

TEACHING TEACHERS FOR THE FUTURE: MODELLING AND EXPLORING IMMERSIVE PERSONAL LEARNING NETWORKS

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Abstract

The world in which teachers are working is one, thanks to collaborative technologies, in which high levels of interactions among colleagues and the wider educational community can be facilitated. The question, then, is about how to prepare new entrants to the profession to be effectively engaged in this professional reality. In this paper, we report on our initiative to redesign a pre-service primary science education program to explicitly value personal learning networks, discursive learning spaces and metacognitive thinking. A range of e-learning tools that could support these learning objectives were trialled, creating learning spaces for both large and small group learning experiences, including informal, personal and public forms of engagement. We present a profile of the pre-service teachers and their levels of knowledge about the technologies, the change to the lecturer's practice and experiences provided to students, along with stories which illustrate how the changes extended or developed the use of technology for personal learning.

Introduction

The goals for this project arose from a vision that a major contribution of information technology is its potential to support knowledge creation and sharing (Dede, 2009). Notions of collaboration have been increasingly embraced as core to science learning (Harlen, 1993) and in teacher's professional learning experiences (Skamp, 2012). In this paper, we report on our initiative to redesign a pre-service primary science education program to embrace these perspectives and, as a result, situate students in a learning experience which explicitly value personal learning networks, discursive spaces and metacognitive thinking.

This paper presents the stories of one academic, co-ordinating the program for 135 teachers-in-training, the motivations for change and the strategies implemented thus far to leverage that change.

Background

The redesign has emerged from the educational perspective of the second author (the program co-ordinator in this study): if one believes that good learning arises from discursive spaces and self-initiated personal learning networks, then we should endeavor to have teaching reflect this. In addition, improving both collaborative thinking and ICT competence is an imperative for soon-to-be teachers whose work will be with students whose lives are increasingly digital (Stevenson, 2008).

A desire to 'try more things' to embrace this perspective on education has conveniently coincided with the institution's participation in the Teaching Teachers for the Future (TTF) project. TTF has been a nationally funded project that included all 39 Australian Teacher Education Institutes. Its main aim was to increase the capacity of graduate teachers in their use of ICT to support and enhance learning. It hopes to achieve this by supporting university academics in their ICT practice. The project has identified the Australian Institute for Teaching and School Leadership (AITSL) Standards for Australian Teachers as a measure of graduate capacity in their use of ICT. In order to accommodate the introduction of an Australian Curriculum, TTF focused on the four key learning areas that had been identified as the first phase of the Australian Curriculum introductory process: Science, Maths, English and History; at the institution described in this paper, the principal focus has been on Science education. The project is made up of three components, as shown in Figure 1:

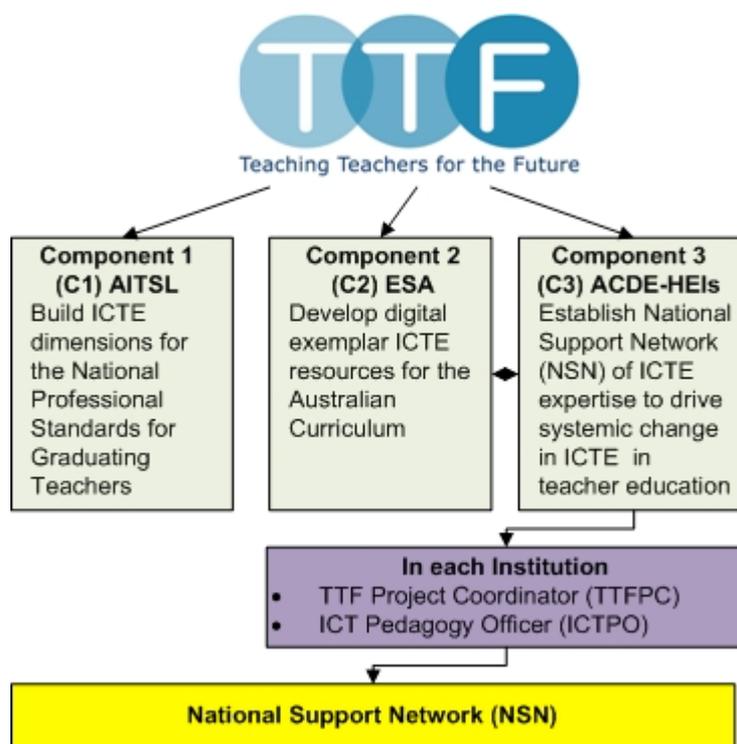


Figure 1: The three TTF components (TTF, 2011)

The national project provided funding for each institution for an ICT Pedagogy Officer (ICTPO) and for a TTF Project Coordinator (TTFPC). The TTFPC position was typically a university academic who received workload ‘buy out’ to allow them to coordinate the project, and in this instance has had a minimal, background facilitation role in relation to the work described. At the University of Melbourne, the ICTPO was an external person brought into the institution to work with and support academic ICT practice (the first author of this paper). The academic receiving support through the TTF project (the second author of this paper) was an experienced Science educator, with a track-record for innovation, who was seeking to further develop her pedagogy.

Background

When we considered how to construct the initiation of emerging technologies into an existing university subject we undertook to make the introduction a shared exploration and analysis of the changes a responsibility of both the academics and the university students. As we were providing a range of technologies for exploration and use in different settings we were striving to set up an authentic environment, as described by Barab, Squire and Dueber (2000). We sought the authenticity that arises as a result of the interactions between learners, tasks and also the environments that they are in on a daily basis. Some other features that have been drawn upon include the characteristics for authentic learning, offered by Herrington, Oliver and Reeves (2003). These include having relevance, meaning and usefulness in the real world of these users, flexible time-frames and good support for the collaborative activity.

Funded project and studies have been instigated over recent years to determine what students expect, have experience of and may need to use in the future (Wallace, 2007; Collis & Moonen, 2008). More recent research by The University of Melbourne, Charles Sturt University and the University of Wollongong (Kennedy, Dalgarno, Bennett, et al, 2009), that has been funded by the Australian Learning and Teaching Council, examined students’ and lecturers’ preferences and experiences. That project also undertook to detail the issues that had been experienced, and provided policy on the ways forward that could possibly resolve these, which are summarized in the published handbook, *Educating the Net Generation*.

Characteristics of teachers-in-training

In commencing our work, we accepted that introducing a requirement for the use of emerging technologies could present a challenge to the students, the lecturer and others tutoring in the subject. To prepare ourselves, and our students, for the challenges that might be involved we conducted a survey to better understand the current role and contribution of technology in the everyday lives of our particular cohort of teachers-in-training. The survey aimed to focus on their use and reactions to the new technologies and what the properties could be perceived to offer them, as both learners and teachers (Wynne, 1992), and picked up on many of the points and issues raised in the handbook, *Educating the Net Generation* (Kennedy, Dalgarno, Bennett, et al, 2009).

Our survey was presented to the cohort of students enrolled in the subject Science and Technology, which is a core component of the *Master of Teaching, Primary* program, at The University of Melbourne. The subject runs at the beginning of the semester and in their second year. There were 111 responses from a cohort of 135, and results are summarised in Tables 1, 2 and 3. Table 1 summarises the numerical responses. Respondents were provided with the opportunity to make any comment in relation to the items "what do you use the device for?" and "what are your favourite uses?" A minority of students took the opportunity to provide this further information, and those are summarised in tables 2 and 3.

Table 1: Access to, and typical use of, portable digital devices
(note that some respondents had multiple devices)

Device	Do you have one?		What do you use the device for?				What are your favourite uses?		
	Yes	Intend to get	Facebook	Twitter	Email	Apps	SMS	Email	Apps
Smartphone	85%	2%	69%	10%	59%	74%	80%	43%	14%
iPod Touch	17%	2%	9%	8%	8%	10%	1%	1%	5%
iPad	12%	2%	9%	8%	23%	11%	3%	3%	4%
Laptop	87%	14%	81%	9%	64%	32%	6%	65%	4%
Other	20%	2%					9%	2%	

Table 2: Comments on "What do you use the device for"?
Respondents could make more than one comment

	Smartphone (18 respondents)	iPod Touch (4 respondents)	iPad (1 respondents)	Laptop (13 respondents)
calls	7			
creating documents				9
games	2			3
general browsing	3	1	1	4
movies/youtube	1			4
music	2	3		
news				2
photos/camera	1			3
podcasts/RSS	2			
reading blogs	1			
reading documents/books	1			1
shopping				1
SMS	3			
twitter (reading only)	1			

Table 3: Comments on "What are your favourite uses"?
Respondents could make more than one comment

	Smartphone (21 respondents)	iPod Touch (3 respondents)	iPad (4 respondents)	Laptop (16 respondents)
banking	2			
calendar			1	1
calls	2			
creating documents				5
email	1			1
facebook	3			2
games	5	1		1
general browsing	3	1		6
maps	4		1	
movies	1	1		3
music	4	2	2	1
news	4			2
photos/camera	5		1	
podcasts/RSS	2			
reading blogs	2			1
reading documents/books			1	2
tram tracker	3			
TV		1		
weather	4		1	
webcam				1

In brief, this cohort of teachers-in-training can be characterised as "social users". Smartphones and laptops dominate the hardware owned, and Facebook, SMS and e-mail dominate the applications used. Use of photography complements this social purpose. For the generation, there is surprisingly little engagement with Twitter or even games. Even though 26% of respondents had nominated "apps" as a favourite use, two were brave enough to write "what's app?" - even the language of mobile devices has not become universally well known amongst this group.

Four further questions asked students for a brief written response. These were "have your goals for effective teaching been supported by new technologies", "how do you think your goals for personal learning might be supported by new technologies?", "what are your favourite educational apps, and why?" and "what is your vision for using new technologies in your teaching?". The responses to these were brief, but a clear theme was an enthusiasm for using new technologies. Our students are teachers-in-training who have recognised the potential contributions that could be made by implementing some of the emerging new technologies into classroom settings. We also note that the variations that occur across school-based settings would have a range of impacts on their initial predilections. In some cases, their experiences of technology use in schools would support initial ideas and vision, in others thwart them, and the full spectrum in between. The teachers-in-training were broadly aware of emerging technologies, but declared that they had limited experience with them, especially in their daily lives. It was therefore the contributions of the classroom-based technologies that we decided we should make available for them.

Pedagogical approach and technologies

The preceding analysis then informed the selection of experiences that we determined could be helpful to extend our teachers in training current uses of emerging technologies, and which could potentially empower them in their two daily major roles: that of university students, and as teachers when in their placements in classroom settings. It was therefore important to present, and model, pedagogically sound ways in which the identified technologies can be used in the classroom.

Our approach was affirmed by recent studies that reveal a common trend in the university use of technologies. We have attempted to address the student concerns that were identified and listed in the policy guidelines: 'Include student consultation, feedback, suggestions and concerns in decision-making about new and emerging technologies for learning' (Kennedy, Dalgarno, Bennett, et al, 2009, p 70).

We chose to tackle the perception, documented in the *Educating the Net Generation* handbook, that social networking and social collaborative spaces were not considered to be helpful for them as university students,

the Investigation stage of the project showed that a sizeable proportion of students did not believe that popular technologies such as instant messaging and social networking would be useful for their university study. Furthermore, a majority of them saw little value in technologies such as blog and wikis (Kennedy et al, 2009, p. 69).

We sought to develop, promote and support an on-line community that would share the events they were experiencing, at university, in their lectures, in their workshops and in their classroom based teaching scenarios. Here we have aligned with the Vygotsky's (1978) concept of a zone of proximal development that is nurtured and supported by peers, and Bruner's idea (1980) that inquiry-based learning generates a more enthusiastic level of participation. This inquiry approach was designed to be exploratory and playful learning with, and from, the technologies. We intended to create an appreciation of 'learning with others', and to create productive places of social discovery, followed with an analysis of any possible pedagogical contributions.

The teachers-in-training had been asked to consider and identify their own inclinations towards the use of new technologies for e-learning. This was an attempt to make them aware of their motivational beliefs towards technologies and so that they could redevelop, rethink and identify a range of possibilities. We planned to provide opportunities, to assist discussions and experiences through interaction with a diverse range new technologies. This was an attempt to develop their self-knowledge, through reflection, and assist them to re-engage, and reconsider the contributions of new technologies to learning.

This approach has taken a phenomenological approach to the use of emerging technologies. Our goals have included the use of emerging technologies for increasing the effectiveness of learning experiences and developing the learning experience to one that aligns with a 21st Century experience (Dede, 2010). This project was also embedded in the discipline of science, and there was a sense that the experiences were not only about the emerging technologies, in themselves, but that we were also supporting the enculturation of these teachers into the discipline of science (Lave and Wenger, 1991).

There were three elements to our approach, which overall could be described as a 'flipped classroom'. The flipped classroom often refers to students watching videos at home, and then returning to the classroom to work on related problems, but in its most general and empowering sense refers to efforts by teachers to gain more 'in class work' together with focused and ably supportive work time, often by deploying creative uses of mobile technologies (Bergmann, Overmyer, & Wilie, 2012; Flip teaching, 2012; Pink, 2012).

In the model of the 'flipped classroom' in which learners (for instance, school students, or teachers-in-training) watch videos at home, those videos act as mini-lectures that explain the key learning focus or key ideas, as background knowledge to the upcoming class work and practice with the ideas. One of the perceived advantages for the learner is that they can view the video as many times as they would like to, and until they feel that they have understood, and can effectively use the information embedded in the video explanations. The learner would be then taking more responsibility for his/her own learning, but most importantly we, and they, needed to ensure that they have time to play and explore the ideas in their own time, and they can invest, as much time as they recognise that they need. It is these attributes that we sought to develop in our pedagogical approach. Our central consideration was providing resources that would facilitate teachers-in-training playing and exploring with the ideas of the course in their own time. There were two key elements that we tried to embed into the approaches that we explored with the students. We were highlighting the nature of a space that was

constructed to be both an exploratory workplace for individuals to make sense of their understanding and then a social learning space, where ideas are shared and elaborated on.

The Exploratory Workspace

We instigated use of an on-line community to enable the sharing of the events being experienced in various facets of their lives, particularly, at university generally, in lectures, in workshops, at home, and in their classroom based teaching settings. The space chosen was Edmodo (Schachter, 2011). Edmodo (<http://www.edmodo.com>) is described as a free, secure, social learning platform for teachers, students, schools and districts. Appearing very much like facebook to the use, Edmodo provides teachers and students with a secure and easy way to post classroom materials, share links and videos, access assessment tasks and co-ordinate activities using a calendar.

This system was introduced early in the semester, was presented as a collaborative and sharing workspace and purposefully not tied to any assessment. The teachers-in-training were encouraged to use it, and to identify through their own exploratory use, what they saw were possibilities for supporting classroom learning. They recognised that Edmodo was a tool that could be used for a number of tasks, and that it could be personalised by the user. Use of Edmodo was a response to their need to be mobile, and this was another opportunity that extended students' use of emerging technologies and which was identified as a way to strengthen the sense of belonging between students when they are off campus.

In addition, time was given to 'in class' support, by an experienced Edmodo user (a teacher with many years of experience who provided expert advice and consultancy to the teachers and students in this project). Edmodo support was provided in each of the six tutorial groups for the subject. The expert, they were advised, would come and answer their questions and introduce new unexplored elements of Edmodo. The use of Edmodo was constantly encouraged, and they were often reminded to explore its features, and to share their ideas and any links to useful resources. As their initial explorations had been in the role of a student, time was now provided in class to show them, what the Edmodo platform could offer them when they are acting in the role of the classroom teacher in the future.

It was hoped that as they shared their ideas and thinking in this space, that they would experience the contributions of this type of tool, and simultaneously could then master any of the mental performances required for using it. In the long term, it was anticipated that they would consider using something like it, in their classrooms next year. Through the familiarity gained with Edmodo in this subject, it was envisaged that this could help teachers-in-training to identify Edmodo as offering a form of collaboration and engagement worthy of being embraced a routine component of pedagogy. The Edmodo-style of tool is presented as a being fundamental to a classroom in which students are working collaboratively together, sharing and learning with and from each other.

After their initial foray and work with Edmodo, and the addition of more detailed information about its features, teachers-in-training were provided with new incentives to use the Edmodo. The teachers-in-training were provided with iPads and were able to take photos of the results of their science experiments and activities. These could be shared on their Edmodo page, which could then be shared, with just their group or with other groups. The advantages of the ease of this sharing of information was noted as useful as the information was recognised as relevant to the other groups and was described by the teachers-in-training as being easy to do. The iPads were a great success and students noted the potential of iPads for use within shared collaborative spaces.

The lecture you have when you don't have a lecture

Edmodo, and the flipped classroom, was given particular prominence at a time when a regular lecture was not possible - canceled, as it happened, because of a public holiday. Prior to this 'interruption', the teachers-in-training were given some introductory science knowledge on the topic of water, presented in a lecture, with examples of key principles explained. This was followed by two workshops which were dedicated to explaining these ideas in practical ways. Then teachers-in-training were provided

with a choice of 14 related activities from which they choose one (or more) to explore in their own time, and optionally introducing one of their own choosing. These were to be explored over a period of 10 days – their engagement with this task replacing the lecture. Had these activities not replaced a conventional lecture, it would have been possible that teachers-in-training felt that this was additional expectation that was above the requirements of the subject. They recognised, and accepted, the appropriateness of this request.

Using Edmodo, the teachers-in-training were invited to select one or more of the activities and to record the results of their explorations of the science investigation. All the activities could be conducted at home, without the need for specialised equipment materials, and were likely to be completed in the company of others. It was suggested, not required, that as future science communicators they could include family or friends in their activity. The activities were selected both for the brevity of the activity, and the potential richness of the science concepts within these events. The teachers-in-training were then required to record their results in their reflective science class lab book, and on the Edmodo space for their workshop group. This was to create a meaningful purpose for sharing in Edmodo, and to encourage further exploration of Edmodo as a collaborative workspace, for sharing ideas.

The back channel

The next aim was to trial the use of a ‘twitter style back channel’ in the lecture that could support teachers-in-training to contribute to the content of the lecture. Today's Meet (<http://www.todaysmeet.com>) was the technology chosen. Teachers-in-training could use their mobile device, and report on the home-based science activities that they had conducted. It was hoped that this activity could provide the teachers-in-training with a greater opportunity to voice their thoughts, and create a shared learning space. It is worth noting that an indicative ‘show of hands’ during the lecture revealed that the majority of students who were accessing the back-channel were doing so through their own 3G wireless connection, and only a minority were using the university-provided wireless; the teachers-in-training considered the university wireless to be too problematic. Thus the online conversation was dominated not just by those who had a wireless device with them, but by those who had a 3G-equipped device and saw no problem with using their personal download quota for study purposes.

It was anticipated that the teacher-in-training could evaluate and assess the value of this type of tool in their own classes in school. A strong theme emerging from their considerations was that in a classroom, with access to iPads (or similar devices), learners could benefit in many ways from these visual conversations, by record their ideas publicly, and sharing their thinking and questions. Our teachers-in-training arrived at the lecture, with prepared material, and mini reports on the science activities that they had conducted at home. This 'home based' preparation was instigated to ensure that each person had an experience to contribute and that it was completed in another settings, and therefore was (at least partially) unfamiliar to others. It also meant that each person had rehearsed what it was that they could contribute to this large discussion, and that they could learn from each other. The format was designed to provide the teachers-in-training with an opportunity to share their experiences, and, very importantly, to hear from others, and understand what they had discovered. They were invited to explain and report also on ‘the why’ of their experiences.

iPads

The iPads were used for drawing experiences. In their first workshop in the subject the teachers-in-training focused on the contribution of drawing in science education practices. They were able to explore the important role of representations and models in science education. A drawing application, ArtSet, was published and installed on to the iPads. After using pencil and paper, the iPad was used and the teachers-in-training later discussed the benefits of each. They determined that the iPad would enable drawings in a classroom to be stored, reworked, annotated, projected and shared in class discussions. Several teachers-in-training had been utilising iPads in their school settings and thinking about the tool for teaching and learning meaning. Informal discussions with teachers-in-training have

indicated that they identify the contribution of the iPad as a tool that can support social, collaborative and exploratory communication experiences.

Conclusion

This project was developed around the concept that human cognition, and actions and conversations need to be harnessed to create rich learning experiences, and that being told how or why you should do something does not support change (Wittgenstein, 1953). Rather it is in social collaborative spaces, with others, on task that have meaning that we start to care about the activity, and draw upon our tacit knowledge, and make connections with related experiences (Bruner, 1980). We sought to provide first hand experiences, that were relevant to the immediate situation of being a university students, as well as the impending scenarios of school based teaching next year. The use of the technologies always utilised the linguistic and practical skills of the participant, symbiotically (Shotter, 1984) in order to develop teachers of the future with a social network and way of learning.

References

- Barab, S.A., Squire, K.D., & Dueber, W. (2000). A co-evolutionary model for supporting the emergence of authenticity. *Educational Technology Research and Development*, 48(2), 37-62.
- Bergmann, J., Overmyer, J., & Wilie, B. (2012). *The Flipped Class: Myths vs. Reality*. The Daily Riff. Retrieved May 1, 2012, from <http://www.thedailyriff.com/articles/the-flipped-class-conversation-689.php>
- Bruner, J. (1980). *Beyond the information given*. London, Allen & Urwin.
- Collis, B. & Moonen, J. (2008). Web 2.0 tools and processes in high education: Quality perspectives. *Educational Media International*, 45(2), 93-106.
- Dede, C. (2009). Technologies that facilitate generating knowledge and possibly wisdom, *Educational Researcher*, 38(4), 260-263.
- Dede, C. (2010). Technological supports for acquiring 21st-century skills. In E. Baker, B. McGaw, & P. Peterson (Eds.), *International encyclopedia of education* (3rd ed.). Oxford, England: Elsevier. Retrieved April 18th, 2012, from https://learningcenter.nsta.org/products/symposia_seminars/iste/2010.aspx
- Flip teaching. (2012). Flip Teaching. Retrieved April 27, 2012, from http://en.wikipedia.org/wiki/Flip_teaching
- Harlen, W. (1993). *Teaching and Learning Primary Science*, London: Paul Chapman Publishing.
- Herrington, J., Oliver R., & Reeves, T. C. (2003). Patterns of engagement in authentic online learning environments. *Australian Journal of Educational Technology*, 19(1), 59–71. Retrieved April 18th, 2012, from <http://www.ascilite.org.au/ajet/ajet19/herrington.html>
- Kennedy, G., Dalgarno, B., Bennett, S., Gray, K., Waycott, J., Judd, T., Bishop, A., Maton, K., Krause, K., & Chang, R. (2009). *Educating the Net Generation: A Handbook of findings for policy and practice*. Australian Learning and Teaching Council. Retrieved May 1st, 2012, <http://www.netgen.unimelb.edu.au/outcomes/handbook.html>
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Pink, D. H. (2012). *Think tank: flip-thinking - the new buzz word sweeping the US*. The Telegraph.

Retrieved May 1, 2012, from <http://www.telegraph.co.uk/finance/businessclub/7996379/Daniel-Pinks-Think-Tank-Flip-thinking-the-new-buzz-word-sweeping-the-US.html>

Schachter, R. (2011). Kid2kid Connections: How to Use Technology to Connect Your Students to a Larger World. *Instructor*, 120(5), 46-52. Retrieved from <http://www.eric.ed.gov/PDFS/EJ945712.pdf>

Shotter, J. (1984). *Selfhood and social accountability*. Oxford, Blackwell.

Skamp, K. (Ed.) (2012). *Teaching Primary Science Constructively*, 4th Edition, Southbank, Victoria: Thomson Learning Australia.

Stevenson, O. (2008). Ubiquitous presence, partial use: the everyday interaction of children and their families with ICT. *Technology, Pedagogy and Education*, 17(2), 115-130.

TTF. (2011). *Teaching Teachers for the Future*. Retrieved 10th December, 2011, from <http://ttfc3.esa.edu.au/default.aspx>

Vygotsky, L. (1978). *Mind in Society*. Cambridge, MA, Harvard University Press

Wallace, J. (2007). Online teaching and university policy: Investigating the disconnect. *Journal of Distance education*, 22(1), 87-11.

Wittgenstein, L. (1953). *Philosophical Investigations*, trans. G.E.M. Anscombe & G.H. von Wright. Oxford, Blackwell.

Wynne, B. (1992) Misunderstood Misunderstanding: Social Identities and Public Uptake of Science, *Public Understanding of Science* 1(3), 281-304.

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