Australian Educational Computing, 2017, 32(1).

Stalled Innovation: Examining the technological, pedagogical and content knowledge of Australian university educators

Karin Barac
Griffith University, Australia

Sarah Prestridge
Griffith University, Australia

Katherine Main
Griffith University, Australia

This paper presents a summary of the key findings of a TPACK survey adapted for a higher education context and serves as an initial sampling technique for a larger study in the design and delivery practices of academics. There are few studies that investigate how technologies are used and experienced in courses from an objective pedagogical perspective. In this first stage, a survey was implemented to understand academic perceptions of the role that technologies play in relation to their content and their pedagogies. The initial findings indicate that the connections within these domains are limited in the academic context.

Keywords: TPACK, learning design, higher education

Introduction

In 2013, Universities Australia, the leading advocacy group that represents Australian universities, stated in the A Smarter Australia policy document that “the digital economy and technology are transforming higher education as they have transformed media [and] retail” (p. 8). Many argue, however, there is still little evidence to support claims for widespread renewal of this magnitude in the daily business of higher education (Oliver, 2012; Price & Kirkwood, 2014; Russell, Malfroy, Gosper, & McKenzie, 2014; Selwyn, 2014). These studies suggest that the introduction of technologies alone will do little to transform education if it is not linked to pedagogies.

As a significant gap in the research still exists, the purpose of this study is to explore the nexus between pedagogy and technology in higher education, in particular, how technology is being used in specific relationship to the content and whether pedagogy is being shaped by the technology. To be able to understand academics’ perceptions of technologies the framework of Technological, Pedagogical and Content Knowledge (TPACK), developed by Mishra and Koehler (2006), has been selected as it provides an ideal conceptual lens to analyse these potential relationships.

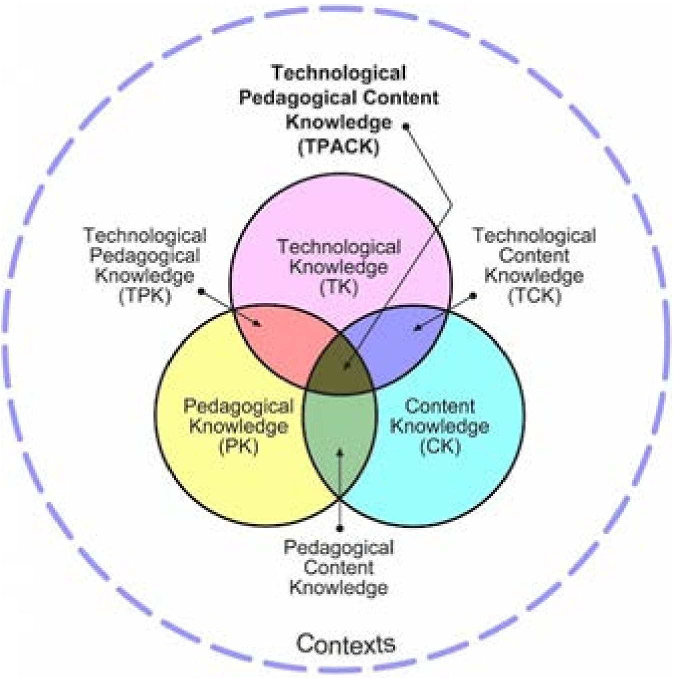

Figure 1. The TPACK Model from http://tpack.org

The basis of this framework is "the understanding that teaching is a highly complex activity that draws on many kinds of knowledge" (Mishra & Koehler, 2006, p. 1020) and aims at "providing teachers with a conceptual model to effectively design and implement technology-enhanced learning" (Rienties, Brouwer, & Lygo-Baker, 2013, p. 123). When reviewed as a whole, the model highlights the complex relationship that technology has with pedagogical and content knowledge and that technology should be integral to the design of learning and teaching and not be seen as a separate entity (Unwin, 2007). To date, TPACK research tends to focus on its use in K-12 educational environments or within training programs for pre-service teachers. This study uses survey responses from 219 academic teachers to explore the relationship between technology, pedagogy and content within the higher education context.

Background

Research into adoption rates of technologies by academics has found that their use is still largely confined to supporting or enhancing their existing practices (Flavin, 2012; Garrison & Akyol, 2009; Kirkup & Kirkwood, 2005) rather than changing or transforming their practices into something new (Price & Kirkwood, 2011). Livingstone (2012) suggested that academic practices are moving into the second phase of integration of technology, that of "ensuring its effective use" (p. 13). This second phase is far more complex and harder to address, as it requires a fundamental shift in how academics view the relationship between pedagogy and technology (Garrison & Akyol, 2009; Garrison & Kanuka, 2004; Kirkup & Kirkwood, 2005; Livingstone, 2012).

Technology adoption has been sporadic in higher education with institutions placing emphasis on infrastructure, such as providing access to technologies for their users (Kirkup & Kirkwood, 2005). Institutions often deployed these infrastructures with little educational support for either academics or students in how to use these technologies effectively (Zemsky & Massy, 2004). As a result, the main use of technologies has been for administrative purposes or to support "transmission modes of learning" (Mostert & Quinn, 2009, p. 72). These results are hardly surprising as universities still largely rely on the historical paradigm of the lecture-tutorial model where the discipline expert imparts their knowledge to the student. This is further compounded by the fact that what support was given to academics usually looked at developing their knowledge of technologies out of context of what and how they teach (Herring, Meacham, & Mourlam, 2016).

In recent years the growth of the information society has also caused a huge shift in the learning context. Garrison and Vaughan (2008) argued that students have higher expectations of a university classroom than sitting and listening to a discipline expert transmit information, rather, they want to come to class to critically engage with that content, their peers, and the experts. The place of academics is now to teach students how to interpret content through collaboration, reflection, and critical analysis (Ehlers & Schneckenberg, 2010). However, higher education institutions still support and perpetuate a model where academics are the holders of the expertise as the experts in their disciplines. However, the student's new relationship with information and knowledge means that academics need to transform their teaching practices (Gosper & Ifenthaler, 2013) to ensure students engage with content rather than just consume it.

The type of transformational teaching practices that this new learning context demand is based on student-centred theories of learning which are supported through the use of technologies. It is for this reason that we have seen a growth of blended learning (Garrison & Vaughan, 2013). In fact, it is predicted that blended learning, exemplifying student-centred pedagogies will become the standard delivery mode in higher education (Graham, Woodfield, & Harrison, 2012; Johnson, Adams Becker, Estrada, & Freeman, 2015). A shift in pedagogy to active learning or student-centred learning should, therefore, align with an increase in the use of technologies in education institutions due to the affordances of technologies to enable these pedagogies (Schneckenberg, 2009). However, much of the research suggests that the implementation of technologies has yet to produce a radical change in learning and teaching practices in higher education institutions (Garrison & Akyol, 2009; Kirkwood & Price, 2006; Livingstone, 2012; Selwyn, 2007).

One of the benefits of technologies in education is their ability to allow the flexibility of choice of where and when students can learn in blended modes, however, this power can only be realised if academics design their learning and teaching activities to exploit these features in pedagogically sound ways. Hammond (2011) found that academics had a pragmatic view of technologies to enhance their existing practices where communication with students was concerned but were only just considering ideas that completely changed their pedagogies. In his case study, Oliver (2012) observed that academics who did make use of technologies did not necessarily change their teaching practices as they did not know who to talk to, or how to talk about technology in meaningful ways that were connected to their ideas of pedagogy. Rienties et al. (2013) noted that academics often aligned their content with pedagogy, but rarely aligned technology in the same way with their content or pedagogy.

To date, educational technology research in higher education tends to focus on the pedagogy or the technology but rarely looks at the integration of both these domains. This is where the TPACK framework may offer benefits to the body of research.

More research is required to understand this relationship between technology and pedagogy within the academic community. A further understanding of the tension between this complex interplay will help inform better professional development frameworks and activities so that universities are able to innovate and remain competitive.

Methodology

This study aims to understand how academics perceive the relationship between pedagogy and technology in contemporary Australian higher education. The study has used a multifaceted approach through collection of quantitative and qualitative data sets to help reveal the pedagogical practices of academics and understand the place technologies have in their learning and teaching activities. The first phase of data collection, which is reported here, was conducted to understand how academics currently identify the role of technologies in their course design processes and to answer the sub-question:

Where do academics currently position technologies in the design and delivery of their courses?

The use of TPACK as the guiding framework for phase one has been selected because its research instruments focus academics on describing their current usage of technologies rather than judging their attitudes towards technologies (Schmidt, Baran, Thompson, Mishra, Koehler, & Shin, 2009). The TPACK framework also attempts to explain the complexity of the relationship between three concepts of teacher knowledge: pedagogy (PK), content (CK) and technology (TK) (Schmidt et al., 2009). However, rather than seeing these in isolation, it is suggested that they are investigated in intersecting yet discrete domains: pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK); or as a whole technological pedagogical content knowledge (TPACK) (Mostert & Quinn, 2009).

This first phase of data collection also allowed for large scale, random sampling to occur for the larger research project. It served to provide background, context and selection of a number of cases to be studied in phase two of the enquiry, which will triangulate academics perceptions of technologies captured through the survey against the academics' practices captured through interviews and document analysis.

Instrument

This study adapted an instrument developed and validated by Schmidt et al. (2009) that was developed to "measure teachers' self-assessment of the TPACK domains". This instrument is freely available for use to extend the body of research on TPACK and is available from the TPACK community website on registration (http://tpack.org/). The instrument was originally constructed for use with pre-service teachers and therefore needed adaptation to be applied to the academic context. The original survey consisted of 75 items using a 5-point Likert scale across the seven TPACK domains (TK: 8, CK: 17, PK: 10, PCK: 8, TCK: 8, TPK: 15, TPACK: 9).

The biggest challenge in the adaptation was that many of the domain questions consisted of questions directed to the specific content areas (e.g. mathematics, social studies, science and literacy) that are the focus for K-12 teachers. These specific content areas are not applicable to the academic teaching context as academics tend to be focused on only one content or discipline area. Some of the changes to the questions in the content-related domains were to take the original intent of the questions but make them general enough for an academic to link them to their particular discipline. For example, the original content domain (CK) questions were centred on knowledge of and development in each content area, e.g. I have sufficient knowledge about mathematics, and I have various ways and strategies of developing my understanding of mathematics. As such the intent of this questioning was maintained and was reduced the two questions: I have a sound knowledge of my discipline and I am able to develop knowledge in my discipline. The PCK question (I know how to select effective teaching approaches to guide student thinking and learning in mathematics) where there was one for each content area was reduced to I know how to select effective teaching approaches to guide student thinking in my discipline. And finally, the TCK question (I know about technologies that I can use for understanding and doing mathematics), with four content options in the original was reduced to I know about technologies that can enhance understanding of the complex ideas in my discipline. Consequently, the adaption resulted in the survey being reduced to twenty-four questions in total to capture the seven TPACK domains (TK: 6, CK: 2, PK: 7, PCK: 1, TCK: 1, TPK: 3, TPACK: 4). Each of these items was measured on the following 5-point Likert scale:

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree

The instrument also included five demographic questions to capture the discipline areas; years of experience in teaching; and the modes of teaching delivery (in person, online or mixed-mode). The discipline and modes of teaching questions use the terminology unique to the University context under investigation. A question was also added to the end of the survey to capture the current technologies being used by academics. This question consisted of checkboxes against 11 technologies that are widely known to be used in university learning and teaching (i.e. PowerPoint, quizzes, blogs etc.). An open text-field Other option was also included to allow respondents to add any technologies they were using that they felt were not captured in the provided list. There was also an opt-in question for participants to be approached for the second phase of the investigation into academic design practices. As a result, the constructed survey contained thirty-one items in total.

Once the instrument was developed, it was given to a small number of academics for review to check the questions for readability and to highlight any ambiguities. Once it refined from this review process, it was deployed online through the use of LimeSurvey within a large Australian university. An email invitation was sent to 1105 academics that are responsible for the design and delivery of courses within the university programs. There was a total of 219 valid responses, which gives a response rate of 20%.

Participants

Of the 219 respondents, 63% were female and 74.4% were at either lecturer or senior lecturer level. Within the ten discipline groups of the university in question, the largest group of respondents came from the health disciplines (34.7%), business and commerce (12.8%), followed by education and criminology and law (10.5%).

Demographics indicated that the respondents represented a wide range of experience in the design and delivery of courses from 0 to 40 years. The median being ten years and an interquartile range that extended from five years to 17.5 years. A large proportion of this experience being in the delivery of face-to-face courses (79%) representing the majority of their teaching load, however, they also reported a high level of experience in mixed-mode (44.3%) and online (43%) delivery.

Analysis

The responses to the survey were analysed using the statistical software package SPSS. A broad descriptive analysis was conducted to observe the basic features of the data set in order to understand the academics' self-assessment against the TPACK domains. Inferential analyses (in the form of Pearson's correlation) were also conducted to identify the relationships between the domains.

Results

To determine if the survey items were reliable, Cronbach's alpha values were calculated as a test of internal reliability. The values are represented with the descriptive statistics in Table 1 show that the subscales, which have alpha values from 0.810 to 0.918, are within the acceptable level for internal consistency (Vogt & Johnson, 2011). Overall, the data in Table 1 indicates that academics have more confidence in their content knowledge than their pedagogical knowledge or technological knowledge.

Table 1

Summary of descriptive statistics for subscales

Knowledge Domain	**Number of survey items**	**Mean**	**SD**	**Cronbach's alpha**
Technology (TK)	6	3.40	0.914	0.918
Content (CK)	2	4.71	0.478	0.879
Pedagogy (PK)	7	4.30	0.492	0.879
Pedagogical content (PCK)	1	4.16	0.669	-
Technological content (TCK)	1	3.55	0.904	-
Technological pedagogy (TPK)	3	3.69	0.865	0.810
Technology pedagogy content (TPACK)	4	3.55	0.766	0.831

Technology Knowledge

In the technology knowledge domain, respondents were all in the neutral to agree range across the six questions (Table 2). They were most likely to agree that they learn technology easily but were least likely to agree that they know a lot about a lot of technologies. The clustering of these responses around the neutral range with a very limited standard deviation suggests that academics tend towards ambivalence about their technical knowledge.

Table 2

Descriptive statistics for technical knowledge items

Questions	**N**	**Mean**	**SD**
Know how to solve my own technical problems	217	3.36	1.110
Can learn technology easily	217	3.71	1.019
Keep up with important new technologies	217	3.54	0.981
Frequently play around with technology	217	3.21	1.213
Know about a lot of different technologies	217	3.12	1.127
Have the technical skills I need to use technology	217	3.47	1.050
TK scale score (average)	217	3.40	0.914

Content Knowledge

These results in the technology knowledge domain are in sharp contrast with the content knowledge domain (Table 3), which shows a stronger tendency towards *agree* and *strongly agree*. This is in line with the literature that academics associate themselves primarily by their discipline expertise professionally (Hanson, 2009; Kember, 1997).

Table 3

Descriptive statistics for content knowledge items

Questions	**N**	**Mean**	**SD**
Have a sound knowledge of my discipline	217	4.70	0.516
Am able to develop knowledge in my discipline	217	4.73	0.504
CK scale score (average)	217	4.71	0.478

Pedagogical Knowledge

In Table 4, the data shows that for all seven items in this range responses were in the *agree* to *strongly agree* with little standard deviation. However, there seems to be less agreement when it comes to addressing student understandings and misconceptions in their pedagogies. There was also less agreement when it came to using a wide range of teaching approaches which is not that surprising seeing that academics are rarely trained in teaching, rather, their pedagogies tend towards how they were taught or what they have experienced. Based on this it would be expected to find equal levels of neutrality to the pedagogy knowledge questions as the technical knowledge questions.

Table 4

Descriptive statistics for pedagogical knowledge items

Questions	N	Mean	SD
Know how to assess student learning in my courses	212	4.39	0.593
Can adapt teaching based on what students currently do or do not understand	212	4.43	0.608
Can adapt my teaching style to different learners	212	4.26	0.698
Can assess student learning in multiple ways	212	4.27	0.675
Can use a wide range of teaching approaches	212	4.18	0.782
Familiar with common student understandings and misconceptions	212	4.16	0.653
Know how to organise and maintain my course delivery	212	4.42	0.615
PK scale score (average)	212	4.30	0.492

Integrated Domains

When looking at the integrated domain questions (Table 5 and 6), we start to see the connections that academics make (or don't make) between content, pedagogy and technology. There is a stronger link between making pedagogy and content choices than between technology and content choices. The introduction of concepts of technology into these domains starts to erode the academics' confidence. This is evidenced by the tendency towards neutrality to these types of questions in the TCK, TPK and TPACK results.

Table 5

Descriptive statistics for integrated domain items

Questions	N	Mean	SD
Know how to select effective teaching approaches to guide student thinking in my discipline			
PCK scale score	212	4.16	0.669
Know about technologies that can enhance understanding of the complex ideas in my discipline			
TCK scale score	212	3.55	0.904
Can choose technologies that enhance the teaching approaches in my courses	211	3.63	0.855
Can choose technologies that enhance students' learning in my courses	211	3.58	0.865
Think critically about how to use technology in my course design and delivery	211	3.85	0.874
TPK scale score (average)	211	3.96	0.865

Table 6

Descriptive statistics for TPACK domain items

Questions	N	Mean	SD
Select technologies to use in my courses that enhance what I teach, how I teach and what students learn	211	3.69	0.860
Choose technologies that enhance the content of a course	211	3.72	0.836
Provide options for students to demonstrate their learning through own selection of technologies	211	3.16	1.079
Confident can design and deliver courses that combine elements of discipline, technologies & teaching approaches to enhance learning	211	3.64	0.967
TPACK scale score (average)	211	3.55	0.766

Technologies used to enhance learning and teaching

Table 7 reports the results from this final question that was added to the TPACK survey that captured the technologies currently used by the academics. Participants indicated 11 examples of technologies used within courses to enhance learning and teaching and were given an opportunity to add any other technologies used that were not listed. The responses were scored as follows: No (0), Yes (1). The mean participant responses to items equate to the percentage selecting that item, with 93% of participants likely to indicate that they used PowerPoint or Prezi, and with only 14% of participants likely to indicate that they used multimedia creation software or web platforms.

Table 7

Descriptive statistics for content knowledge items

Technologies	N	Mean	SD
PowerPoint/ Prezi	219	0.93	0.253
Quizzes/ Tests	219	0.77	0.424
Blogs	219	0.23	0.421
Wikis	219	0.19	0.391
Discussion boards	219	0.67	0.471
Virtual classroom	219	0.40	0.490
Multimedia creation software or web platforms	219	0.14	0.349
Adaptive Learning Platforms	219	0.03	0.164
Cloud-based apps	219	0.33	0.471
Tablet apps	219	0.14	0.349
Web-based social platforms	219	0.29	0.454
Other	219	0.16	0.363

Within this question set, the open-ended *Other* field yielded 34 entries of technologies that the respondents felt did not fit into the supplied categories. Even with the addition of these other technologies, represented in Table 8, it can be seen that the types of technologies being used are still limited.

Table 8

List of Technologies in the Other category

Technologies	Number of Mentions	Technologies	Number of Mentions
Journal	2	Student Response System	6
Direct engagement	1	Quizlet	1
Annotation tools	1	survey monkey	1
Thinglink	1	SparkPLUS	1
Slate	1	Apps	1
Videos	7	MapInfo	1
iMovie	1	YouTube	1
GarageBand	1	Skype	1
Teleconference	1	Smartphones	1
Discipline based software	3	Website	2
Blackboard	3	Padlet	1
Reflective diary	1	Telephone	1

The vast majority of tools represented in Table 7 and 8, are PowerPoint, videos and quizzes, which are usually used to support transmission-type pedagogical activities. However, the second largest group of tools (represented by discussion boards, virtual classrooms and student response systems) can be classified as communication tools. This potentially indicates there is movement towards more student-centred and social-constructivist approaches to teaching.

Relationships between the sub-scales

As indicated in Table 8, the technical skills, pedagogical skills, TPACK components and TPACK summary subscales are significantly positively correlated with all other scales and subscales. In contrast, the content knowledge subscale does not correlate at significant levels with the TPACK components subscale or the use of technologies in the classroom scale. Another way of looking at this is that content knowledge is the only scale that is not significantly correlated with the use of technologies. This is particularly problematic given that it has been previously shown that academics are largely driven by their content knowledge. It indicates that academics are not able to make connections between their content and applications of technologies or an understanding of the relationship between these two items and therefore do not have an integrated view of their teaching.

Table 8

Pearson's Correlation matrix for TPACK subscales & use of technology

Scale scores	Statistics	Technical skills scale	Content knowledge scale	Pedagogical skills scale	TPACK components scale	TPACK summary scale	Technologies used within courses
Technical skills scale (av)	Pearson Correlation	1					
	Sig. (2-tailed)						
	N	217					
Content knowledge scale (av)	Pearson Correlation	.151*	1				
	Sig. (2-tailed)	0.026					
	N	217	217				
Pedagogical skills scale (av)	Pearson Correlation	.139*	.376**	1			
	Sig. (2-tailed)	0.043	0.000				
	N	212	212	212			
PCK, TCK, TPK components scale	Pearson Correlation	.373**	0.091	.218**	1		
	Sig. (2-tailed)	0.000	0.182	0.001			
	N	217	217	212	219		
TPACK summary scale	Pearson Correlation	.537**	.141*	.438**	.461**	1	
	Sig. (2-tailed)	0.000	0.041	0.000	0.000		
	N	211	211	211	211	211	
Technologies used within courses	Pearson Correlation	.562**	0.042	.395**	.461**	.783**	1
	Sig. (2-tailed)	0.000	0.541	0.000	0.000	0.000	
	N	211	211	211	211	211	211

* Correlation is significant at the 0.05 level (2-tailed).; ** Correlation is significant at the 0.01 level (2-tailed).

Summary

This small quantitative study examines the applicability of the TPACK model to higher education to capture current academic perceptions of content, pedagogy and the use of technology. From the data obtained it suggests that academics have stronger ideas around content than they do about their pedagogy or their use of technology but there was little relationship between content knowledge and the other integrated domains. The weighting towards content knowledge was not a particularly surprising finding as research has shown that academics identify with their discipline first and this identity shapes their values and behaviours (Hanson, 2009; Kember, 1997; Trowler, Saunders, & Bamber, 2012). However, considering this, it was surprising to find that through the investigation of the correlations between domains that content knowledge was the only domain that was not significantly related to the use of technologies. This finding may help to explain why technology integration in higher education has been sporadic as academics are not able to relate technologies to their prime knowledge and operational base.

Additionally, it was also shown that when ideas of technology intersect into the domains of content and pedagogy academic confidence erodes. This finding and the previous one suggest that academics view technologies as a separate and unknown entity to their teaching and learning practices.

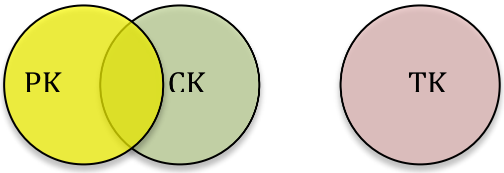

Figure 2. Representation of TPACK Domains in the Academic Context

One of the reasons behind this may be the fact that current academic development programs for technology adoption still seem to largely concentrate on technical skills rather than their pedagogic use (Dondi, Mancinelli, & Moretti, 2006; Garrison & Akyol, 2009; Kirkwood & Price, 2006; Littlejohn, 2002; McCarney, 2004). Current thinking describes the need to move professional development from the provision of technical skills to that which allows for the pedagogical application of these tools to their teaching practices (Ingram & Gilding, 2002; Macdonald & Poniatowska, 2011; McCarney, 2004; Shephard, Mansvelt, Stein, Suddaby, Harris, & O'Hara, 2011; Spratt, Weaver, Maskill, & Kish, 2003). Kember (1997) states that for professional development initiatives to be successful, they cannot be done without addressing a change in beliefs related to these new practices. Given the results of this study, professional development that only looks at the technical or pedagogy without recognising the disciplinary context will not give academics the support they need to embrace new pedagogical models or shift current beliefs to accept new teaching models.

Future Directions

A large proportion of the research conducted thus far in this area tends to rely on interview data, or self-reports, which do not provide a complete picture of "design and delivery practices" (Bennett, Thomas, Agostinho, Lockyer, Jones, & Harper, 2011, p. 165). As such, research is needed to interrogate "the intentional nature with which teachers approach their teaching" (Åkerlind, 2008, p. 375) and how this is actualised in their courses with their students. The implementation of this TPACK survey was just the first step to provide context. However, the survey is limited as it only captures academics perceptions of their understandings and does not capture how they apply these concepts in their daily practice of designing and delivering their courses.

As such this research only represents the first phase of the investigation and further phases are in progress that investigates the design and delivery practices within five courses by analysing the course artefacts (course sites and course outlines) and the experiences of the academic and students involved in the courses. This will provide a snapshot of current practices of academics and hopefully reveal that nature of the "dissonance between beliefs and practices" (Kirkwood & Price, 2006, p. 2). When complete, it is expected that this information could be beneficial to the design and development of university courses, as well for the design and development of professional learning activities for academics within universities.

References

Åkerlind, G. S. (2008). Growing and developing as a university researcher. *Higher Education, 55*(2), 241-254.

Bennett, S., Thomas, L., Agostinho, S., Lockyer, L., Jones, J., & Harper, B. (2011). Understanding the design context for Australian university teachers: Implications for the future of learning design. *Learning, Media and Technology, 36*(2), 151-167.

Dondi, C., Mancinelli, E., & Moretti, M. (2006). Adapting existing competence frameworks to higher education environments. *In I. Mac Labhrainn, C. McDonald Legg, D. Schneckenberg, J. Wildt (Eds.), The Challenge of eCompetence in Academic Staff Development*, 19-28.

Ehlers, U.-D., & Schneckenberg, D. (2010). Introduction: Changing Cultures in Higher Education. In U.-D. Ehlers & D. Schneckenberg (Eds.), *Changing Cultures in Higher Education: Moving Ahead to Future Learning* (pp. 15-25). Berlin: Springer.

Flavin, M. (2012). Disruptive technologies in higher education. *Research in Learning Technology, 20*, 102 - 111.

Garrison, D. R., & Akyol, Z. (2009). Role of instructional technology in the transformation of higher education. *Journal of Computing in Higher Education, 21*(1), 19 -30.

Garrison, D. R., & Kanuka, H. (2004). Blended Learning: Uncovering its transformative potential in higher education. *Internet and Higher Education, 7*, 95-105.

Garrison, D. R., & Vaughan, N. D. (2008). *Blended learning in higher education: Framework, principles, and guidelines*. San Francisco, CA, USA: Jossey-Bass.

Garrison, D. R., & Vaughan, N. D. (2013). Institutional change and leadership associated with blended learning innovation: Two case studies. *Internet and Higher Education, 18*, 24-28.

Gosper, M., & Ifenthaler, D. (2013). *Curriculum Design for the Twenty-First Century*. New York: Springer.

Graham, C. R., Woodfield, W., & Harrison, J. B. (2012). A framework for institutional adoption and implementation of blended learning in higher education. *Internet and Higher Education*(18), 4-14.

Hammond, M. (2011). Beliefs and ICT: what we can learn from experienced educators? *Technology, Pedagogy and Education, 20*(3), 289-300.

Hanson, J. (2009). Displaced but not replaced: the impact of e-learning on academic identities in higher education. *Teaching in Higher Education, 14*(5), 553-564.

Herring, M. C., Meacham, S., & Mourlam, D. (2016). TPACK Development in Higher Education. In M. C. Herring, M. J. Koehler & P. Mishra (Eds.), *Handbook of Technological Pedagogical Content Knowledge (TPACK) for Educators* (pp. 207-223). New York: Routledge.

Ingram, D., & Gilding, A. (2002). *Centralised decentralised professional development models: Supporting the long term use of information and communication technology (ICT) in higher education.* Paper presented at the Winds of change in the sea of learning: Proceedings of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE) Conference.

Johnson, L., Adams Becker, S., Estrada, V., & Freeman, A. (2015). NMC Horizon Report: 2015 Higher Education Edition. Austin, Texas: The New Media Consortium.

Kember, D. (1997). A reconceptualisation of the research into university academics' conceptions of teaching. *Learning and instruction, 7*(3), 255-275.

Kirkup, G., & Kirkwood, A. (2005). Information and communications technologies (ICTs) in higher education - a tale of gradualism rather than revolution. *Learning, Media and Technology, 30*(2), 185-199.

Kirkwood, A., & Price, L. (2006). Adaptation for a changing environment: Developing learning and teaching with information and communication technologies. *The International Review of Research in Open and Distance Learning, 7*(2).

Littlejohn, A. H. (2002). Improving continuing professional development in the use of ICT. *Journal of computer assisted learning, 18*(2), 166-174.

Livingstone, S. (2012). Critical Reflections on the benefits of ICT in Education. *Oxford Review of Education, 38*(1), 9-24.

Macdonald, J., & Poniatowska, B. (2011). Designing the professional development of staff for teaching online: an OU (UK) case study. *Distance Education, 32*(1), 119-134.

McCarney, J. (2004). Effective models of staff development in ICT. *European Journal of Teacher Education, 27*(1), 61-72.

Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record, 108*(6), 1017 - 1054.

Mostert, M., & Quinn, L. (2009). Using ICTs in Teaching and Learning: Reflections on Professional Development of Academic Staff. *International journal of Education and Development using ICT [online], 5*(5), 72-84.

Oliver, M. (2012). Technology and Change in Academic Practice. In P. Trowler, M. Saunders & V. Bamber (Eds.), *Tribes and Territories in the 21st Century: Rethinking the Significance of Disciplines in Higher Education. International Studies in Higher Education*: ERIC.

Price, L., & Kirkwood, A. (2011). Enhancing learning and teaching through technology: a guide for evidence-based practice for academic developers. York, U.K: Higher Education Academy.

Price, L., & Kirkwood, A. (2014). Using technology for teaching and learning in higher education: a critical review of the role of evidence in informing practice. *Higher Education Research and Development, 33*(3), 549-564.

Rienties, B., Brouwer, N., & Lygo-Baker, S. (2013). The effects of online professional development on higher education teachers' beliefs and intentions towards learning facilitation and technology. *Teaching and Teacher Education, 29*, 122-131.

Russell, C., Malfroy, J., Gosper, M., & McKenzie, J. (2014). Using research to inform learning technology practice and policy: a qualitative analysis of student perspectives. *Australasian Journal of Educational Technology, 30*(1).

Schmidt, D. A., Baran, E., Thompson, A. D., Mishra, P., Koehler, M. J., & Shin, T. S. (2009). Technological Pedagogical Content Knowledge (TPACK): The Development and Validation of an Assessment Instrument for Preservice Teachers. *Journal of Research on Technology in Education, 42*(2), 123-149.

Schneckenberg, D. (2009). Understanding the real barriers to technology-enhanced innovation in higher education. *Educational Research, 51*(4), 411-424.

Selwyn, N. (2007). The use of computer technology in university teaching and learning: a critical perspective. *Journal of computer assisted learning, 23*(2), 83-94.

Selwyn, N. (2014). *Digital Technology and the Contemporary University: Degrees of Digitization*. UK: Routledge.

Shephard, K., Mansvelt, J., Stein, S., Suddaby, G., Harris, I., & O'Hara, D. (2011). Professional development for e-learning: Researching a strategy for New Zealand’s tertiary education sector. *International Journal on E-Learning, 10*(4), 461-481.

Spratt, C., Weaver, D., Maskill, L., & Kish, K. (2003). *Online pedagogy and the challenges for academic staff development.* Paper presented at the Exploring Educational Technologies Conference - From Strategy to Implementation, Monash University, Melbourne, Australia, July 16-17, 2003.

Trowler, P., Saunders, M., & Bamber, V. (2012). *Tribes and Territories in the 21st-century: Rethinking the significance of disciplines in higher education.* USA: Routledge.

Universities Australia. (2013). *a smarter Australia: An Agenda for Australian Higher Education 2013-2016.*: Retrieved from www.universitiesaustralia.edu.au.

Unwin, A. (2007). The professionalism of the higher education teacher: What's ICT got to do with it? . *Teaching in Higher Education, 12*(3), 295 - 308.

Vogt, W. P., & Johnson, R. B. (2011). *Dictionary of Statistics & Methodology: A Nontechnical Guide for the Social Sciences: A Nontechnical Guide for the Social Sciences*: Sage.

Zemsky, R., & Massy, W. F. (2004). Thwarted innovation. *What Happened to e-Learning and Why, The Learning Alliance*.