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USING MOBILE TECHNOLOGY TO ENHANCE TEACHING

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This chapter has been developed from a longitudinal study conducted over 12 months—
from December 2010 to June 2012. The purpose of the research was to investigate how
lecturers use mobile technology within a classroom setting. The technological basis for
this study is the Apple iPad tablet, five of which were given to academics at an Australian
university, with no instruction or guidelines for their use. This chapter examines the
practical outcomes from the study, and the learning that has taken place, in order to
arrive at some insights into managing mobile technology in the classroom. This chapter
also develops a personal-development strategy for academics in the digital age.

BACKGROUND TO THE STUDY

Considerable research has been conducted into how students use mobile technology to
enhance their learning (Hwang & Chang, 2011; Looi, Seow, Zhang, Chen, & Wong, 2010;
Shih, Chuang, & Hwang 2010; Wang, Shen, Novak, & Pan, 2009). Similarly, there have
been a large number of studies that look at how students engage with academics with
regard to specific courses (Meurant, 2010). What is missing from the current array of
research has been an investigation into how academics use technology as part of their
teaching practice in general and, more specifically, mobile technology within their
teaching practice.

The advent of cloud computing represents both an opportunity and a challenge to
academics. First, there has been a noticeable tendency for universities to build new
infrastructure in order to cater for changes in technology use. This, in itself, is somewhat
perplexing and also paradoxical, as cloud computing has evolved to free the users from
the traditional physical constraints that university campuses often bring (Round, 2011).
It also challenges Australian universities’ obsession with real estate and their adopted
mantra (as well as that of many other universities globally) of “build it and the students
will come.” With this change, academics have been required to adopt new techniques
with regard to mobile “teaching” (here we interpose the word “teaching” as opposed to
learning, as this represents a new style for the delivery of information, rather than the traditional mechanisms associated with student learning). Traditional classroom activities associated with “chalk and talk,” or “log in and lecture,” are now under siege, as teaching moves to a more open frame of delivery, where students engage with the materials before many classes begin, and lecturers are required to add value, by making a significant contribution to students’ understanding. It is the conundrum of balancing the need for value-added teaching and understanding that is challenging many of the existing teaching paradigms. Academics are feeling exposed, as Generation Y now demands greater digital interactivity, as well as facing “burnout” through 24/7 access to materials and support. Bonk and Graham (2006) discuss the widespread adoption and availability of digital-learning technologies, which have led to increased levels of integration of computer-mediated instructional elements into the traditional face-to-face learning experience. Further, these authors argue that blended learning is now a standard part of education and training, helping to link people across countries and the globe. In addition, it can help reduce travel time for employees undertaking management training, or be used to distribute corporate-developed material and resources to instructors all over the globe.

The problem for many academics is that teaching no longer begins and ends at the classroom door, but is now a constant process where students expect to be able to engage (when they want it), throughout their time at university. The advent of the computer tablet has meant that academics have had to come to terms with the “anytime, anyplace, anywhere” mentality that is increasingly pervading the university-education system. Considerable research has been undertaken that looks at how students both cope with and manage the digital university system (Bennett & Maton, 2010; Bullen, Morgan, & Qayyum, 2011; Morgan & Bullen 2011). However, there are limited studies investigating the strategies that lecturers have developed and are still developing in order to cope with these changes.

THE PARTICIPANTS

The current study involves five academics who teach business communications at one of Australia’s mid-size universities. The unit teaches in excess of 4,000 undergraduate students per annum, requiring the academics to develop a variety of teaching and learning strategies (both digital and face to face) in order to teach the unit as well as manage a large administrative load. The five academics were each given an iPad and, adopting a naturalistic inquiry approach, were asked to use these iPads where they felt would be appropriate with regard to teaching the unit. No other training or instruction was given or offered, but was however, available on request. It is because the realities for each lecturer are multiple, and the cause-and-effect relationship are indistinguishable, that the study had adopted a naturalistic inquiry (Lincoln & Guba, 1985). This was a deliberate ploy in order to understand how academics would approach the problem of new technology being introduced into their “world” and, second, to allow them free reign regarding how they might use the technology, without imposing any immediate constraints. The iPads were both Wi-Fi and network enabled, but no SIM card was provided. It was down to each recipient as to whether they wished to avail themselves of the iPad’s telephone network capability. In addition, an iTunes card to the value of
A$30 was provided in order to allow the academics to purchase any software apps that they might need, in order to carry out their teaching roles.

The remaining sections of this chapter set out what has been learned and provide a checklist for introducing technology into teaching.

THEORETICAL FRAMEWORK

As the basis for this study, the authors used an adaption of Revans’ (1980) action-learning framework (see Figure 26.1).

Revans (1980) uses the following formula in order to explain the model’s dynamics:

\[ L = P + Q \]

L is the individual learning that takes places, which comprises programmed knowledge (P) (knowledge acquired from experts or through training courses) and questioning (Q). The argument presented is that programmed knowledge on its own is not sufficient to encourage learning, and that the questioning process (for example, closed, objective, relative, and open questions) allows us to reorganize our knowledge, so as to generate insights from a collective approach to learning and then put these into practice.

Marquardt (2009) extended Revans’ (1980) formula to include reflection, which overcomes a gap in Revans’ (1980) original framework involving the necessary aspects of “action”:

\[ L = P + Q + R \]

The current framework still presents a problem, and, although learning is the acquisition of “new” knowledge, it was apparent that different people treat knowledge

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Figure 26.1 Revans’ (1980) Original Action-Learning Framework
accumulation differently, and process it in very different ways. Importantly, without reflection taking place, little knowledge is acquired, but, if participants spend too much time reflecting, then the process slows significantly. In order to overcome this problem and understand how the participants engage with the mobile technology, we have added "feedback":

\[ L = P + Q + R + F \]

The feedback loop is extremely important, as it allows for the monitoring and subsequent management of the possible effects caused by inertia and action without reflection. It is also very apparent that people process information in many different ways, and this study is no different in that respect. We were looking for academics to feed back to the head of the unit, for example, that they might need training, or that further enhancements would be required to enable them to fully utilize the technology in the classroom environment. Action learning was originally conceived of as an educational process where people learn together. The theoretical proposition that underpins action learning is that "learners" acquire knowledge through action, rather than instruction, and will in fact overcome various inhibitions when working in small groups. Therefore, an additional interest for the researchers was whether the iPad might
act as a catalyst to draw the unit team together (tablets are often advertised as a socially unifying tool), or, because of different competency levels, possibly push them apart.

**LEARNING TO USE MOBILE TECHNOLOGY**

Perhaps one of the most controversial findings from this study is that, although all of the academics had requested the use of an iPad for teaching and had cited improvements in their classroom delivery as the main reason, as well as ensuring familiarity with a communication technology that many students were now using, the study concluded that three out of five academics had never used Apple computers or phones prior to the study and had had little or no exposure to mobile technology.

Why is this important? There is a widely held belief (particularly in universities) that, when an employee requests access to a particular technology, her or she does have some comprehension of its operating features, and how it might enhance the productivity. This assumption appears to be incorrect, as evidence suggests that the majority (in this study at least) have no immediate sense of how the technology might add value, or indeed how it might be used to enhance their own in-class experience.

The use of iPads has been found to possibly enhance students’ learning experience (Brand, Kinash, Mathew, & Kordyban, 2011; Fontelo, Faustorilla, Gavino, & Marcelo, 2012; Perez, Gonzalez, Pitcher, & Golding, 2011), but not necessarily to lead to better learning outcomes (Perez et al., 2011). Academic staff appear most likely to use the iPad primarily for administrative purposes, using applications such as e-mail, calendar, and meeting notes (Linsey, 2011), or for access to course resources and libraries, using applications such as e-books, as a means of communication with students using blogs, wiki, social media, and e-mail (Yeung & Chung, 2011), or as a projection device (Fontelo et al., 2012; Yeung & Chung, 2011) using various presentation applications. Only a small number of staff reported using iPads in their teaching activities in class.

The situation also arose where one of the academics gave his iPad to his son, on the grounds that he saw little or no value in its use, either for teaching or administration, and that there was no reason to undertake any form of training with regard to its operation, believing it would not enhance current practices. The academic in this case took no interest in the technology, not even asking for it back from his son when interviewed at the end of the 12-month research cycle.

Now, although this might appear unusual and perhaps a little extreme, the solution used here is not that uncommon. In another example, Academic 3 initially allowed her son to use the iPad and sat with him while he “played” with it. The learning that took place was action-based, but grounded in family experiences and expression. In this case, the academic recovered the iPad and went on to become a heavy user of the tablet.

M-learning is part of an ever-changing digital world in which “knowledge, power, and productive capability will be more dispersed than at any time in our history—a world where value creation will be fast, fluid, and persistently disruptive, a world where only the connected will survive” (Dorman, 2007, p. 6). In addition, in education, and in business, those who fail to grasp this reality will find themselves “ever more isolated, cut off from the networks that are sharing, adapting, and updating knowledge to create value” (Dorman, 2007, p. 6). This connected world is not constrained by physical space or time (Ng, Nicholas, Loke, & Torabi, 2010). The iPad-style tablet has very quickly become popular in higher education and has been adopted by the younger generation (Nielsen, 2010).
Questioning

What is perhaps most telling is that almost no questions were asked of the unit chair concerning iPad use (or of other colleagues), and indeed whether any training was available. Neither did the unit chair receive suggestions from the team that, where possible, the learning be captured and shared. As already noted, the strategy employed here was naturalistic inquiry, where the aim is to understand how people create meaning from, and interpret events in, their world (Lincoln & Guba, 1985). Initiation of discussions by the unit chair was deliberately withheld, so as not to bias the findings in any way.

Academics 4 and 5 were experienced Apple-technology users and found the transition seamless. They immediately took up the technology and started using it for both teaching and administration. Interestingly, neither chose to share their experiences with the other members of the team, and they had assumed that their colleagues had a reasonable level of familiarity with mobile technologies, or at the very least would ask. They did, however, talk together about what they had been doing with the iPad and shared various apps.

Academic 1 made one e-mail inquiry of the unit chair concerning why the telephone-network SIM card was not provided. Other than this she remained silent on how the iPad was used. In searching the university records, Academic 1 did make a request to the university IT department concerning training, but never attended the workshop, and did not follow up with further inquiries.

Academic 2, who relinquished use of the iPad to his son, was asked at one of the regular team meetings what he had been doing with it, and he openly admitted that he was not using it and felt that it was a more appropriate tool for “the younger generation . . . and that he could not see how to use it.” Academic 2 made no attempt to discover how other academics were using the iPad and seemed oblivious to the fact that it was a requested tool for work.

Testing: iPad Use

Of the five academics, three used the iPad to various degrees, in their classroom and also for administrative work; one relinquished its use, and another used it sparingly:

- **Academic 1**: used the iPad to read and answer e-mails, only at work. Academic 1 refused to use the iPad for lecturing, or in the classroom, and explained that it was a distraction. Academic 1 deliberately did not take the iPad home, regarding its 24/7 functionality as an invasion of home life. Neither did Academic 1 take the iPad to meetings on other campuses. Its sole use was either as an additional office e-mail facility, or to take notes at local meetings. No apps were downloaded, and no SIM card was purchased.

- **Academic 2**: As already noted, he relinquished his iPad to a son. Prior to doing so, he did use it very briefly, but found that it was not intuitive and could see no way to use it in the classroom. Academic 2 did not download any apps or purchase a SIM card.

- **Academic 3**: After a relatively slow start, and with some guidance from her young son, she fully engaged with the technology, using it for lecturing, classroom teaching, and administration and, much later on, research. Academic 3 also used it socially at home and found that it significantly enhanced her teaching and classroom mobility. She did download a variety of productivity and social apps and, later on, purchased a SIM card.
• Academic 4: Already had her own personal iPad, and so was an experienced user. She had a high level of familiarity with Apple products and immediately uploaded a large number of apps. The iPad was used for lecturing, classroom teaching, administration, research, and full social engagement, both at work and at home. Academic 4 was using the full mobility provided by the iPad and purchased a SIM card upon receiving the iPad.

• Academic 5: Is an experienced Apple user and was very familiar with the technology, as he had been using an iPhone. Academic 5 immediately uploaded a variety of apps, most of which related to productivity, and a small number for social engagement. The iPad was used immediately for lecturing, in classroom teaching, research, meetings, administration, and limited social use. Academic 5 immediately purchased a SIM card on receiving the iPad, so as to exploit the technology’s full mobility capability.

The variability of use is perhaps unsurprising. However, the extreme range was unexpected. Lower levels of technological engagement were both anticipated and expected, but completely relinquishing the technology was something that the researchers had not predicted.

Also evident was the fact that the technology was not proving to be the unifier that was expected. In fact, much of the testing and experimentation took place individually, and almost no cross-fertilization of ideas or discussion was entered into by the team.

Reflecting

Although the process of reflection was also variable, it is the range that was most notable. For example, Academic 2 only spent time using the technology to decide whether the iPad offered immediate value, but did not explore or reflect on what it might offer over the longer term. We have classified this Academic as a “non-adopter” (Hu, Poston, & Kettinger, 2011). Similarly, Academic 1 only spent time on immediate needs and not on what the technology might potentially offer. Some very limited reflection was undertaken, but not to any degree or depth, and there was an inherent refusal to explore beyond the technology’s immediate functionality. The level of adoption here was classified as “contained limited adopter” (Venkatesh, Morris, Davis & Davis, 2003), in that she would use the technology, but only within existing limits, and sought no further capability or use.

Academic 3 was effectively a “slow adopter” (Venkatesh et al., 2003) of the technology and initially only spent time reflecting on the iPad’s capability with family members at home. It took her approximately 6 months to become fully conversant with the technology and also to realize that it had potential benefits within a classroom setting. Once fully engaged with the iPad, Academic 3 integrated the advantages that mobile technology offered into her entire work and productivity cycle. It was apparent that Academic 3 needed both to be “shown” how to engage with the technology on different levels, as well as to be allowed to experiment with it in order to establish its purpose.

Academics 4 and 5 reflected in different ways and were seeking enhancements from the technology, rather than simple application. Although these two might be classified as “early adopters” (Wenger, White, & Smith 2009), their approaches were actually very different. Academic 4 saw greater versatility in the technology for social-interaction purposes, whereas Academic 5 focused much more on mobile productivity and the
enhancements for teaching. Both reflected regularly on the various apps that were available and were prepared to purchase and try new products on the iPad beyond the A$30 allowance. Academics 4 and 5 were committed to using the portability functions of the technology in order to improve, not only their learning experience, but also those of the students.

The point to be noted here is that the provision of technology does not automatically encourage reflection to take place. There is a degree of scalability with regard to the reflective process, in that the user clearly needs to understand the technology's immediate value, in terms of being able to enhance the immediate experience. Indeed, in the case of Academic 3, experiential learning was a crucial part of the embedding of the technology into her daily use. For Academics 4 and 5, the importance of experience was also part of the reflection process, and, although both occasionally shared information on app use, they already had a good comprehension of the value that might be attributed to mobile technology.

**Feedback**

As mentioned earlier, the research ran for 12 months, and, during this period, only Academics 4 and 5 fed back what they had learned to the unit chair without needing to be prompted. Academics 1, 2, and 3 remained largely silent on their use of mobile technologies and only engaged in feeding back when they were interviewed for the research. What is perhaps most telling is that the researchers had assumed that feedback would be automatic and regular via meeting contact points, but there were clearly inherent problems preventing that process from taking place. In summary terms, Academics 1 and 2 did not think that it was their responsibility to provide feedback or seek support and help, nor to give guidance or advice. They argued that the technology had been given to them without instruction, and that it was the unit chair's (interestingly, not the university's) duty to organize some level of training for them, and find out their needs. Both disagreed with questions relating to their own accountability, particularly when they realized they had not been using the technology to anywhere near its full potential, and still insisted that it was the unit chair's obligation to train and provide them with support.

Why is it important to employ a feedback strategy? There was a significant delay in requesting feedback (12 months). The other problem with feedback is whether it should be based on push or pull strategies. Conceptually, the idea was not to burden any of the academics or influence their choice with regard to technology use. The study was predicated on the belief that each of the participants would, as action learning suggests, find learning easier in a small group where prescriptive techniques concerning technology use were eliminated, and that the technology would act as a catalyst for cohesion (Marquardt, 2009).

What happened, however, is that clear divisions evolved around competency and capability. Academics 1 and 2 saw little or no value in the mobile technology, but did not feed this back until the end of the research cycle. Academic 3 took time to understand how productivity could be enhanced through portability, but sought feedback from outside the team. Academics 4 and 5 spent time reinforcing their own knowledge and did not engage the other members because they were unaware that Academic 1 had disengaged, Academic 2 was a very limited adopter, and Academic 3 was a slow but competent adopter.
Earlier feedback might have encouraged greater sharing and improved the learning experience of Academics 1 and 2. Similarly, although the learning style involves seeking external support, Academic 3 might have recognized the value that mobile technology adds much earlier. It is unclear what value Academics 4 and 5 would have received from a comprehensive feedback process. However, it is suggested that learning throughout the entire unit might have improved, and a stronger and more cohesive team could have been established.

**USING MOBILE TECHNOLOGY IN THE CLASSROOM**

This study set out to discover how academics use mobile technology in the classroom. What is immediately apparent is that two of the five participants did not, and would not, use mobile technology to engage with students. However, the results from our study show that Academics 3, 4, and 5 use iPads extensively in their teaching:

(a) *Lecturing to students*: The iPad offers a lecturing capability, and Academics 4 and 5 used it instead of the fixed desktop computers. This allowed greater flexibility in terms of having the lecture already loaded, but the primary constraint was that a projector is still required for large audiences.

(b) *Instant information assistance*: It was also possible to use the iPad to gain immediate access to information contained within personal files, as well as on the Internet.

(c) *Personalized teaching and learning*: If the main computer and projector were being used, it was possible for the lecturer to move around the class with the iPad and call files up, or use the Internet to personalize the teaching for the students.

(d) *Loan of iPad*: On a number of occasions, equipment unpredictability in the classroom meant that students needed to borrow an iPad, in order to complete certain aspects of the assignment. Having an iPad available as an extra resource proved to be invaluable and freed the lecturer up to concentrate on other students, without having them drift off to other computer laboratories.

(e) *Problem resolution*: Students often had administrative problems that could be sorted on the iPad before or after class (and occasionally during class), without the need to use a public computer, or having to return to the office in order to complete the task.

The benefits that accrue from using mobile technology in the classroom are clearly evident, and they relate to a mixture of content management and technological flexibility. The problem of static class-based teaching paradigms is something that possibly hinders its wider application (as Academics 1 and 2 are testament to). In spite of this, mobile technologies do allow for a diverse range of possibilities and broaden the scope for a different level of teaching engagement. The main constraints are individual vision concerning the application of technology in the classroom and the current mechanisms of preferred delivery (fixed location and face to face).

**WHAT WAS LEARNED FROM THE STUDY?**

So what precisely was learned? There are a number of important findings from this study, which have beneficial practical application for the adoption of mobile technology by
academics for teaching in a classroom setting, and also improving productivity. The iPad was mainly used for administrative and professional development (PD) (e-mail, conducting business during meetings, reading e-books, etc.), and only one-third used the iPad in actual teaching delivery (Linsey, 2011). Here, the lessons learned are applied to a higher-education establishment, but are of relevance to other organizations considering adopting mobile technology:

1. The iPad is merely one of a number of mobile platforms that are available, and all do much the same thing, although to varying degrees. The assumption that people are immediately familiar with the technology, no matter how widespread and pervasive it is, must be questioned. It is, therefore, extremely important that organizations that regularly use mobile technologies need to both have and continually develop a high level of training and input, to maximize employee performance and avoid the range and scalability issues described in this study.

2. Mobile technologies for educational purposes, along with cloud learning, are all pervasive and form part of the norming process that organizations undergo with regard to changes in their business environment. There is good evidence to suggest that use of mobile technologies in the classroom should now form part of an academic lecturer’s PD. We suggest this on the basis that, for certain businesses, there is a high expectation that their staff will be automatically familiar with a range of mobile technologies. The evidence, however, suggests otherwise. Many employees have at best a mediocre understanding of technological use and the advantages that it offers, and, at worst, and as shown here, occasionally none at all. This variation is a worrying finding, given the importance that many universities are placing on the provision of m-learning as a platform for competitive advantage.

3. It is clearly necessary that appropriate PD processes, such as regular feedback reviews, be undertaken concerning mobile-technology use. This may include both formal and informal feedback, or team-based meetings to discuss how the technology can be leveraged for greater performance. What is apparent from this study is that employees cannot simply be left to their own devices, and that regular feedback sessions might identify productivity problems at a much earlier stage than the 12-month research cycle used here.

4. Developing a community of practice (CoP) provides an avenue for feedback, discussing practices, and sharing learning opportunities to enhance and expand practice (Lave and Wenger, 1991). CoP also allows for feedback, concerns, resolutions, and identification of PD opportunities. A CoP should be broader than the basic teaching unit and look to capture lessons learned from other academics in different disciplines. Academics 4 and 5 have been engaged in regular communication and sharing what they have learned, as well as leveraging off other professional communities that are also passionate about educational technologies. Both commented that they found these exchanges of ideas useful in their adoption and use of the iPad. It is also possible that a CoP support approach might have assisted Academics 1 and 2, who could have discussed and shared practices of iPad use with a community of practitioners. Academic 3 would certainly have benefitted from engaging with a CoP, given that Academic 3’s preferred style was “external” experiential learning.
5. There also needs to be clear recognition at the outset concerning individual roles and responsibilities with regard to technological learning. For example, Academics 1 and 2 held the unit chair solely accountable for their failure to adopt the technology and their lack of engagement with the iPad, in spite of the fact that it was specifically purchased by the university for them to use as a teaching tool.

6. There is also an identified broader problem that, although universities are using mobile technology more than ever before, what seems to be evolving is a sort of hybrid approach to education. The demands of classroom attendance still take up much of an academic’s time, and mobile-technology platforms are used largely to enhance, rather than supplant, this engagement. So the mantra of “log on and lecture” remains the dominant paradigm. Mobile technology in a classroom setting undoubtedly provides greater flexibility, which is a significant benefit, but it is questionable whether it offers any other substantial teaching or learning advantages, particularly while the current classroom model of teaching engagement continues to dominate the education process. The important point to make here is that mobile (able to engage anytime, anyplace, anywhere) does not equate to portable (same basic product that can be moved), and universities need to decide whether they are working toward/within a portable or mobile teaching framework, as this both influences and affects the way that lecturers deliver the content, as well as the student learning experience.

7. Our final learning point relates to the issue of human and social capital. Investment in technology is a significant draw card for employees, and being at the cutting edge of m-learning is becoming increasingly important for academics. While investing in technology, the universities clearly also need to invest in their staff. As evidenced here, two of the five academics have limited or no understanding of the technology provided to them. If this is reflective of the wider academic community (and we have no reason to doubt that it is not), there is both a productivity and human-capital problem simply waiting to happen. At our own university, discussion ranges about the value of giving all of the academics iPads. Although, in theory, this appears to be a reasonable suggestion, our study shows that, in practice, it is not without both human and social problems and concerns. Technology is changing how universities do business, but the teaching paradigms remain largely fixed in 20th-century delivery modes. This is partly attributable to an underinvestment in carefully targeted staff training and development and, in spite of the rhetoric, the inherent aversion to breaking with the historical legacy of “chalk-and-talk” (or the modern version of “log-on-and-lecture”) teaching paradigms.

In this study, the use of iPads was embedded into the pedagogical design of an undergraduate subject. The results indicate that the use of Internet-connected technologies in the classroom was found to be useful only for some of the participants. Yeung and Chung (2011) reported initial findings from the first phase of their exploratory study to investigate the potential pedagogical use of iPads in higher education. Overall, iPads were found to be useful to provide instant access to the course resources and library databases, and as efficient means of communication with the students. However, the study raised a concern that the technology has yet to fully evolve for greater practical use in the classroom, particularly where there was a lack of university policy regarding technology support.
In using the action-learning framework developed earlier in the chapter in order to summarize the key learning outcomes, although all of the participants have learned from generating insights into their experience, as Revans (1998, p. 83) argues, "there can be no learning without action, and no action without learning." The lessons learned from this study can be summarized as seven principles for introducing and using mobile technology in the classroom. These are:

1. Never assume prior technical knowledge and always provide instructions concerning how the technology might and should be used.
2. Build academic staff capacity through PD to develop mobile-technology educational literacy.
3. Develop and regularly use both informal and formal feedback mechanisms to monitor and manage technology adoption.
4. Encourage and develop a CoP across the university.
5. Clearly define individual roles and responsibilities.
6. Challenge existing education paradigms in order to enhance the teaching and learning experience.
7. Along with technological investment, there is an urgent need to invest in human and social capital.

It is immediately evident that, although mobile technology provides a platform that allows for good practice to develop, it also highlights various levels of intransigence among users and problems associated with the existing teaching paradigms. There is a pressing need for a more focused pedagogical design of curricula, which is designed for mobile technology, as well as various applications for an innovative blended learning environment. Although there are clearly positive benefits to doing this, at the present time, reconciling these last two issues is proving to be both challenging (for example, cultural change) and enormously time consuming (such as, which mobile platform is best suited to teaching, and is this the same for learning?).

**SUMMARY AND CONCLUSION**

The study has focused on academic use of mobile technology within a classroom environment through a longitudinal study that was conducted over 12 months, an adapted action-learning framework, originally proposed by Revans (1980), modified by Marquardt (2009) to include “reflection,” and in our study further adapted to include “feedback” in order to provide the theoretical framework for the study. It is apparent that the additional component of feedback provides a strong foundation for developing a practical framework for sharing and developing better teaching practices.

Although the seven key principles for introducing and using mobile technology in the classroom might seem obvious, it is evident that, when introducing mobile technology into educational environments, there clearly needs to be a substantive support mechanism already in place for academics to engage with. These principles have been used to good effect in a second study that has recently concluded, and the results are promising. In following the guidance from the key principles highlighted here, our preliminary results from a different cohort of six academics using mobile technology strongly suggest clear
engagement with the iPad and have mostly reported greater satisfaction with the process and, in places, even potential stretching of the teaching paradigm.

Murphy (2011) compiled and analyzed secondary data from various sources, such as press commentaries, reports, and blogs on universities using or piloting iPads in their institutions, and concluded that iPads are used “in a limited, content delivery capacity” (p. 30), to predominantly deliver course materials, and many universities are “still unsure of the best way to incorporate it into their existing programs and curriculums” (p. 30). Murphy (2011) found that iPads were largely being used for course delivery, and not for teaching. Universities are almost exclusively focused on ubiquitous access to course and subject materials—typology 1 (Murphy, 2011, p. 21), followed by content generation and collaboration, but only 13 percent used iPads for administration, professional development, and research.

To conclude, the study has shown that there are some inherent benefits and weaknesses in how mobile technology is introduced to academics for use in a classroom setting, different levels of technology adoption and expectations of users, as well as what can be achieved. The key to successful implementation remains the careful management of people, product, and then process.

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