case study 10. Connecting, communicating and learning through social networking sites

Appendix C: Evaluator's report

Appendix D: Phase 1 student survey

Appendix E: Phase 1 staff survey