Mobile technologies in hospital schools

Innovative professional development to enhance the learning environment

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Executive Summary

With over 5,000 students hospitalised each year in just one Australian hospital, mobile technologies offer a means for a large number of students to stay connected with their peers and engaged with their learning. Hospital schools are investing heavily in technology to support students and teachers, but state-of-the-art rethinking about pedagogy is required to effectively utilise mobile technology in this complex teaching environment where so many different factors and pressures are juggled. This project examines the impact of an innovative professional development program to transform teaching in the hospital context via the integration of mobile technologies with sound content and pedagogical knowledge. It highlights the importance of pedagogy-focused training alongside coaching in a collaborative group setting. The project illustrates what is possible with teachers, university researchers, hospital school leadership and students working together to enable an innovative, relevant and flexible program to be developed.

BACKGROUND

The effects of chronic illness on hospitalised adolescents’ educational progress creates a level of disengagement from their learning (Hopkins et al. 2014; Martinez & Ercikan 2009; Taylor, Gibson & Franck 2008). Expectedly, these students often lose interest in education (Martinez & Ercikan 2009), possibly triggered by the effects of their health condition, treatment regimes, and subsequent absences from school (Taylor et al. 2008; Hopkins et al. 2014). Therefore, there is a compelling need to promote learning and re-engage such ‘at risk’ adolescents to continue along their individual educational trajectories.

Incorporating mobile technologies into teaching and learning in hospital settings presents a wealth of opportunities through which to engage and motivate students, and subsequently promote their learning (Maor & Mitchem 2015). However, simply showing and telling teachers how to use specific types of technology is not likely to improve teaching and learning (Lock & Redmond 2010). If mobile technologies are to be used in ways that will support student learning, teachers need the skills, knowledge and confidence to teach with them effectively (Voogt et al. 2013), so that they are able to implement the technological resources in pedagogically sound ways (Laurillard 2012). It is also important to consider any additional complexity added for teachers because they are in a hospital setting where young people’s education is to fit in around the demands of a being a patient first.

THE INNOVATION AND STUDY

Seventy-five hospital school teachers in WA had the opportunity to participate in general technology pedagogy workshops provided by the researchers at their quarterly one-day professional development (PD) sessions held in 2013. They also had the opportunity to participate in one-to-one technology coaching provided by the Hospital School.

To assess the specific needs and priorities of hospital-school teachers, 29 teachers volunteered to participate in interviews and focus groups. This provided the basis for prioritising the specific needs of teachers in the hospital setting. The participants clearly articulated some of the challenges for teachers and students in hospital schools.

For example: A lot of my students at the moment are from the country and so they don’t really have much connection with their classes. (Pt.11) I went up to the ward. The teacher I was working with had to be in a hundred different places at once and most of her students were bedridden and needed one to one (CR.1).

Nine broad areas of need emerged from thematic analysis of the pre-interviews:
1. Personal use, confidence, and time;
2. Coaching and personal support;
3. Integration of mobile technology into teaching;
4. Communication;
5. Hospital environment;
6. Access and IT;
7. Peer collaboration;
8. Student engagement;
9. Tricks and tips.

Two needs particularly stood out from the teachers’ perspective:

1. Their lack of proficiency with mobile technology and consequently their lack of confidence in using it. They spoke of an underlying expectation that they should be knowledgeable about mobile technology and be able to use it proficiently.
2. The need for assistance that was tailored to their personal circumstances. They often conveyed a sense of urgency regarding this, which appeared to be created by being time poor and busy but having specific questions they needed answered. This desire for specific information suggested that coaching would be an effective and efficient means of supporting the teachers.

I feel if I’m not keeping up with technology and being able to model creativity and problem solving myself, I’m not very useful to the students and I guess given our dynamic setting that is different to the usual setting it is even more applicable as a teacher in that environment. (Pt.10)

The complexity of the hospital setting calls for an innovative professional development model to empower teachers to confidently navigate the intersection of technology, content areas and discipline-area pedagogy. The research team designed a professional development program to provide hospital school teachers with pedagogical insights into the use of mobile technologies. Although the technology is available in schools, examples of best practice in the use of mobile technology and in professional development are rare. Pedagogy-focused professional development was offered to the sub-set of 29 hospital teachers who volunteered to take part. Here are the key findings from this professional development experience.

**KEY INSIGHTS**

*Pedagogically focused PD in conjunction with coaching and peer collaboration produced a synergistic effect.* The ability to have personalised and relevant PD in a group provided the context for more meaningful reflection and learning. Including pedagogy within the PD provided a framework for participants to examine their teaching strategies in relation to the desired outcomes. The comments made during the discussions highlight that the pedagogy enabled reflection on participants’ teaching practices and thinking about how they could engage students to learn in difficult situations.

We’re talking about it a lot more. We’re showing each other how to do things: ‘have you seen this?’ a lot more than we ever have before. (Pt.25)

I think more opportunities to have the school development days or PD sessions with groups of people who are working in a similar situation so we can bounce ideas off each other and how other people use the technology and how I can work that into my teaching. (Pt.24)

*Coaches build confidence.* The results suggest that spending one-on-one time with the coach increased teachers’ technological literacy and pedagogical use of mobile technology to support learning. The ongoing support from the coach built teachers’ confidence and ability. In addition, the interactions developed their technological pedagogical capability.

Coach initially helped me build up more confidence and I just keep going with that journey myself. (Pt.24)

*Teachers significantly increased in confidence with the integration of mobile technology into their curriculum.* After engaging in professional development with mobile technologies, teachers’ perceptions changed significantly and they felt more confident about implementing their pedagogical knowledge in their specific content knowledge area and using mobile technology with hospitalised children. This synergistic effect increased teacher proficiency in supporting student learning with mobile technology as reflected in their significantly improved perceptions of not only their technological knowledge (TK), but also the integration of technology and pedagogical knowledge (TPK) and integration of pedagogical with content knowledge (PCK).

It’s not actually about the technology—I think a lot of people from the staff point of view are probably looking at a tablet thinking it’s the application, what I’m teaching to; but it’s actually not, it’s the curriculum and how to use the application to enhance that. (Pt.13)

*Mobile technologies can increase student engagement.* Teachers could see the potential of mobile technology to engage students. For example, Pt 8 was able to utilise a “Dr Who” clip on the tablet device as a present day, funny skit to engage a student with Shakespeare.

A student came in very angry after lunch. He had been doing some Shakespeare with another teacher and she wasn’t in on Friday so I said I knew something that would be fun. …So that was an example of him getting really quite engaged and then asking questions and being really quite light hearted. (Pt.8)
**Hospital school leadership support is critical.** The coaching was introduced to the teachers to provide ongoing, just in-time technological and pedagogical support from an expert, the coach. Employing a coach indicated the priority the school administration placed on introducing technology to support learning. The expense and time involved in providing teachers with individual coaching sessions implicitly emphasised the priority that was placed on acquiring technological skills and knowledge. Further, the individual coaching supported the intention of the teachers to improve these skills and knowledge.

The pedagogically complex PD model used in this project, containing multiple elements, maximised professional development outcomes and as such, can be considered a best-practice model. One key to this success was the collaboration of multiple stakeholders, including teachers, hospital school leadership and university researchers. Each partner added different strengths, so that the end result was a flexible, pedagogically grounded and personalised professional development experience that empowered continued learning and enabled flexibility in the use of mobile technologies. The success of this PD suggests that the model adopted in this project may be applicable for use in different school settings.
Introduction

I can really see these devices being so successful in that setting, used quite differently to other school settings…It’s a completely different context but for those kids who can’t get out of their beds; for those kids who are in isolation and you can’t take anything in to them; for those kids who are just there on a one-off visit; even for those kids who are there long term; for those kids who are working towards something that they have been sent from school, technology can fit into all of that... (I-Coach)

Hospitalised adolescents are a vulnerable group who can easily become disengaged and disconnected from education. Being removed from familiar surroundings potentially creates a sense of isolation, which can significantly impact upon an adolescent’s emotional and physical wellbeing. Reducing the isolation, therefore, is an important goal. In a similar vein, the effects of chronic illness on hospitalised adolescents’ educational progress creates a level of disengagement from their learning (Hopkins, et al., 2014; Martinez & Ercikan 2009; Taylor, Gibson & Franck 2008). Expectedly, these students often lose interest in education (Martinez & Ercikan 2009), possibly triggered by the effects of their health condition, treatment regimes, and subsequent absences from school (Taylor, Gibson & Franck 2008). Chronic illness itself, often leads to substantial time away from school which considerably disrupts student learning (Hopkins et al., 2014). Therefore, there is a compelling need to promote learning and re-engage such ‘at risk’ adolescents to continue along their individual educational trajectories.

Mobile technology provides an effective means of connecting adolescents with their family, friends and teachers, alleviating some of the negative aspects of disengagement and disconnection. Incorporating mobile technologies into teaching and learning in hospital settings presents a wealth of opportunities through which to engage and motivate students, and subsequently to promote their learning. Maor and Mitchem (2015) reviewed the literature relating to the use of technology with hospitalised adolescents. It revealed that technology use, not only increased the potential for learning; it also increased connectivity with the world outside. The use of mobile technologies for learning, however, is largely uncharted territory in hospital school contexts.

Mobile learning is often held out to be a powerful means for providing greater opportunities for accessibility, communication, portability and learning engagement (Drexler, Barait & Dawson 2008; Jonassen 2012). Technology in mainstream school settings has been available for some time now. To date, there are limited resources that have specifically focused on equipping teachers to support student learning in hospital settings (Maor & Mitchem 2015).

If mobile technologies are to be used in ways that will support student learning, teachers need the skills, knowledge and confidence to teach with them effectively. According to researchers, the iPad, as an example of mobile technology, has the potential to be the pedagogical game changer in education (Cochrane, Narayan & oldfield 2013). From this perspective, it is important that teachers develop the skills and knowledge to use technology effectively (Voogt et al. 2013), so that they are able to implement the technological resources in pedagogically sound ways (Laurillard 2012).

For teachers to use mobile technologies, professional development is required to illuminate the ways in which technology can potentially transform their teaching practices and subsequently, their students’ learning. While such professional development is important for classroom teachers, it is even more essential for hospital school teachers, who are in the business of supporting vulnerable students’ educational pathways and minimising their isolation and disrupted education.

BEST PRACTICE IN PROFESSIONAL DEVELOPMENT

Historically, teacher professional development has been characterised by approaches that ‘told’ how to improve practice, prescribing specific teaching practices (e.g., Hanna, Glowacki-Dudka & Conceição-Runlee 2000; Harasim, Hiltz & Turoff 1995; Palloff & Pratt 1999, 2001, 2003; Salmon 2000). An inherent problem with current professional development activities is the lack of pedagogically sound approaches to teaching with technology to enhance learning (Maor 2003).
Simply showing and telling teachers how to use specific types of technology is not likely to improve teaching and learning (Lock & Redmond 2010; Mishra & Koehler 2006; Tee & Lee 2011). The transition from traditional teaching methods to teaching with new technologies, such as mobile devices, requires that teachers develop not just technological skills and knowledge; it also requires that they develop knowledge about new ways of teaching with that technology to achieve a pedagogical shift (Ellis & Phelps 2000).

To support teachers’ integration of technology, ‘best practice’ professional development tends to be grounded in constructivist learning theory (Dabbagh & Kitsantas 2012; Protheroe, 2005). This theory emphasises the importance of organising professional development based on teachers’ current work practices, ensuring authenticity, meaningfulness and relevance (Ertmer, Ottenbreit-Leftwich & Sadik 2012; Herrington, Reeves & Oliver 2010). Furthermore, it highlights the need for professional development that is based on meaningful and collaborative learning experiences that are set in real-life, social contexts. Similarly, the need for appropriate professional development grounded in a ‘community of practice’ was perceived as essential if mobile learning was to be integrated in ways that would change the teaching and learning process (Pegrum, Oakley & Faulkner 2013).

In addition, developing teachers’ knowledge beyond specific technology skills should be emphasised in professional development programs (e.g. Niess 2005; Polly, McGee & Sullivan 2010). According to Loughran, Mulhall and Berry (2004), the process of teaching with technology can be enhanced by considering the different types of approaches to teaching within the content of what is to be taught. As is common during learning or behavioural change, knowledge extends along a continuum from basic practices to mastery (Puentedura 2012). In the context of teaching with technology, knowledge becomes progressively more sophisticated, beginning with the basic introduction of technology into teaching, where a device is used as a substitute for another tool, and finishing with the most complex method of using technology in teaching, known as redefinition (Puentedura 2012).

Professional development programs that expose teachers to models of ‘best practice’ provide an opportunity for self-reflection and enhancement of teaching knowledge (Koehler et al.2013; Mishra & Koehler 2006; Puentedura 2012). These models would need to highlight the pedagogical implications of using different technologies with specific content or subject matter, and create awareness of the changes to teaching practices that are required.

One such model is the Technology Pedagogy and Content Knowledge framework (TPACK) because it recognises the dynamic interactions between three key teaching components (Mishra & Koehler 2006). As a Venn diagram, it visually represents the relationship between technological, pedagogical and content knowledge, rather than viewing technology in isolation (Yurdakul et al. 2012). The model’s universal appeal indicates that it has been used successfully to both identify and address professional development needs (e.g. Chai et al.2011; Harris & Hofer 2011; Mishra & Koehler 2006; Tee & Lee 2011).

The TPACK model enables teachers to examine their practices and increase their knowledge and understanding about teaching with technology. In this study, it provides a framework with which to develop and extend teachers’ use of mobile technologies to support student learning, allowing them to transform their pedagogical and content knowledge by leveraging the advantages of mobile technology (Jang & Tsai 2013). Applying the model for professional development offers the potential to invite such inquiry, bringing about greater awareness and reflection of teaching practice, thus creating the opportunity for a pedagogical shift.

Preparing teachers to support student learning with mobile technology may not be enough. Best practice professional development would need to consider the skills that lead to student engagement in a globally competitive, digital age. As Wagner (2008) notes, society has shifted from an industrial-based to a technology-based economy. Seven critical skills are identified for students so that they become effectively engaged in this new economy. These skills are captured in the 21st Century Skills Model (Mishra & Kereluik 2011) and include: (a) abilities in critical thinking and problem resolution; (b) competency for collaborating within networks and leading through persuasive ability; (c) agility and adaptability; (d) initiative and entrepreneurialism; (e) effective written and oral communication abilities; (f) accessing and analysing information; and (g) curiosity and imagination.

Factors that influence teachers’ use of technology within their teaching practice are worth exploring. Agyei and Voogt (2014) reported that professional development programs that are grounded in collaboration between participants improves training outcomes. This was attributed to teachers’ perceptions about the level of collegial support offered, improvement in self-confidence and attitude. Adopting a collaborative, inquiry-based approach to
professional development centred on the use of technology to enhance learning, may be more critical than the technology or the content matter (Parr, Bellis & Bulfin 2013). These findings suggest that the process of learning is as important, if not more important, than the content of what is being taught.

COACHING
The importance of coaching within professional development programs cannot be underestimated. Programs based on collaboration and support between colleagues and experts, provide an opportunity to build upon prior knowledge, skills and pedagogical understanding (Daloz 2012). Effective learning requires exposure to applicable, meaningful, and substantial experiences, along with adequate support, constructive feedback, and ongoing monitoring. In particular, ample practice time and follow-up were noted as being pivotal in ensuring learning progress Daloz (2012). Daloz (2012) stated that professional growth is derived from self-directed inquiry centred on what teachers need to know to improve their practice. Informal discussions with other teachers, and activities embedded into daily routines and classroom settings can facilitate meaningful learning that progresses one’s practice (Desimone 2009). Rhodes & Beneicke (2002) suggested that in order to enhance teacher performance it was imperative to identify the needs of the teacher before introducing coaching and networking activities. In light of this, a coaching model may enhance professional development as it provides the capacity for continuing follow-up that is tailored to individual needs.

In the current study, hospital teachers took part in a professional development program that included both workshops and reflective activities. The workshops were informed by three pedagogical models, however greater emphasis was placed on the technology integrated pedagogical model. In addition, the participants completed a series of coaching activities, conducted one to one and in small groups. Initially, the interactions with the coach took place over a period of four weeks but some teachers opted to repeat the process more than once. The focus of the study was on how the professional development program met the perceived needs of the teachers.

The aims of the research were to:
- Introduce the use of mobile technologies to hospital school teachers
- Investigate teachers’ immediate and future needs in relation to the use of mobile technologies and teaching
- Provide professional development that applied different teaching models: TPACK (Mishra & Koehler 2006), SAMR (Puentedura 2012) and the 21st century skills (Mishra & Kereluik 2011) and also included one-to-one sessions with a coach and in small groups
- Investigate the role of professional development in integrating mobile technology in teaching.

The research
PARTICIPANTS
A total of 75 hospital-school teachers and educational assistants (teachers/educational assistants) were engaged in supporting hospitalised students at a hospital school. Each staff member was involved in the whole-school professional development (PD) day. As part of school PD, these development days were conducted each term, to increase teachers’ competency to use mobile technologies. Twenty-nine of these teachers volunteered to participate in the research component of the project, from which 20 teachers completed a full data set, including pre- and post-survey, pre- and post-individual interview and focus group interviews.

Permission to recruit participants was obtained from the hospital school administration before the recruitment process began. Firstly, the researcher introduced the study in a whole school PD program for the staff of the hospital school, including those in country locations. Having been informed of the research goal and the benefit to the hospital school, participants were recruited through an email request for their ‘expression of interest’ in involvement with the study. Ethics approval was gained both from Human Research Ethics Committee, Murdoch University Number 2013/081 and the Department of Education Number D13/0289012.
CONSULTATION AND COLLABORATION
This project was conducted in consultation and collaboration with staff from the hospital school. The project’s focus was developed in response to a series of objectives identified during strategic planning, and conducted by hospital-school staff. The vision was to use mobile technology to enhance student learning opportunities and as a means to communicate between students and their teachers. Consequently, the school’s 2013 strategic plan centred on increasing the use of technology. This involved introducing iPads for student use, and providing teachers and educational assistants with comprehensive professional development and support to equip them to teach with technology.

In addition to the initial direction gained from the hospital leadership, a reference group was convened to advise the implementation of the research. This group supported the first phase of the research, described in this report. At each meeting the chief researcher provided an update on the progress of the research, and future plans were discussed. The reference group comprised the Principal, the three Associate Principals, the Resource Centre Teacher, a Medical or TICHR (Telethon Institute of Child Health Research) representative and a Murdoch University Researcher.

Figure 1 shows the interrelationship between the school’s strategic planning process, the support given to the teachers/educational assistants via a professional development program, the research process, and the subsequent strategic outcomes.

The timeline in Figure 1 illustrates the relationship between the core activities involved in each component of the research. The acronyms and details of the study are explained in the sections relating to the individual components.

![Figure 1. Interrelation between strategic planning and professional development](image)

PEDAGOGY PROFESSIONAL DEVELOPMENT PROGRAM
The PD program was designed to support hospital school teachers and educational assistants (teacher/educational assistants) to integrate mobile technology into their teaching practices. It was developed in response to the school administration’s recognition of the need to address the increasing demands for mobile technology within a hospital school environment. The PD program was developed by the university researchers in collaboration and consultation with hospital school staff. The focus of the program was to assist the teachers to:
1. Identify the need for the use of mobile technologies in the hospital school
2. Refine teachers’ understanding about how mobile technologies are currently being used
3. Develop a professional teaching model that will help teachers improve their own use of mobile devices and their students’ learning with the tools.

The PD program included several meetings conducted by the researchers, as well as coaching sessions, conducted by a coach who was employed by the hospital specifically for these sessions. **Figure 2** shows the aspects involved in the PD program: technology training with iPads and a coaching component that were available for all teachers/educational assistants. The coaching was a unique initiative, incorporated into the program in response to the perceived needs of the hospital teachers.

![Figure 2. Aspects of professional development](image)

To cater for the unique hospital setting context, the PD program was delivered through a series of events across 2014. The program was run in conjunction with the hospital school’s scheduled professional training, which included one day of whole-school teacher development per term. Each of these development days incorporated sessions from the PD program and some teachers/educational assistants were involved in coaching.

Some of these events were repeated several times during the year (for example, coaching cycles of one hour per week over four weeks, one-to-one with the coach), to accommodate the availability of teachers/educational assistants and include all teachers. The iterative process was inclusive of teachers/educational assistants and allowed opportunities for learning and modification of knowledge. It was anticipated that this process would enable the establishment of a ‘community of practice’ (Wenger, 1998) consisting of the teachers who would support the hospitalised students. This would achieve the hospital school administration’s objective, which was to engage students in the use of mobile technologies to increase connectivity with their peers and enhance their learning.

**COACHING**

Coaching was an important component of the professional development program. Teachers/educational assistants were supported by an Information and Learning Technology (ILT) Coach, an external consultant employed by the hospital school. This was generously funded by the Hospital’s Foundation. The role of the technology coach was to guide or help a group of four or five teachers/educational assistants for four weeks at a time. Staff members participated in several individual sessions with the technology coach, as well as in small group sessions. The coach facilitated learning by acknowledging the difficulties and challenges that emerged throughout the process, rather than on predetermined PD.

The four-week coaching block ensured that most of the staff had access to the coach within a school year. Depending on individual needs and availability, some staff members engaged in several coaching cycles. This produced an iterative process that allowed the progressive development of skills and knowledge and was tailored for individual needs. The technology coach worked closely with the research team. With researcher support, the coach emphasised the role of the technological pedagogical aspect of the mobile technology with the teachers.
CONTENT OF THE PROFESSIONAL DEVELOPMENT

In conjunction with the PD days presented to the whole school, teachers/educational assistants who were involved in the research component received a number of additional PD sessions. The additional sessions were conducted by researchers during the scheduled small group coaching meetings. This professional development addressed a range of topics, including pedagogy, and lasted approximately an hour.

A major focus of the professional development program was pedagogy, or how best to teach with technology. Three pedagogical models were introduced to the teachers: TPACK (Mishra and Koehler 2006), SAMR (Puentedura 2012), and The 21st Century Skills model (Mishra & Kereluik 2011). Each of these models provided insight into the process of ways of teaching with technology. Together, they provided a robust framework for understanding how to teach with mobile technology.

INTEGRATING TECHNOLOGICAL, PEDAGOGICAL AND CONTENT KNOWLEDGE

While the three models were presented during the PD, the major focus was on the TPACK. The TPACK model (see Figure 3) facilitated new ways of thinking about integrating technology into teaching practice. The model emphasises the intersections of technological, pedagogical and content knowledge, thus creating another four blends. The centre of the diagram represents the integration of the knowledge that teachers need to introduce technology successfully into their teaching. The model is therefore useful in enabling teachers to reflect on their practices once they decide to introduce technologies to support learning.

The aims of the Research PD were to prepare the teachers for teaching in the three knowledge domains (see Figure 4) and at the same time, introduce the overlapping area of TPACK, that stem from Shulman’s (1986) concept of pedagogical content knowledge. This involved deconstructing the relationships between content knowledge (subject matter to be taught), technological knowledge (iPad and apps) and pedagogical knowledge (practices, processes, strategies, procedures and methods of teaching and learning) (Archambault, 2011, p. 76). During the workshops, TPACK was used as a model to illustrate how to integrate technology using innovative pedagogies, as an underpinning theoretical framework with which to increase teachers’ awareness of the blends of different knowledge domains, and as a visual guide to ensure balance between the three knowledge domains.

LEVELS OF TEACHER ENGAGEMENT WITH TECHNOLOGY

The second pedagogical model introduced during the PD was SAMR (Substitution, Augmentation, Modification and Redefinition) (Puentedura, 2012). SAMR indicates the levels of complexity at which technology can be used to support learning. The model (see Figure 4) depicts the four levels.

Figure 3. TPACK Model. Source: http://www.TPACK.org (Mishra & Koehler 2006)

Figure 4. SAMR Model. Source: http://www.TPACK.org (Puentedura 2012)
The first level, **Substitution** does not involve a functional change in teaching practice; it merely replaces a tool, for example writing on the iPad instead of a pen and paper. The next level of complexity is **Augmentation**, when the technology tool is used and there is some functional improvement. For example, using a word processing program such as Microsoft Word, provides access to a synonym dictionary. **Modification**, the third level of complexity, uses the technology in a manner that significantly redesigns the task, such as inserting a link to YouTube or a website to enhance the learning opportunity. The final level of complexity involves using the technology to create new tasks that previously were unimaginable; as such, it is suggested that the **Redefinition** level, is the ultimate aim for teaching because of its value in the learning process. For example, peer learning is enhanced by using social media and Google Docs for collaborative writing.

The aim during the PD was to encourage teachers to move from the basic levels of using technology, known as Enhancement (substitution and augmentation) to the higher levels referred to as Transformation (modification and transformation). It was expected that applying this model would bring about a shift in teacher’s thinking about ways to use mobile technologies to support student learning.

**SKILLS STUDENTS NEED**

The third pedagogical model introduced teachers to 21st Century Skills. This model was used to frame the universal needs of 21st century students. The framework outlines the “skills, knowledge, and expertise” needed for student success in both work and life (Partnership for 21st Century Skills, 2011).

Current educational goals are no different compared to previous educational goals. However, rapid advances in technology have transformed some of the skills required of students in the 21st century to meet these goals. The PD program emphasised the skills that are relevant to the teachers who will be engaged in ‘mobile teaching’. From this perspective, it was necessary to review the 21st Century Skills Model ‘Meta Knowledge’ (see Figure 5). It includes, Problem Solving and Critical Thinking, Communication and Collaboration, and Creativity and Innovation. Although it is acknowledged that the skills involved in Foundation and Humanistic Knowledge are important, time constraints meant they were not emphasised during the PD.

Each of the three pedagogical models, introduced by the researchers, were further enhanced and practiced during the sessions with the technology coach. Within each model, the importance of acknowledging that teaching and learning changes when mobile technologies are introduced was a key outcome of the professional development program. To reach this level of awareness, teachers require support.
STUDY DESIGN
The current study used a mixed method approach, collecting primarily qualitative data with 29 participants, three focus group interviews and reflection from the technology coach. The interviews and focus group centred on the use of technology in a hospital school, teachers’ technology needs and the outcomes of a PD program based on the teachers’ use of technology to enhance teaching practices. A pre- and post-survey measured change in teachers’ perceptions of Technological Pedagogical and Content Knowledge (TPACK), with 20 participants completing both the pre- and post- surveys.

The schedule of the pre and post PD interviews and TPACK surveys, and other research related activities were based on the timing and selection of the groups working with the technology coach. The timeline in Figure 6 illustrates the relationship between the core activities involved in each component of the research. The acronyms and details of the study are explained in the sections relating to the individual components.

Figure 6. Timeline of core activities involved in the research

Pre
- Interviews
- TPACK Survey

PD
- Mobile Technology PD
- Coaching

Research
- Pedagogy PD
- Focus Group

Post
- Interviews
- TPACK Surveys

Ongoing
- Pre and Post Cycle repeated every 4 weeks

Outcome
- Peer Coaches

Figure 5. The 21st Century Skills Model. Source: Mishra & Kereluik (2011).
INDIVIDUAL INTERVIEW
Individual interviews were conducted prior to the PD program (pre-PD interviews) and after completion of the PD program (post-PD interviews). All the interviews were conducted at the hospital school facilities at a time convenient to the participants, and during normal teaching hours. The pre-PD interviews were 20 minutes and post-interviews were 30 minutes. The questions centred on the teachers’ current situation and the teaching and professional development needs of teachers. A typical question inquiring about the current situation was: ‘What is your perception on the use of technology in hospital schools?’ An example of a question examining professional development was: ‘How does the professional learning and development provided to you deal with the integration of technology into your learning program?’ Other questions enquired about the personal experience and skills of the participants. For example, ‘What technology have you used and for what purpose?’

FOCUS GROUP
The focus group interviews were conducted during the whole-school PD days, but only involved the research study participants. They were designed to gain a deeper understanding of the needs, progress and challenges of the participants. Examples of the type of questions used were: ‘In what way has the technology coach supported your professional development?’; ‘How are you integrating technology into the way you teach?’; and ‘How would you like to get support?’ The focus group interviews were conducted twice during the research and involved five groups of 4-8 teachers on each occasion. Each focus group session lasted approximately 30 minutes. The results of the focus group discussion were reported back to the plenary session during a school PD day.

PRE- AND POST-PD TPACK SURVEY
Teachers who participated in the research study completed a TPACK survey before and after the PD program. The pre and post PD survey was administered online prior to the start of the PD and at the end of the year to identify changes in teachers’ perceptions about their use of TPACK. The questions were modelled on the TPACK framework developed by Mishra and Koehler (2006). This framework provides a structure for creating questions to explore individuals’ knowledge concerning technological, pedagogical, and content knowledge. The survey administered during this study was modelled on a survey used in similar research, conducted by Archambault (2011). It was adapted for this study to accommodate the context of teaching in the special environment of a hospital school with mobile technologies.

Teachers’ perceptions were examined using 49 statements about the seven knowledge domains: content knowledge (CK), pedagogical knowledge (PK) and technological knowledge (TK); their overlapping domains of pedagogical content knowledge (PCK), technological content knowledge (TCK) and technological pedagogical knowledge (TPK); and then the complete intersection of technological pedagogical content knowledge (TPACK). The possible responses for each item in the seven scales were arranged based on a five-point Likert type scale from strongly disagree (1) to strongly agree (5). In the post-TPACK survey there were two questions that asked the teachers to describe a specific episode where they, as teachers, demonstrated or modelled the use of TPACK in a single teaching scenario.

DATA ANALYSIS
The survey data was cleaned and then analysed using SPSS version 23 (IBM Corp, Armonk, NY). The descriptive statistical results were tabulated and reported for each sub-scale of the TPACK using all participants. Dependent sample t-tests were then conducted for the 20 participants who completed all measures, including the pre- and post-survey.

Each individual interview, focus group and coach reflection was audio recorded and transcribed verbatim. The transcripts were imported into QSR NVivo 10 software (QSR International Pty Ltd, Australia), ensuring that the data by different means was stored and analysed independently. The analysis began with the lead researcher repeatedly reading and re-reading the transcripts to immerse herself in the meaning of the content and to produce an empathetic understanding. As per Strauss and Corbin (1990) a coding hierarchy was created using the interview guides, reflection questions and emergent topics from the data. One researcher grouped the data according to the questions in the protocols. Subsequently, two other researchers immersed themselves in the data in order to identify emergent themes.

As they proceeded with the coding, the researchers discussed their interpretation of the comments to ensure the trustworthiness of the interpretation via a process of researcher triangulation. In addition, data interpretation was facilitated by examination of the full transcripts and nodes, and by running matrix and text searches. Information
from multiple methods of data collection (interviews, focus groups, and reflections) and several sources (participants and technology coach) enabled triangulation of themes, which increased the reliability of the outcome.

Results

The results are presented in two sections: (1) The needs of the teachers; and (2) Impact of the pedagogy-focused PD as evidenced in the TPACK survey results and qualitative data from interviews and focus groups.

THE NEEDS OF THE TEACHERS

Central to creating a relevant professional development offering is determining the technological needs of the teachers and educational assistants. In this study the needs were ascertained via the pre PD interviews. It was revealed that the participants had a variety of needs related to teaching and supporting their students’ learning through the use of mobile technology. The unique challenges of teaching in the hospital school setting provided the context for the design of the professional development. Here are a couple of exemplar quotes:

*I’ve just come off the day program. I’ve walked from one building to the next. Kids who have just come from eating lunch, when they don’t want to be eating (eating disorder), they’ve come in and they’re extremely angry and they’re extremely anxious. We have to settle them down, get them to learn.* (Pt: 5)

*We need immediacy, because we will walk in and we will see that patient… I’m not on the same ward every day and so someone else might come in and finish that lesson, or that area of teaching and then I’ll come in and be on the next thing.* (Pt: 8)

*Truly, it is traumatic sometimes working in the hospital because we work with kids that are sick, kids that die.* (Pt: 27)

There were nine broad areas of need that emerged from qualitative analysis of the pre-interviews: coaching and personal support; integration of mobile technology into teaching; personal use, confidence, and time; communication; hospital; access and IT; peer collaboration; student engagement; and tricks and tips (Figure 7).

![Figure 7. Technology needs of teachers/educational assistants](image)

In order to gain a broad understanding of the importance participants placed upon their needs, they were prioritised by quantifying how often comments occurred within each category. As indicated in Figure 7, *Personal use, Confidence and Time* were the most commonly mentioned needs of the participants (N=151, 23%). This was followed by *Teaching and Integration of Mobile Technologies* which accounted for 20 percent of the needs mentioned by participants (N=135). The third most commonly mentioned group of needs was *Access and IT,*
which featured in 17 percent of the comments (N=116). The least mentioned needs involved Communication at Home and School and Peer Collaboration, which were marginalised in comparison with other more pressing needs. These needs were mentioned in 3 percent and 4 percent of the comments, respectively.

PERSONAL USE, CONFIDENCE, AND TIME

Many participants mentioned their lack of proficiency with mobile technology and consequently their lack of confidence in using it. They spoke of an underlying expectation that they should be knowledgeable about mobile technology and be able to use it proficiently. As this was not the case for many of the participants, they had little confidence in their technological ability. Their lack of confidence was often exacerbated by the contrast in skill sets between the teachers, who were predominantly not digital natives, and the students they taught, who invariably were digital natives. Teachers used terms such as being on the ‘backfoot’ when it came to using technology. Such terminology conveys a sense of inferiority, which indicated that teachers/educational assistants perceived themselves as outclassed with regard to technology. The impression of an inferior skill set was reinforced by comments that indicated teachers/educational assistants often asked their students for help when they had difficulties with technology. In addition, the time constraints that were inherent within their roles meant many participants felt they did not have the time to become proficient with the technology.

I suppose for me the greatest issue that I have is that there is an expectation that we know technology but I don’t believe that we have enough time to become practical and useful in using that PD. (Pt:3)

I find I’m always on the back foot with the kids with the technology… I have no confidence at all. (Pt: 4)

INTEGRATION OF MOBILE TECHNOLOGY INTO TEACHING

Participants were concerned that they lacked an appropriate level of knowledge and understanding in relation to mobile technology and its uses. Some participants felt they were not keeping up with the changes that were occurring with technology and, therefore, they could not model the use of technology in a satisfactory manner to their students. In light of their lack of expertise in this area, some teachers noted they felt unable to solve problems which arose when using technology. Participants recognised that using technology could improve their teaching practices and expressed the desire to effectively integrate mobile technology into their current practices in order to do so. Further, it was noted that the immediacy that technology offers would be invaluable in the hospital’s dynamic environment. Situations and patients are in a constant state of flux, where the needs and requirements can change at a moment’s notice.

I feel if I’m not keeping up with technology and being able to model creativity and problem solving myself, I’m not very useful to the students and I guess given our dynamic setting that is different to the usual setting it is even more applicable as a teacher in that environment. (Pt: 10)

I’m keen to find out how I can improve my teaching by using things like iPads and other technologies. (Pt: 23)

ACCESS AND IT

The hospital environment placed constraints upon the availability of internet access and devices such as printers. Several participants noted that access to the internet was variable and appeared to be dependent on the location in the hospital. The hospital school appeared to be grappling with the specific challenges associated with introducing technology into a hospital location where students are not located in one area but instead are spread over several wards located on different levels in the building. In addition, the internet was accessed through the Department of Education and, therefore, had restrictions and criteria specific to this. Moreover, the students were from a diverse range of schools, including government, catholic and independent, which meant some were not members of the Department of Education system. The combination of these factors produced numerous challenges to providing reliable and accessible internet access for students and teaching staff. The unreliability of the system was a source of frustration for some participants.

Access to the internet and IT devices such as printers has been challenging...sometimes we cannot even use laptops in rooms because of the connection, internet. (Pt: 6)
.. So often we’re hamstrung because of the practicalities of the environment in which we operate in. (Pt: 20)

I’d just like a system that works without so many hiccups. Typically at the moment, occasionally we don’t have internet, often the printers don’t work. (Pt: 4)

HOSPITAL ENVIRONMENT

Teaching in a hospital school involves a somewhat unique set of challenges related to the students and the environment. Students have a variety of needs related to their physical and emotional circumstances. These circumstances may include specific requirements based on the medical treatment they are undergoing or the medical condition they are currently experiencing. The emotional effect of their medical condition or the treatment they were undergoing often impacted upon the student’s motivation to learn. Therefore, in order to encourage student learning, teachers had to devise strategies that would enthuse and motivate students. In addition, the clientele of the school changes rapidly in accordance to their medical needs and often with little prior notice, which makes it extremely challenging for teachers to prepare and plan for an individual’s learning requirements.

We have a lot of individual needs within a hospital setting and we’re also exposed to sort of ad hoc situations where you have a range of different students and you need to access something very quickly so it certainly is of benefit. (Pt: 3)

What I was finding was that in my team, the pediatric adolescent medicine team, … physical disabilities as well, and non-verbal. …. (Pt: 22)

I had a little girl this morning that just did a little book on dolphins and she’d had a stroke last week. She’s 10 years old and now could only use her left hand. The iPad was perfect for her. She finding images of dolphins on Safari and she was typing with her left hand. (Pt: 10)

TIPS AND TRICKS

As well as improving their understanding of technology, participants expressed the desire to learn tips and tricks that could improve their use of technology; specifically, knowing which apps would be most suitable for use within their teaching to help support the students’ learning. While they understood that technology was constantly changing, nevertheless they felt it would be extremely useful to have a repertoire of the relevant apps that were currently available.

I’d like to be aware of the things it can really do, all the accessibility options. I’d like to nail down some really good apps, I know that they are always changing, but I’d like to have some at my fingertips. I’d like to feel confident in my use of that, particularly with being able to get back to schools quickly, so the students can send their work back to TAFE or Uni or school. (Pt: 21)

I don’t know enough to troubleshoot. You know enough to do the work when it’s all going smoothly. (Pt: 3)

STUDENT ENGAGEMENT

The emotional state of the students may be heavily influenced by their treatment and medical condition. Participants mentioned that students could be experiencing strong emotions, such as anxiety, distress, or anger, when they participate in learning activities. These emotions must be addressed before the students can focus on learning and properly engage in the planned activities.

Kids who have just come from eating lunch, when they don’t want to be eating, they’ve come in and they’re extremely angry and they’re extremely anxious. We have to settle them down, get them to learn. (Pt: 3)
COACHING AND PERSONAL SUPPORT

The majority of participants expressed the need for assistance that was tailored to their personal circumstances. They often conveyed a sense of urgency regarding this, which appeared to be created by being time poor and busy but having specific questions they required answering. This desire for specific information suggested that coaching would be an effective and efficient means of delivering PD. Further, the participants mentioned that in some instances, prior PD had provided a great deal of helpful information; however, the quantity of information that was disseminated in one session meant their level of retention was low. Again, a coaching model for the PD would alleviate this because information would be given in small amounts and the participants would be given time to practice what they learnt.

Consecutive coaching sessions would allow the concepts to be reinforced and new information to be presented once the initial information was assimilated. The iterative process often involved in coaching provides opportunity for reflection, feedback, and progressive development of skills and knowledge.

*It needs to be quite targeted for my needs at the moment, and I would like people to be able to answer my needs fairly quickly.* (Pt:7)

*Lots of PD I’ve been to, they’re trying to give you as much info as they can…and you think “oh that’s really good” and then you forget about it, unfortunately.* (Pt: 18)

PEER COLLABORATION

Being able to share with others was perceived as something that would be very beneficial to the PD of participants. Discussing the use of technology with colleagues who were working in a similar environment was identified as a source of information that would enable participants to develop their skills and knowledge. It was noted that this could be facilitated by providing more opportunity for these interactions to occur during PD sessions.

*I think more opportunities to have the school development days or PD sessions with groups of people who are working in a similar situation so we can bounce ideas off each other and how other people use the technology and how I can work that into my teaching.* (Pt: 24)

COMMUNICATION

Reducing the isolation caused by being in hospital was described as a very important need. Mobile technology was considered an effective means of connecting students with classmates and teachers from their home school. It was recognised that patients from the country were often more isolated than others because of the distance involved, which acted as a deterrent for those who may want to visit. The accessibility of connection that is achieved using mobile technology extended to teachers being able to contact the students’ teachers from their enrolled school. In addition, with the increasing use of portal systems in school settings, many students are now able to access information regarding lessons and assessment tasks via their home school’s website. The portal system provides a constant link that aids in bridging the educational gap caused by being in hospital.

*A lot of my students at the moment are from the country and so they don’t really have much connection with their classes.* (Pt:11)

*…we used to always be completely in charge of the student and what was happening, and directing it because the [home] teacher would be in contact, but now there’s a lot of contact from the student directly to their home teacher and you have to make sure you are part of that because you are the one who is facilitating their learning as well, it’s in tandem.* (Pt:04)

IMPACT OF THE PEDAGOGY-FOCUSED PD

The research component of the project set out to meet the needs of teachers as determined in the pre-PD interviews. The teachers’ identified needs included lack of confidence with integrating technology into teaching as well as a lack of comfort with mobile technologies used. The impact of the professional development was examined using quantitative and qualitative approaches.
PERCEIVED ABILITY TO INTEGRATE PEDAGOGY WITH TECHNOLOGY

Teachers’ perception of their ability with mobile technologies impacts on their confidence to integrate pedagogy and technology in their everyday teaching. The teachers in this study started with good confidence in their technology knowledge (M=3.1 out of 5) but were less confident when asked about integrating technology with content (M=2.7; TCK), and also integrating technology with content and pedagogy (M=2.5; TPCK).

The emphasis on mobile technologies and pedagogy did change and improve teachers’ perceptions about the use of mobile technology (TK). T-tests were used to evaluate whether increases from pre to post-professional development were significant (see Appendix 2). There was a significant increase between pre (M= 3.1) and post (M=3.3) results for the technology knowledge measure (TK, t= -2.579, df=18, p<0.02). This is a good assessment of the professional development as it shows a basic increase in confidence with using mobile technology.

Even though the increase was small (+0.2), the pre-survey value may represent an overestimation of their confidence with mobile technology that masks a greater impact of the professional development. Actually doing the integrating of technology with content or pedagogy turned out to be more challenging than expected and the post-PD values may represent a more realistic evaluation of their perceived ability with mobile technologies. One participant even suggested that at the end “they now know what they don’t know” which wasn’t the case at the start.

In the pre-survey, perceived ability to integrate technology with content was lower than their confidence to integrate it with pedagogy. This is interesting to note given their high confidence with content knowledge (M=4.2; CK), the added technology component led to a drop in confidence when you combine the two elements together (M=2.7; TCK). The TPACK, which combined all three, was M=2.5, which is the mid-point of the scale and often indicates no opinion either positive or negative. This may indicate a lack of understanding of what this concept and pedagogy would involve or mean for their teaching process at this stage.

The impact of the professional development can be seen in the significant increase for two areas of blended knowledge (see Table 1 and Appendix 2). The first was an increase in confidence with integrating pedagogical and content knowledge (PCK; t= -2.424, df=18, p<.05); and perhaps most importantly for this study, there was an increase in confidence to integrate technology with pedagogical knowledge (TPK; t= -2.214, df=18, p<.05). There was also some improvement between pre and post-test results for two other blends of knowledge: technological with content knowledge (TCK) and technological, pedagogical and content knowledge (TPACK). Although they were not statistically significant, they do indicate a trend in a positive direction with such a small sample size. These T-test results suggest that after engaging in professional development with mobile technologies, teachers’ perceptions changed significantly and they felt more confident in three knowledge domain areas.

TABLE 1: Pre and post professional development mean scores and confidence level for sub-scales in the TPACK survey.

<table>
<thead>
<tr>
<th>Area</th>
<th>Pre Mean</th>
<th>Confidence</th>
<th>Post Mean</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Knowledge</td>
<td>3.1</td>
<td></td>
<td>3.3**</td>
<td></td>
</tr>
<tr>
<td>Content Knowledge</td>
<td>4.2</td>
<td></td>
<td>4.1</td>
<td></td>
</tr>
<tr>
<td>Pedagogical Knowledge</td>
<td>4.1</td>
<td></td>
<td>4.1</td>
<td></td>
</tr>
<tr>
<td>Technology and Content Knowledge</td>
<td>2.7</td>
<td></td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>Pedagogical and Content Knowledge</td>
<td>3.1</td>
<td></td>
<td>3.6**</td>
<td></td>
</tr>
<tr>
<td>Technology and Pedagogical Knowledge</td>
<td>3.8</td>
<td></td>
<td>4.2**</td>
<td></td>
</tr>
<tr>
<td>Technology, Pedagogical and Content Knowledge</td>
<td>2.5</td>
<td></td>
<td>2.9</td>
<td></td>
</tr>
</tbody>
</table>
The PD impacted heavily on the way participants taught in their content area (PCK) and had significant impact on their perceptions of how they integrated pedagogy with the new technology they used (TPK). However, their perception did not change (and not surprisingly) in relation to content knowledge (CK) or pedagogical knowledge (PK) as many of the teachers were experienced teachers and were experts in their field. These teachers felt more confident and tended to integrate more of the technology into their area of teaching and were more positive about the challenge of combining the technology with the appropriate pedagogy in their content area.

In terms of the full TPACK, the shift from mid-point to almost 3 out of 5, while not statistically significant, represents a positive move in the teachers’ perception of the integration of mobile technology and pedagogy in their teaching area. The researchers interpret this as the beginning of “ah-ha” moments where understanding has begun. Now teachers are comfortable with mobile technology they are ready to accept the need to develop the pedagogy that are necessary for successful implementation of mobile technologies. Table 1 shows the change in their perceived confidence with the different knowledge domains.

TECHNOLOGY COACHING
The majority of the participants mentioned the benefit they gained from the coaching offered during the PD program. Many participants felt the one-to-one guidance provided by the technology coach made an invaluable contribution to their learning, and that the interaction with the coach provided a connection and a support that enabled them to develop their technology knowledge and skills. It was apparent that there were several aspects of learning that were enhanced or influenced by the one to one interactions with the coach. The main aspects affected by this process were: prioritising and making space for learning; flexibility regarding what was taught; confidence building; motivation; and knowledge and skill development. The iterative process involved in the coaching model was also identified as having a positive effect on learning outcomes. Further information regarding these aspects is outlined below.

PRIORITISING AND MAKING SPACE FOR LEARNING
The coaching sessions enabled participants to prioritise their engagement in professional learning by creating a time when they must engage in such activities. While participants recognised their need to allocate time to increase their technology knowledge and skills, their workload and commitments precluded this being prioritised. There was a distinct contrast between the ‘good intentions’ to engage in self-directed PD (via online sources) that were not realised, and the coaching that provided space to develop technology knowledge and skills.

Employing a coach indicated the priority the school administration placed on introducing technology to support learning. The expense and time involved in providing teachers with individual coaching sessions implicitly emphasised the priority that was placed on acquiring technological skills and knowledge. Further, the individual coaching supported the intention of the teachers to improve these skills and knowledge.

FLEXIBILITY
The flexibility of the coaching, both with respect to where the coaching sessions were held, and what was covered, contributed to the effectiveness of this form of PD. The coaching took place in the participants’ working environment, including their classrooms and also student’s hospital rooms. This meant that the technology coach observed the specific needs of the participants and was able to provide ‘on the spot’ and just-in-time advice, as well as begin to develop remedies for the identified needs.
I went up to the ward. The teacher I was working with had to be in a hundred different places at once and most of her students were bedridden and needed one to one (CR:1)

CONFIDENCE BUILDING
Confidence building was a very important part of the coaching process. Participants often mentioned the confidence they gained from engaging with the technology coach. The support of the coach helped participants to build their confidence regarding the use of technology within their teaching. It was indicated that the support of the coach also gave participants confidence to work through the challenges involved in the journey of learning to use technology to support learning. This confidence enabled the participants to begin to view and use the technology to support student learning rather than for the purpose of the technology serve as a babysitting or a play.

Coach initially helped me build up more confidence and I just keep going with that journey myself. (Pt:8)

... Previously, a lot of people looked at the iPads as almost like a baby-sitting tool. The kids sit there and they play with the apps. Well the apps I wanted to use were those creative apps that I needed to have and use as part of a learning process. I now have enough confidence that I've used those few apps, that other creative apps that I get, I'm now confident I have enough information about the iPad, that I skill myself. (Pt: 6)

I don’t feel like such an old Nanna, kind of like ‘show me how to turn this on again’ (imitates an aged voice). I was feeling kind of like that but now I feel a lot more confident while they are sitting next to me watching me do stuff. I feel like I am confident in what I am doing, whereas before it was ‘how about you doing it’ or ‘can you find it?’ because I didn’t want them watching me be a bit incompetent, basically. (Pt: 25)

The coaching broadened the participants’ perspective on how they could use technology. It was suggested that joining social media such as Twitter would widen the participants’ networks and learning opportunities. In addition to suggesting these interactions, this was another example of the manner in which the coach provided the confidence to be involved in ongoing learning.

The coach encouraged me to join Twitter and making wider networks with other people, for my IT journey so I feel like I have the confidence to find out from someone or branch out myself to keep that up as a priority to keep on top of it. (Pt: 9)

MOTIVATION
Having access to relevant information and resources has had a motivating effect on the participants and the students they support. In particular, being shown relevant apps has provided resources that have increased the interest and enthusiasm of participants and students alike.

I use an ipad a lot, and specifically some of the apps that the Coach has been training me to use, which was very useful. I access the ones that I find most useful for the students. They have been very motivating, not just for me and my own interest, but I’ve noticed the students’ enthusiasm. (Pt: 7)

KNOWLEDGE AND SKILL DEVELOPMENT
Participants had varying levels of skills and knowledge with respect to technology. The coaching process enabled participants to receive individualised information to help them improve.

The coach (coaching) was great in that if I said ‘look these are the areas that I teach, this is the information that I would like to see if there are any information for’ and so we accessed them. (Pt: 20)

Through the process with the coach I’ve developed my knowledge of some different apps that can be used to support student learning. (Pt: 8)

ITERATIVE PROCESS
An advantage of the coaching model was the ability for learning to be an iterative process. Regular contact with the coach meant the participants could learn a skill or strategy and then experiment with using it in their teaching. After trying out the strategy within their teaching, the process provided the opportunity for the participants to ask the coach for further advice or help to amend their original strategy.
I suggested an app for her to use with her students. Each session she came back with questions on how to refine the strategy for teaching her students. (CR: 2)

COLLABORATION
The PD provided an opportunity to share and collaborate with other teachers/educational assistants. In particular, the group coaching sessions were considered an opportunity to share information and resources with others. These coach-guided sessions provided a structure that focused the discussions and the resource sharing. Interacting with other staff members who were grappling with similar needs and problems also provided a source of support for those who were struggling.

Through exchange and sharing of apps, if you are using an iPad, even what’s available on the internet so a lot of collegial sharing and then inputs during the year from people who direct themselves, someone like [the coach] who is directed at finding and knowing where to go, in helping us. (PT: 11)

We’re talking about it a lot more. We’re showing each other how to do things: ‘have you seen this?’ a lot more than we ever have before. (PT: 25)

I think more opportunities to have the school development days or PD sessions with groups of people who are working in a similar situation so we can bounce ideas off each other and how other people use the technology and how I can work that into my teaching. (PT: 24)

Well I like watching what they're doing, how they're incorporating it in, because we work closely together so I can see what they are doing with other students. I also, as something comes up, ‘hey [Melanie] can you show me how to print things from an iPad?’; ‘hey [Clover], do you know how to open this document here but print it…?’ just that sort of technical stuff that is very important, as it comes up they tell me, and that’s that. (Pt: 4)

PEDAGOGY
Including pedagogy within the PD provided a framework for participants to examine their teaching strategies in relation to the desired outcomes. The comments made during the discussions highlight that the pedagogy-focused sessions enabled reflection on participants’ teaching practices, thinking how they can engage students to learn in difficult situations. The three pedagogical models encouraged this process by providing material that stimulated thoughts and raised questions. In addition, a beneficial synergy was created by using pedagogy simultaneously with the coaching process.

REFLECTION
The discussion on pedagogy stimulated a reflective process. This removed the focus from implementing and using technology to support teaching (that is replacing a pen with a computer) and instead centred it on an inquiry process such as, how and why technology can enhance learning. This process encouraged participants to engage in critical thought about their teaching strategies, which is essential for optimising learning, but is sometimes neglected during the hectic pace of everyday work, such as this hospital context. This also suggested a new use of terminology that was not used by the teachers in the past, such as ‘innovative pedagogies’ and “I want to augment what I do, to redefine what I do”.

I was curious to find one of the statements on the blurb that you sent out, about innovate pedagogies. It raised a question in my head about whether technology is helping us to develop new ways to help people learn. (Pt: 6)

PEDAGOGICAL MODELS
Exposure to the three pedagogical models used in the professional development (TPACK, 21st Century Skills, and SAMR) provided a framework for discussions regarding using technology to support student learning. Figure 8 shows the flow between the three models and the types of comments that were generated:
Figure 8. Reflection on the pedagogical models

ENGAGING STUDENTS TO LEARN
In particular, the unique circumstance encountered in the hospital setting reinforced the need to create learning opportunities that were engaging and motivating. The students’ medical concerns often had considerable emotional and psychological impact upon them, which exacerbated reluctance, or lack of motivation, to learn. In addition, heightened emotions produced by medical issues had to be considered when attempting to engage students. Therefore, reflecting on one’s pedagogical stance both assisted and enabled the teachers to develop meaningful learning opportunities for students.

I will give you an example of when it worked. A student came in very angry after lunch. He had been doing some Shakespeare with another teacher and she wasn’t in on Friday so I said I knew something that would be fun. Dr Who, so it was a little skit about one of the girls that plays opposite him…spruiking off Shakespeare…so it was just to give this boy an idea…it was in a skit, present day, very funny. He laughed and laughed which was good. So that was an example of him getting really quite engaged and then asking questions and being really quite light hearted. It is a recent example of how its [pedagogical use of technology] been used to engage him and help him to just get a bit of context and hear it, hear ‘Shakespeare speak’

SYNERGY OF PEDAGOGY AND COACHING
Presenting pedagogical information in conjunction with coaching appeared to create a synergy that enhanced the learning process. This approach provided an opportunity for the pedagogical considerations to be reinforced by ongoing interactions between the technology coach and the participants. The coach reminded participants about the importance of considering the pedagogical ramifications of using technology. The coach also encouraged the participants to consider the benefits of teaching strategies and provided stimulus for self-reflection on teaching approaches (i.e., student centred vs teacher centred).

So, I found now that the children will come to me and say ‘this is the idea I have’ rather than me say ‘do it this way’ which you’ve suggested. ‘Can I do it electronically?’ In order for me to say ‘yes’ I have to feel confident that they will be engaged and that they will stay on task, and get the outcome that they want. And in order for that I have to be versed in the type of technology they will engage in, otherwise how do I know that they are getting the most out of that activity? (Pt: 3)
Conclusion

This project provided professional development for teachers in a hospital school to alleviate the problems associated with introducing and using mobile technologies in hospital school setting. Adolescents who are staying in hospital for a period of time suffer not only from physical trauma, but also from social and emotional trauma because they are separated from their routine life including their schooling. In particular, adolescents in hospital often express the view that they want their teachers in the hospital setting to provide opportunities for learning and prepare them for exams rather than be concerned about their health (Wilkie, 2014).

Studies suggest that schooling and connection to peers and family are essential for the recovery of adolescents (Maor & Mitchem, 2015). In recent years, advancements in technology have made mobile devices more accessible and relevant for learning and communication (Ferguson & Walker, 2014). In light of this, teachers require greater focus on how to integrate technology into their teaching practices. Therefore, the research team designed a professional development program to provide hospital school teachers with pedagogical insights into the use of mobile technologies. Although the technology is available in schools, examples of best practice in the use of mobile technology and in professional development are rare.

Results from the TPACK survey data found that teachers increased their confidence and their understanding of the use of mobile technology. More importantly, they were more confident about implementing their pedagogical knowledge in their specific content knowledge area and with the mobile technology that they used with hospitalised children. As a result of the professional development they used mobile technologies such as e-books for teaching purposes to benefit student learning, communication and collaboration. They were able to reflect on how information and mobile technologies can influence their teaching approaches. While there were not significant changes in all areas, there was an increase in the integration of mobile technologies with appropriate pedagogies and content area.

In preparation for professional development, a series of individual interviews provided insights into the teachers’ specific needs in the unique context of teaching hospitalised adolescents. The priority areas of need related to personal use, confidence, time, teaching with technology, internet access and IT. The immediacy of these needs for professional development are evident in comments such as:

- It needs to be quite targeted for my needs at the moment, and I would like people to be able to answer my needs fairly quickly.

This study found that a pedagogically complex model of professional development, is important for it to be effective. Professional development grounded in active and reflective teaching practice is also important. Technology training in isolation from the context in which teaching occurs will not be as effective. This tailored year-long professional development for the hospital school teachers had a unique perspective. It had a strong theoretical underpinning of research-specific PD that provided the teachers with strategies for how to teach with mobile technologies.

The research team introduced three pedagogical models (TPACK, SAMR and 21st Century Skills) that provided the hospital teachers with a robust theoretical framework upon which to develop their knowledge and skill. Teachers implemented and reflected on these new strategies. As one participant stated:

- I think TPACK’s really good. It’s not actually about the technology … it’s the curriculum and how to use the application to enhance my teaching.

The coaching was introduced to the teachers to provide ongoing, just in-time technological and pedagogical support from an expert, the coach. The results suggest that spending time with the coach increased teachers’ technological literacy and pedagogical use of mobile technology to support learning. The ongoing support from the coach built teachers’ confidence and ability. In addition, the interactions developed their technological pedagogical capability.

- Coach initially helped me build up more confidence and I just keep going with that journey myself.
A number of teachers participated in two to three iterations of coaching and consequently they became the next generation of coaches—peer coaches. This developed a community of practice whereby the learners became the experts and passed their expertise to others in a manner similar to that, noted by Pegrum et al. (2013). Teachers became peer coaches supporting those with less skills and expertise, thus perpetuating the dissemination of knowledge through the teaching staff in the hospital school.

Although not fully internalised by the teachers, the major focus of the PD was pedagogical knowledge. The exposure to pedagogically focused PD in conjunction with coaching, and peer collaboration produced a synergetic effect. This effect increased teacher proficiency in supporting student learning with mobile technology as reflected in their significantly improved perceptions for three domain areas of the TPACK: technological knowledge (TK), technology pedagogical knowledge (TPK) and pedagogical content knowledge (PCK). Although the non-significant TPACK result suggests that teachers did not develop a comprehensive understanding of pedagogical enhancement of mobile technology, this can be the role of future professional development as we strive to assist teachers to balance the varying constraints of teaching in a hospital setting.

The synergetic effect overall would suggest that this pedagogically complex PD model containing multiple elements maximised professional development outcomes and as such, can be considered a best practice model. The success of this PD suggests that the model adopted in this project may be applicable for use in different school settings.
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Appendix 1: TPACK Pre and Post Test Survey

Professional Development and Mobile Technologies | Hospital School Study
Teaching and Technology Self-Assessment Survey

Thank you for taking the time to complete this questionnaire. Please rate each statement to the best of your knowledge. Your thoughtfulness and candid responses are greatly appreciated. Your individual name or identification number will not be, at any time, associated with your responses. Your responses will be kept completely confidential and will not impact on your own work.

Please rate each statement to the best of your knowledge based on your teaching in the hospital school context.

Technology Knowledge
1. I keep up with new technologies.
2. I have the technical skills I need in order to use the technology for my teaching.
3. I use Web resources and social networks (twitter and face-book) for teaching.
4. I use e-books for teaching purposes.
5. I use mobile technologies to benefit student learning, communication and collaboration.
6. I use various learning systems to deliver instruction (e.g., Edmodo, Blackboard, Moodle).
7. I troubleshoot technical requirements associated with mobile learning (e.g., selecting wireless networks, downloading from the App store).

Content Knowledge
1. I have sufficient knowledge about my content area (name it).
2. I find and adjust appropriate resources for the individual content I teach.
3. I create learning materials or appropriate resources for the individual content I teach.
4. I decide on the scope of concepts taught within my content area.
5. I have various strategies of developing my understanding of my content area.
6. I am teaching in the content area that I was trained in.
7. I have an awareness of the learning theories that inform my content area.

Pedagogical Knowledge
1. I adapt my teaching style to different learners.
2. I practice an inquiry based approach in my teaching.
3. I use a wide range of teaching approaches in an individual or group setting.
4. I use a variety of teaching strategies to relate various concepts to students.
5. I moderate collaboration among students in an offline-learning environment.
6. I adjust teaching strategies based on student performance and feedback.
7. I feel comfortable moving between online and offline teaching with my students.

Pedagogical Content Knowledge
1. I assist students in making connections between various concepts in unit material.
2. I select effective teaching approaches to guide student creativity and innovation in my content area.
3. I determine a particular strategy best suited to teach a specific concept or content.
4. I anticipate students’ likely misconceptions within a particular topic.
5. I produce lesson plans and projects that support collaboration and communication.
7. I promote problem solving and critical thinking in the learning area.

Technological Content Knowledge
1. I use relevant and authentic content using mobile technology applications.
2. I use social media to teach a specific content.
3. I create digital resources that map to a specific unit of competency.
4. I use technology applications (Keynote, Power Point, Apps, etc.) To demonstrate specific concepts in my content area.
5. I use technology to create effective representations of content that depart from textbook knowledge.
6. I enable students to use mobile information and learning technologies.
7. I create digital learning materials or appropriate digital resources for the individual content I teach.

Technological Pedagogical Knowledge
1. I create a mobile learning environment that allows students to build collaboratively new knowledge and skills.
2. I reflect on how information and mobile technologies can influence my teaching approaches.
3. I am thinking critically about how to use mobile technology in my online/offline teaching.
4. I adapt mobile technologies to enhance teaching approaches appropriate for my students.
5. I implement different teaching strategies using information and mobile technologies to overcome students learning in isolation, when away from their home school.
6. I build collaboration among students in an online/mobile learning environment.
7. I meet the overall demands of teaching in an ever-changing technological learning environment.

Technology Pedagogy and Content Knowledge
1. I use mobile technologies to benefit students learning, communication and collaboration.
2. I use student online assessment to modify my teaching in my content area.
3. I integrate effectively the use of mobile technologies in individual or small group settings while teaching in my content area.
4. I utilise effectively the use of social media for teaching in my area.
5. I engage students in learning via the use of interactive ibooks and Apps to teach in my content area.
6. I use mobile learning technologies to assess students’ skill and understanding of a particular topic.
7. I teach and collaborate online with individuals or small groups in my content area.
Appendix 2: Analysis of TPACK data

The 49 items from the TPACK Survey were collapsed into means for the seven dimensions. Scale reliability correlations were run to confirm the dimensions were reliable in this context. The data was then analysed for pre-post change using dependent sample t-tests for participants who completed both the pre- and post-test. This allowed for any individual differences in perceived confidence as change was measured within the individual rather than averaged across participants.

The descriptive data demonstrates a boost for five of seven subscales post the professional development experience (see Figure 9). The means and standard deviations for the dimensions are given in the body of the report in Table 1.

![Figure 9. TPACK sub-scales pre and post professional development mean scores](image)

The dependent sample t-test was used to evaluate change based on the pedagogy-focused professional development provided. Data was matched by participant as the measure is about perceived confidence and use, which is a subjective evaluation. The results of the t-test show three significant increases (at p<.05), with a further two showing a strong trend given the relatively small sample size. Encouragingly, there was no change in the two areas where the teachers were already confident: content knowledge and pedagogical knowledge. The effect was, as hoped, on perceived confidence to integrate mobile technologies with content and pedagogical knowledge (see Table 2).

![Table 2: Paired Sample T-test results for pre- and post-PD TPACK survey.](image)

Note: Paired sample t-test, N=20, df=19.

** p<.01, * p<.05, ⊥ p<.15, NS = not significantly different