

## Conditions for successful technology enabled learning

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This paper reports on the findings of a 16 month project funded by the Australian Government Office for Learning and Teaching. The project utilized an iterative mixed method design to investigate (a) what digital technologies are used and valued by students and educators for learning, and (b) the different factors within the 'ecology' of the university that contribute to these successful uses of digital technology. In total 2838 students and staff across two Australian universities and a further 114 leaders from all 39 Australian universities participated in the project. Through large scale surveys and in-depth case studies thirteen 'conditions for success' were identified that appeared to stimulate, support, and/or sustain specific success stories. These conditions relate to different aspects of the 'ecology' of higher education – from individual skills and attitudes through to institutional policymaking. This paper describes the conditions for success, and concludes with challenges to the higher education sector.

**Keywords:** Technology enabled learning

### Introduction

The nature of technological innovation and change in educational institutions is highly complex and contingent on multiple and often-contradictory influences over time (Fullan 2007). Consequently we should be cautious of overly deterministic or simplistic rhetoric of technology-related 'impact' and 'effect' on universities. This project addresses the long-standing gap between the rhetoric and the realities of technology enabled learning (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

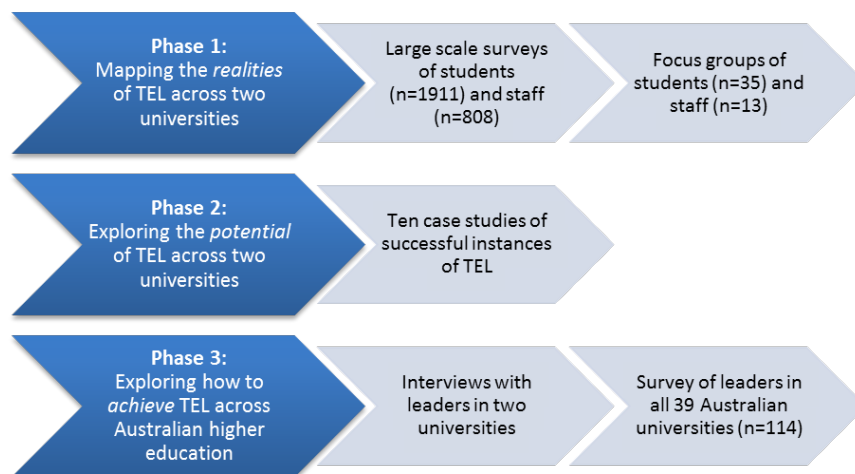
studies have found that university students often are ineffective in their use of the Internet and other digital research tools. As the recent 'Net Generation' study of UK universities concluded, students report varying levels of digital confidence and skills often resulting in "surprise or confusion 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).

This project starts from the premise that any study of technology-related change and innovation needs to recognize the systemic nature of educational activity, and strive to develop understandings of the dynamics of how new technologies and techniques become embedded in the broader 'ecology' of local practice. Such an ecological approach also serves to clarify the institutional policies, practices, cultures and routines that shape that appropriation. As Zhao and Frank (2003, p.807) describe, the ecological metaphor offers "a powerful analytical framework for understanding technology use" in education. Understanding the university 'ecology' therefore highlights the varied influences at the level of the individual student and teacher, alongside the layered 'context' of the classroom, department, faculty, university, local community, state and nation, as well as the presence of many different competing innovations at any one time.

## Research design

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**

In Phase One, large-scale online surveys were administered to students and staff 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 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.

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 case studies can be found at: <https://bitly.com/whatworksandwhy>.

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:

- Examination of the pedagogic/instructional design elements of these 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. 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'.

Phase Three then 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:

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.

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'.

## **Findings – conditions for success**

This paper focusses on the proposed conditions for success arising from an analysis of the three phases of data collection. Other findings, and more detailed analysis of each phase is provided elsewhere (Henderson, Selwyn & Aston, 2015a; Henderson, Selwyn, Finger & Aston, 2015b). Similarly the 10 case studies are described on the project website [<https://bitly.com/whatworksandwhy>].

In developing the proposed conditions for success the histories, practices, enablers and challenges highlighted by the rich data of the Phase Two case studies were triangulated with the Phase One survey and focus group data until the project team felt there was theoretical saturation. This resulted in the identification of 16 initial 'conditions for success'. These 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 13 'conditions for success' are illustrated in Figure 2 and outlined below.

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.

**Institutions: resource and culture**

Clearly, the access to, and reliability of, the **technology resourcing** 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.*

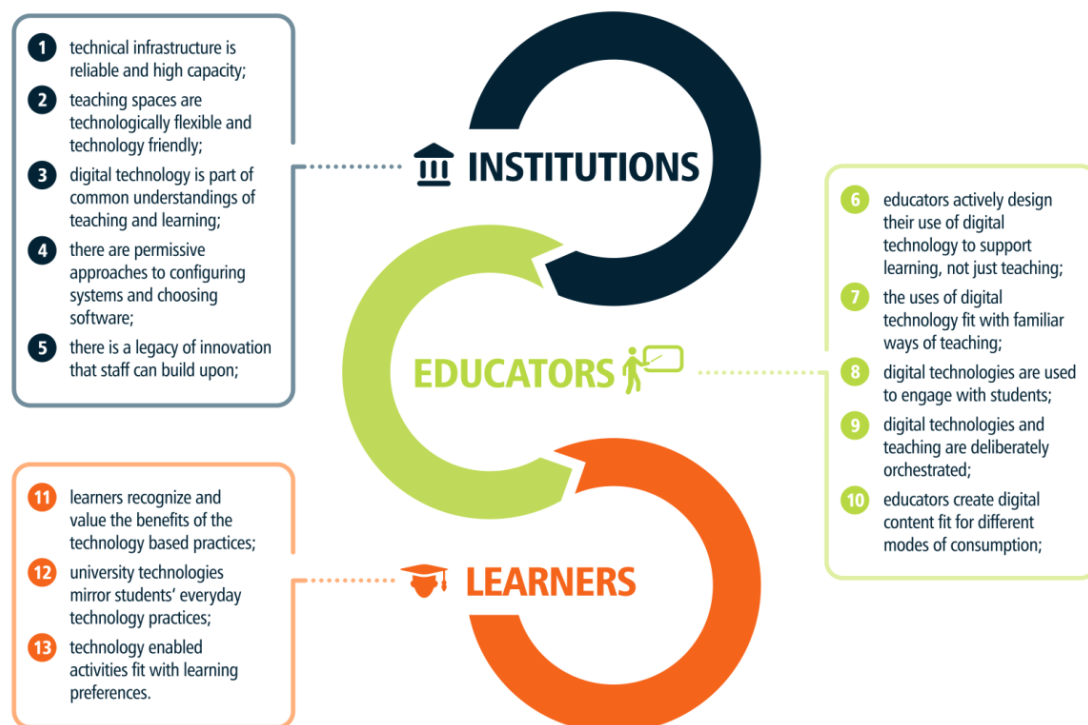
University systems require sufficient bandwidth and generous capacity for streaming videos and storing large files. This also includes teaching spaces being able to support large numbers of simultaneous wireless connections.

*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. Our data 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'.

# Conditions for Success

## Technology enabled learning is successful when...



**Figure 2. Technology enabled learning: Conditions for success**

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:

*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'.

*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'.

*there is a legacy of innovation that staff can build upon.*

Many of the successful TEL examples 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:

*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.

*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.

*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, recognizing 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.

*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.).

*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:

*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.

*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.

*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.

## **Challenges to the conditions for success**

Phase Three offered a useful opportunity to refine the conditions for success as well as to consider them in terms of institutional strategic priorities. 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.

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. However, the data from all three phases does suggest a number of areas that universities need to actively investigate 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:*

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.

*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 lecture-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.

*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.

*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*

*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.

*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.

*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.

*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

##### *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.

##### *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.

## Conclusion

This project began with the assumption that TEL cannot, and should not, be explained as simple interventions with inevitable (positive) outcomes. Analysis of the data in this project confirm Fullan’s (2007) claim that innovation and change in educational institutions is highly complex and contingent on multiple and often-contradictory influences over time. The rhetoric of digital natives, elearning, digital revolution, can lead some to conclusion that the combination of students, digital technologies and education is not only expected but also ultimately successful and largely unproblematic strategy. In contrast this project found the actual usage of technologies for learning is rather low-level and low-key in comparison to the enthusiasms that often surround TEL. For instance students most valued those digital technologies that helped them to managing the logistics of university study (e.g., online access to the library) and when specifically directed to consider learning with technologies they most commonly described forms of consumption of information and content rather than any of the much celebrated forms of active learning with technologies such as collaboration via social media (for discussion see: Selwyn & Gorard, 2015). The ‘reality’ of student experience is also punctured by a number of frequently cited problems including instances where technology:

- has failed to function, preventing them from working
- distracts them from the task at hand (this includes their own technologies and those around them)
- might not be the most suitable tool despite being proscribed by the learning task
- is detrimental to their learning, such as “death by PowerPoint” in lectures and poor quality digital learning materials. (for discussion see: Selwyn & Gorard, 2015)

Nevertheless, the project did identify patterns and cases where TEL was successful and was sustained over time. This resulted in proposing 13 conditions that support ‘successful’ instances of TEL. These include conditions at different levels: institutions, educators and learners. 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. This was particularly highlighted by the 85 senior leaders from the 39 Australian Universities who 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, we propose that the notion of ‘ecology’ can be usefully employed to drive a more localised and strategically focused approach to TEL. We also propose that the conditions and challenges arising from this project are useful starting points for each institution.

## Acknowledgement

Support for this project has been provided by the Australian Government Office for Learning and Teaching. The views in this project do not necessarily reflect the views of the Australian Government Office for Learning and Teaching.



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