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# UNDERSTANDING TPACK IN PRACTICE: PRAXIS THROUGH TECHNOLOGICAL PEDAGOGICAL REASONING

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**ABSTRACT**

Reflective, intelligent, professional teachers research their own practice to inform future improvements. However, the demands upon teacher graduates and early career teachers do not enable the space and time to engage effectively in 'praxis' (Freire, 1970) which involves "highly developed educational practice that consciously articulates the theory on which it is based, and, in turn, generates new theory" (O'Toole & Beckett, 2013). Freire (1970) articulates the term 'limit situations' which can enable teacher voice to portray experience and reflection which might differ from those around them. This paper is situated within an understanding of the complexities of the contexts for graduate and early career teachers to develop Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006) to have the confidence and capabilities to use technologies to support their teaching and to support student learning. This paper provides an Australian early career teacher's story through praxis by drawing upon the TPACK conceptualisation and recent attempts to explore teachers' Technological Pedagogical Reasoning (TPR) (Smart et al., 2013). The praxis is also considered in relation to the expectations of the *Australian Professional Standards for Teachers* (AITSL, 2011a), and the *ICT Elaborations* (AITSL, 2011b) which complement those standards. The authors suggest that this approach can significantly contribute to the TPACK literature to inform what TPACK looks like in practice through the experiences and reflections of teachers and explore the 'black box of technology integration' (Tondeur et al. 2013) through teacher perspectives.

**KEYWORDS**

TPACK, Classroom Practice, Professional Standards, ICT, eLearning

## 1. INTRODUCTION – TPACK RESEARCH, POLICY, AND PRACTICE

The authors have a passion for investigating how new and emerging technologies might be used to enhance learning and teaching. However, as teachers and researchers, we also agree with and adopt Mishra and Koehler's perspective that teaching with technologies is a 'wicked problem', whereby 'wicked problems' are characterised as being incomplete, contradictory, changing, and occurring in complex and unique social contexts. As Mishra and Koehler (2008) indicate, solutions are often unable to be 'right' or 'wrong', and involve engaging "expert knowledge to design solutions that honor the complexities of the situations and the contexts presented by learners and classrooms" (p. 2).

Both authors undertook pre-service teacher education programs which were designed to develop their professional knowledge and professional practice so that they had strong content knowledge and pedagogical knowledge. Throughout those pre-service programs we developed understandings of Shulman's theorising of pedagogical content knowledge (PCK) (Shulman, 1986; 1987) and his Model of Pedagogical Reasoning and Action (MRPA).

Throughout the various stages of our professional careers, we have also understood the importance of 'praxis' (Freire, 1970) which involves "highly developed educational practice that consciously articulates the theory on which it is based, and, in turn, generates new theory" (O'Toole & Beckett, 2013, p. 34). We believe that the emergence of Technological Pedagogical Content Knowledge (TPCK), now known as TPACK, (Koehler & Mishra, 2005; Mishra & Koehler, 2006; 2008) which builds upon Shulman's PCK might enable us to more adequately understand how technological knowledge (TK) might intersect with content knowledge (CK) and pedagogical knowledge (PK).

Therefore, this paper is situated within an understanding of the complexities of the contexts for teachers to develop TPACK capabilities to use technologies to support their teaching and to support student learning. This paper provides an Australian early career teacher's story through praxis by drawing upon the TPACK conceptualisation and recent attempts to explore teachers' Technological Pedagogical Reasoning (TPR) (Smart et al., 2013). The praxis is also considered in relation to the expectations of the *Australian Professional Standards for Teachers* (AITSL, 2011a) and the *ICT Elaborations* (AITSL, 2011b) which complement those standards. The authors suggest that this approach can significantly contribute to the TPACK literature to inform what TPACK looks like in practice through the experiences and reflections of teachers and explore the 'black box of technology integration' (Tondeur et al., 2013) through teacher perspectives.

From the summary of relevant literature relating to TPACK presented in the following section, there is an identification of emerging teacher stories which are now providing insights into what TPACK looks like in practice. The *Australian Professional Standards for Teachers* and the *ICT Elaborations* (AITSL, 2011b) are also discussed in the following section to illustrate that TPACK capabilities are inherent in these expectations for Graduate teachers. Subsequently, the research methodology is briefly outlined, and this is followed by the teacher's story of TPACK in practice and interpretations employing TPR are provided.

## 2. EMERGING TEACHER STORIES ABOUT TPACK IN PRACTICE AND THE AUSTRALIAN PROFESSIONAL STANDARDS FOR TEACHERS

The TPACK conceptualisation (Mishra & Koehler 2006; 2008) has been a catalyst for teacher education research in recent times. For example, Voogt et al. (2013) provides a review of TPACK literature through the examination of 55 peer-reviewed publications between 2005 and 2011. The review determined that there were different understandings of TPACK, and that teacher knowledge (TPACK) and teachers' beliefs about pedagogy and technology determined whether or not a teacher might teach with technology.

Since 2011, the quantity of published TPACK research has substantially increased, with more than 230 papers published in 2012-2013, as identified through a search of the Association for the Advancement of Computing in Education (AACE) EdITLib publications, using 'TPACK' as the search term. This provides evidence of an expanding body of TPACK research which is making a significant contribution to informing pre-service teacher education and the professional learning of practising teachers.

In Australia, the *Teaching Teachers for the Future (TTF) Project* was guided by the TPACK conceptualisation. The TTF Project involved all 39 Australian Higher Education ITE providers, with the lead agency being Education Services Australia (ESA) and partners being the Australian Council of Deans of Education (ACDE), the Australian Institute for Teaching and School Leadership (AITSL), and the Australian Council for Computers in Education (ACCE). Further details about the project are available elsewhere (AITSL, 2013 – see http://www.aitsl.edu.au/teachers/ttf/ttf-project.html) and a summary of the findings are provided elsewhere (see Finger et al., 2013). At the 3rd TTF National Support Network meeting attended by Punya Mishra and Matthew Koehler, they referred to the international TPACK initiatives and networks and Mishra indicated that the TTF Project 'dwarfed' anything occurring internationally.

The TTF Project research and evaluation included three major research and evaluation strategies; namely, (1) the development and administration of a *TTF TPACK Online Survey* (see Jamieson-Proctor et al., 2013), (2) the implementation of Most Significant Change (MSC) methodology, and (3) the facilitation of and opportunities for institution-initiated TTF research and evaluation projects. The findings from the *TTF TPACK Online survey* administered at the beginning of the project and toward the conclusion of the project showed measurable improvements in the confidence of pre-service teachers in using ICT, as future teachers, to support teaching and to support student learning (see Finger et al., 2013). In addition, Heck and Sweeney (2013) describe the MSC approach which involved collecting stories to establish the impact of the project. These MSC stories articulated change across three domains, namely, course development, ICT capacity of teacher educators, and the ICT capacity of pre-service teachers.

Among the TTF Project outcomes and deliverables was the development of AITSL's *ICT Elaborations for Graduate Teachers* (AITSL, 2011b) to complement the *Australian Professional Standards for Teachers* (AITSL, 2011a). It is important to note that, prior to the TTF Project and the development of the ICT Elaborations, it would be possible to read the Focus Area and the Descriptor of each standard and, in most instances, employ only PCK as ICT or technologies are not explicitly mentioned. A close examination of the standards, focus areas and descriptors revealed that ICT was stated in only 3 of the 26 Focus Areas as shown in Table 1 below.

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Table 1. Identification of ICT referred to in the Australian Professional Standards for Teachers Focus Areas and Descriptors

| **STANDARD 2 Know the content and how to teach it** | | |
|---|---|---|
| **FOCUS AREA** | | **DESCRIPTOR** |
| 2.6 | Information and Communication Technology (ICT) | Implement teaching strategies for using ICT to expand curriculum learning opportunities for students. |
| **STANDARD 3 Plan for and implement effective teaching and learning** | | |
| **FOCUS AREA** | | **DESCRIPTOR** |
| 3.4 | Select and use resources | Demonstrate knowledge of a range of resources, including ICT, that engage students in their learning. |
| **STANDARD 4 Create and maintain supportive and safe learning environments** | | |
| **FOCUS AREA** | | **DESCRIPTOR** |
| 4.5 | Use ICT safely, responsibly and ethically | Demonstrate an understanding of the relevant issues and the strategies available to support the safe, responsible and ethical use of ICT in learning and teaching. |

These standards, which shape the teaching profession in Australia, do not refer to TPACK explicitly. Therefore, the TTF Project in assisting in the development of the *ICT Elaborations* (AITSL, 2011b) makes a significant contribution to making TPACK and TPR more explicit. To illustrate, Table 2 displays an example of the ICT elaborations developed for Professional Standard 3 – Plan for an implement effective teaching and learning – expected of Graduate Teachers. Made explicit in each of these elaborations is the intersection of technological knowledge (TK), content knowledge (CK) and pedagogical knowledge (PK), while the Focus Area and Descriptors themselves, with the exception of the Descriptor for Focus Area 3.4, do not explicitly refer to ICT whatsoever.

Table 2. ICT Elaborations for the Australian Professional Standards for Teachers - Standard 3 Plan for and implement effective teaching and learning
(see http://acce.edu.au/national-professional-standards-teachers-ict-elaborations-graduate-teachers)

| **STANDARD 3 Plan for and implement effective teaching and learning** | | | |
|---|---|---|---|
| **FOCUS AREA** | | **DESCRIPTOR** | **ICT ELABORATION** |
| 3.1 | Establish challenging learning goals | Set learning goals that provide achievable challenges for students of varying abilities and characteristics. | Demonstrate knowledge and understanding of how the use of digital resources and tools can support approaches to teaching that enable all students to pursue their individual curiosity, set their own educational goals, manage their own learning, choose the way they respond to tasks and challenges and assess their own progress. |
| 3.2 | Plan, structure and sequence learning programs | Plan lesson sequences using knowledge of student learning, content and effective teaching strategies. | Select and sequence digital resources and tools in ways that demonstrate knowledge and understanding of how these can support deep learning of the content of specific teaching areas and effective teaching strategies. |
| 3.3 | Use teaching strategies | Include a range of teaching strategies. | Demonstrate knowledge and understanding of how to support teaching strategies through the use of digital resources and tools in ways that facilitate accelerated and deep learning, promote creative and innovative thinking and inventiveness, engage students in exploring real world issues and solving authentic problems, promote student reflection and promote collaborative knowledge construction. |
| 3.4 | Select and use resources | Demonstrate knowledge of a range of resources, including ICT, that engage students in their learning. | Demonstrate knowledge of the use of digital resources and tools to support students in locating, analysing, evaluating and processing information when engaged in learning. |
| 3.5 | Use effective classroom communication | Demonstrate a range of verbal and non-verbal communication strategies to support student engagement. | Use a range of digital resources and tools to support effective communication of relevant information and ideas, taking into account individual students' learning needs and backgrounds, the learning context, and teaching area content. |
| 3.6 | Evaluate and improve teaching programs | Demonstrate broad knowledge of strategies that can be used to evaluate teaching programs to improve student learning. | Demonstrate the capacity to assess the impact of digital resources and tools on students' engagement and learning when adapting and modifying teaching programs. |
| 3.7 | Engage parents/carers in the educative process | Describe a broad range of strategies for involving parents/carers in the educative process. | Describe how digital resources and tools can support innovative ways of communicating and collaborating with parents/carers to engage them in their children's learning. |

The important work of Shulman (1987) in theorising MPRA provides potential for deepening our examination and understandings of these professional standards and ICT elaborations. In encouraging praxis, we suggest that an implication from the TPACK literature is to research whether or not teachers adopt TPR. MPRA involves six processes to develop the knowledge base for teaching: Comprehension; Transformation; Instruction; Evaluation; Reflection; and New Comprehension. This model was further developed and confirmed by Wilson, Shulman and Richert (1987) through studying preservice teachers making the transition into classrooms. More recently, Smart et al. (2013), in an award winning *Society for Information Technology and Teacher Education (SITE) Conference 2013* paper, through examining the use of digital portfolios of four experienced teachers, propose that teachers might develop TPR throughout their career. Smart et al. (2013) suggest that, as ICT did not exist when Shulman developed MRPA, further research involving TPR and TPACK through teacher voice and stories should be undertaken. For example, should MRPA with technology be replaced with a Model of Technological Pedagogical Reasoning and Action (MTPRA), as they develop and demonstrate TPACK rather than PCK?

# 3. RESEARCH DESIGN AND METHODOLOGY: AN EARLY CAREER TEACHER'S STORY

As O'Toole and Beckett (2013) indicate, "Good teachers…are automatically researchers. They are researchers in the sense of being those who examine what they do in order…to improve teaching practice" (p. 34). However, they warn that, while it is a short step to formalise praxis, most practitioners don't think of themselves as researchers. They suggest that graduate and early career teachers do not have time to engage in formal research. They are faced with numerous challenges and demands, and, more broadly, "the false dichotomy between 'practice' and 'research' that still influences our education systems and structures can discourage many of us from attempting to formalise praxis…" (p. 34). At the same time, as outlined in the review of the literature, the expanding TPACK research requires more teacher-focused research which provides insights into what TPACK looks like in practice.

The research design adopted an interpretivist approach which privileged the teacher's stories shared through planning documents, online and digital artefacts, and reflections on the teacher's journey as an early career teacher building TPACK confidence and capabilities. To assist in the interpretation of the professional journey, the expectations provided by the *Australian Professional Standards for Teachers* (AITSL, 2011a) and the *ICT Elaborations* (AITSL, 2011b) were drawn upon while using the TPACK conceptualisation. In addition, implications related to TPR (Smart et al., 2013) are suggested.

The authors acknowledge that, as no research is values-free and neutral, there might be other possible interpretations. By disclosing their disposition being driven by a passion for investigating technologies for enhancing teaching and learning, the authors identify their position in relation to the research and explicitly engage with deep thinking and reflection to examine what Tondeur et al. (2013) describes as the 'black box of technology integration'. For Tondeur et al., this means that we need to "look at what's actually going on in the classroom, to collect more in-depth information on why teachers integrate technology in education and to describe the interrelated aspects contributing to their practices" (p.435).

# 4. AN EARLY CAREER TEACHER'S STORY OF TPACK IN PRACTICE

## 4.1 Portrait of the Teacher

The teacher, for the purposes of this paper, is referred to as Mark (not his real name), is a male teacher, in his 5$^{th}$ year of teaching, and can be considered to be in his earlier years as a teacher. This is his 1$^{st}$ year in the current school, located in Queensland, Australia, and he is teaching Year 4 students.

He graduated from a four year preservice teacher education Bachelor of Education (Primary) program, achieving a very high Grade Point Average and receiving awards for academic excellence based upon that Grade Point Average. His very strong academic achievements at University were consistent with his very high achievements in Secondary School, where he obtained an Overall Performance (OP) Score of 2. When

he completed Year 12 in 2004, there were 27 235 OP-eligible students consisting of 15049 female students and 12186 male students. The cumulative percentage of students achieving an OP 1 (N= 636) and an OP 2 (N=726) represented the top 5% of Year 12 students (Source: Queensland Studies Authority, 2007). He has always had a passion for learning as a student, with a 'love' of Mathematics and was the Dux of Mathematics B, Information Technology Systems, and Home Economics at the Independent Secondary School in which he studied.

Mark sees himself as an aspiring teaching professional who already understands TPACK and expresses a desire to add value to the students he teaches, add value to the school and education system in which he teaches, and to engage in productive, respectful relationships with parents/carers and the community to enact quality teaching. Mark believes that, while he is still an early career teacher, there are aspects of his demonstrated professional knowledge, professional practice and professional engagement which align with the expectations of a *Proficient Teacher* stage of development (see AITSL, 2012a). For example, Mark has identified that descriptors for the *Graduate* expectations (AITSL, 2011a) and the *ICT Elaborations* (AITSL, 2011b) which complement the *Graduate* Professional Standards (AITSL, 2011a), are constructed largely in terms of 'know and understand', and that he 'demonstrates' achievement of the seven Standards which is expected at the *Proficient* level.

He aspires to gain acknowledgement within his new school to develop evidence and contribute to the expectations expected of a *Highly Accomplished Teacher* (AITSL, 2012b), who "are recognised as highly effective, skilled classroom practitioners and routinely work independently and collaboratively to improve their own practice and the practice of colleagues" (AITSL, 2012b). At this stage, he believes that he needs more time to gain acceptance and acknowledgement of his professional knowledge and practice, as well as needing more time to gain credibility with peers and adjust to the new educational context in which he is located.

## 4.2 Portrait of the School and the Classroom

The school in which the teacher is located is a primary P-7 school in Queensland in Australia. It is a relatively new school, in only its third year of operation, having opened in January 2011. Its architecture is attractive and modern, and its website outlines that classrooms are digitally rich learning environments that act as a portal to the world. Furthermore, the school conveys a vision that students will be able to utilise digital devices in all classrooms. Each classroom is equipped with Interactive Whiteboards and data projectors, wireless connectivity, and students will use iPads and laptop computers and have access to digital cameras.

Thus, the classroom is situated within a modern school with a vision for technological innovation. Students can opt to be in a Bring Your Own Device (BYOD) classroom, with students in Years 1to 3 having access to iPads, while students in Years 4-7 have access to MacBooks. Students who opt to be in a more traditional classroom have access to school provided iPads and MacBooks. This addresses equity considerations, while also enabling access to digital devices for learning and teaching. All students in this class need Internet access at home to be able to engage with the online materials at home.

The focus classroom of this paper is a Year 4 BYOD classroom and it is well equipped with those digital technologies evident. Students each have their own laptop – MacBooks - for use at school and at home, have wireless connectivity, and their parents are encouraged to connect online. The school uses the infrastructure platform and learning management system provided by the education system.

## 4.3 TPACK in Practice

### 4.3.1 iLearn@eLearn

The following provides insights into the design, planning, implementation, and ongoing reflection undertaken by Mark resulting in the iLearn@eLearn approach. He is very inclusive in his use of technologies to connect parents/carers and students. In a recent presentation to parents, Mark outlined his iLearn@eLearn information. He discussed with parents/carers responses to the following questions - What is 21st Century Learning? How does this look in this class?

Mark explained to parents/carers that blended learning is adopted as it combines pedagogical best practice, with a focus on the purposeful and deliberate use of digital technologies. His justification for a blended learning approach is that digital technologies enable:

- Learning opportunities that could not exist without the technology;
- 24/7 learning that allows students to access important learning information anywhere, anytime;
- Explicit teaching experiences that use a variety of resources including MacBooks, interactive whiteboard, hands on materials, pencil and paper workbooks and teacher support;
- A Virtual Classroom that students can use to access learning information online; and
- iLearn@eLearn is the centre of what we do in this class.

Subsequently, Mark reflected upon the iLearn@eLearn journey so far in terms of 3 phases; namely,

Phase 1 achievements:

- Establish skills for working on MacBooks
- Digital Citizenship
- Accessing learning materials online (TaskCentre, Homework)

Phase 2 initiatives now underway:

- Online Journals
- myGrades

Phase 3 future directions:

- To be designed through reflection and feedback to inform improvements
- To be designed through exploring new technologies and functionalities

In relation to TPACK, Mark believes that he designs and implements a seamless approach using technology for all curriculum learning areas, and incorporates a range of best practice blended learning pedagogical approaches.

### 4.3.2 Digital Expectations

As shown in Figure 1, clear expectations about the use of digital devices are communicated to and shared with students and their parents/carers. Mark explicitly plans for the digital devices to be pervasively used in all learning areas. Students are expected to care for their MacBooks and to have a sense of personal, self-directed agency in using them for learning through engaging online.

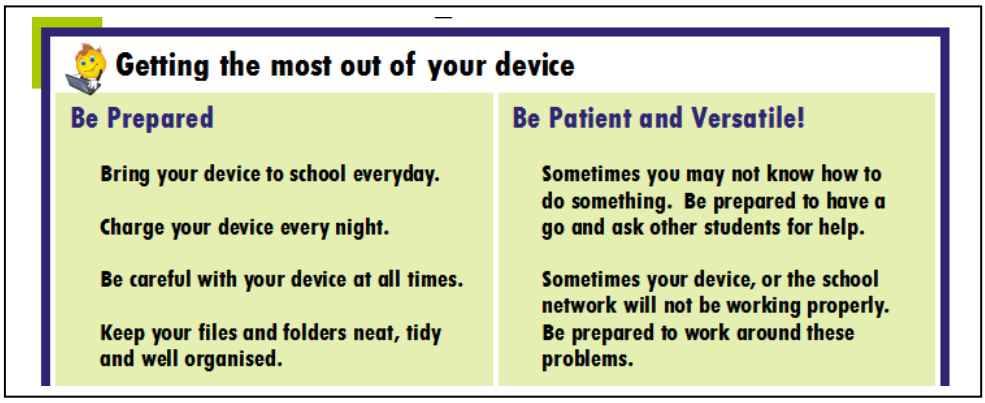


Figure 1. Digital Expectations – Screen shot of information for students and their parents/carers

In this class, homework has become redefined through an approach which uses the digital technologies and the learning management system to enable students and their parents to strengthen the home-school nexus. Mark's approach to this aligns with the concept of a networked school community (Lee & Finger, 2010). The device for achieving this is Marks' well designed 'Virtual Classroom' developed using the BlackBoard Learning Management System. Mark explains that students can access materials online by clicking on the Homework link. Each week, his students complete their homework online, including their writing tasks, spelling activities, Mathematics ongoing practice task, Mathletics, and Literacy Planet activities. Parents/carers have access to this online environment, so that communication and connection is seamlessly connected.

### 4.3.3 iLearn@eLearn Design Feature Examples – TaskCentre, Assessment, myJournals, and myGrades

The design features include a menu which is easily understood and accessed by students and their parents/carers. For example, the TaskCentre houses all of the planned learning experiences for the week. Students use the TaskCentre to work through activities for the day, see the WALT and WILF statements for each lesson, and to access important online learning materials. The TaskCentre screenshot example, shown in Figure 2, includes links to a range of instructional resources, including video clips, activities and supporting resources.

The Assessment section contains all of the assessment tasks students will undertake throughout the semester, and include the Task Description, the Guide to Making Teacher Judgements, and the Due Date. myJournals enables students to access online journals which are the primary method for students to submit work online, as well as edit and complete work either at home or in school. Mark has designed the following key features of the journals:

- Journals are private, which means students only monitor their own work and assessment feedback;
- Journals can be created using features similar to Microsoft Word;
- Students can copy and paste text and tables from Microsoft Word directly in a Journal to submit work;
- Students can review their online journals or make corrections to respond to feedback; and
- Teachers can efficiently mark journal entries and provide feedback to students online.

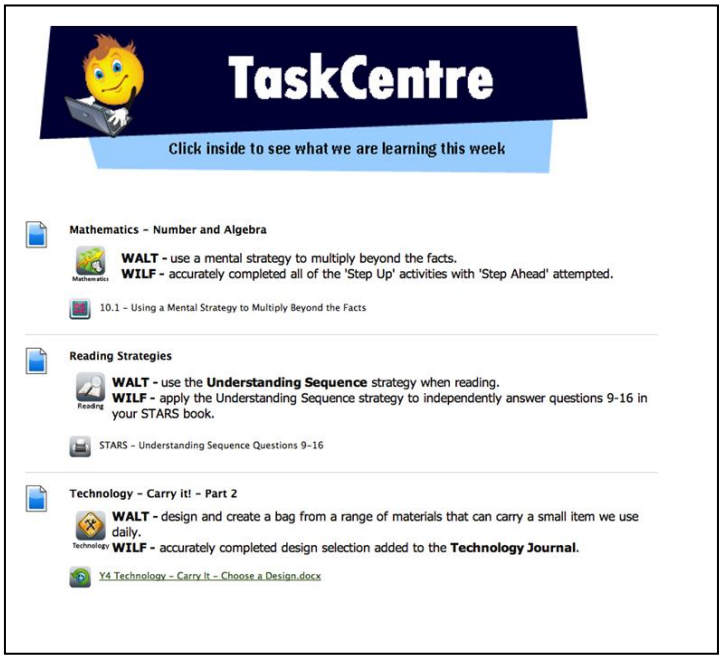


Figure 2. TaskCentre Example Screen Shot

Using myGrades, students can access feedback and ongoing academic results and Mark has designed the following key features and purposes of myGrades, with an example screenshot displayed in Figure 3:

- Student privacy is protected with Grades and comments being accessed only by the student;
- Student privacy also promotes an ipsative assessment model;
- Students can clearly see results for all assessment tasks including comments for both assessment *for* learning (formative) and assessment *of* learning (summative) purposes; and
- The Description button allows students to see what the assessment task involves.

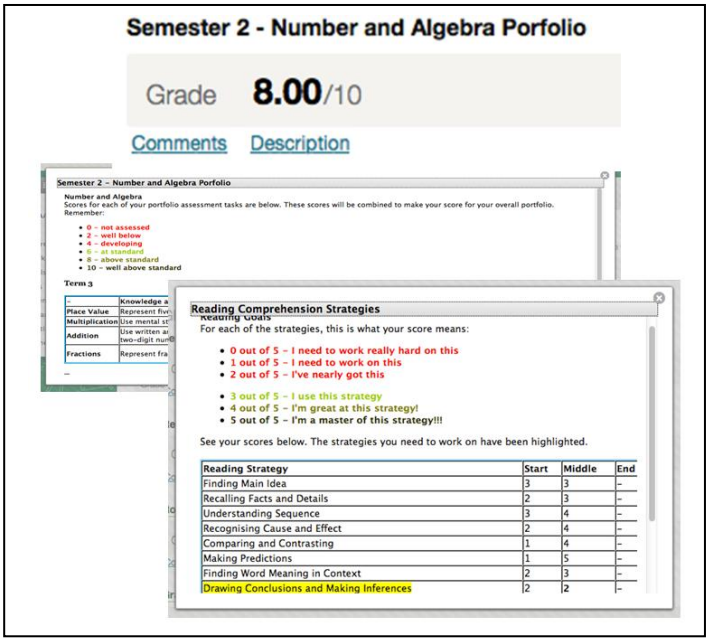


Figure 3. myGrades Example Screen Shot

Mark is excited by his design and use of myGrades, and reports positive parent appreciation of his efforts and effective communication to parents/carers and students using myGrades. Mark relates that positive outcomes have been that students consistently monitor and track their own results through myGrades, and students have a clear, transparent understanding of their level of achievement and have access to learning materials which enable them to move to the next level. This personalises their learning and guides them through their personalised learning journeys. In relation to student outcomes, Mark provided evidence to show that several students who have consistently achieved below standard prior to this year have responded positively to this environment and approach, and they are improving their results over time.

# 5. TPACK REFLECTIONS

## 5.1 TPACK and the Australian Professional Standards

Mark believes that, being a recent graduate, he has a contemporary understanding of the importance and the implications of technological innovation and the implications for teaching and learning. He believes that TPACK is becoming more widely understood throughout the profession, and some professional development about TPACK has taken place with staff at his school. Furthermore, he said that there is also now more widespread discourse in the profession about the *Australian Professional Standards for Teachers* (AITSL, 2011a). At his school, matrices which align with the *Australian Professional Standards for Teachers* are being developed for teachers to use when observing other teachers and as a basis to guide the provision of feedback.

When he undertook his pre-service teacher education, the program was designed to meet the requirements of the Queensland College of Teachers standards published in 2007, and have since been superseded by introduction of the national standards. Mark is developing an increased awareness of the change through identifying the similarities and the differences – for example, there were 10 QCT Standards, while AITSL provides 7 Standards. He was unaware of the *ICT Elaborations* (AITSL, 2011b) and, as he wasn't a student teacher during the TTF Project, he was unaware of this significant initial teacher education project. With his perception that there are generally low levels of awareness of TPACK, and of the *Australian Professional Standards for Teachers* and the *ICT Elaborations*, Mark questions whether or not many teachers, at this

stage, are engaging in praxis which is informed by these. He suspects that in examining the 'black box of technology integration', increasing awareness of TPACK, the *Australian Professional Standards for Teachers* and, in particular, and engaging in rich conversations about the *ICT Elaborations* can provide very useful conceptualisations for teachers to inform their praxis.

As discussed earlier, Mark believes that he has moved beyond the expectations of the Graduate level, as outlined in the *Australian Professional Standards for Teachers* (AITSL, 2011a) and the *ICT Elaborations* (2011b). Mark has deconstructed these and determined that they refer largely to 'demonstrate knowledge' or 'demonstrate understanding'. For example, in the Professional Standard 3 Focus Area – Engage parents/carers in the educative process - the ICT Elaboration states "Describe how digital resources and tools can support innovative ways of communicating and collaborating with parents/carers to engage them in their children's learning". Mark provides compelling evidence that he has moved well beyond 'describing' to designing, implementing, reviewing and improving communication and collaborating with parents/carers.

Similarly, using the ICT Elaboration for Professional Standard 3 Focus Area – select and use resources – the ICT Elaboration states that teachers are expected to "Demonstrate knowledge of the use of digital resources and tools to support students in locating, analysing, evaluating and processing information when engaged in learning". Mark's stories about iLearn@eLearn and the design features outlined in the previous section of this paper, are situated well beyond 'demonstrating knowledge' as he is designing and transacting through praxis and TPR how this is being enacted and can be improved. His students' use of MacBooks and the online Virtual Classroom for their learning in all curriculum learning areas reflects that he has courage to explore and engage with Mishra and Koehler's articulation of teaching with technology as a 'wicked problem' which requires "expert knowledge to design solutions that honor the complexities of the situations and the contexts presented by learners and classrooms" (p. 2).

## 5.2 Praxis and Mtpra

Shulman's Model of Pedagogical Reasoning and Action (MPRA) involves six processes to develop the knowledge base for teaching: Comprehension; Transformation; Instruction; Evaluation; Reflection; and New Comprehension. More recently, Smart et al. (2013) explored four teachers' digital portfolios to investigate if teachers now undertake TPR. Smart et al. (2013) found that there was evidence of Shulman's MPRA as the teachers' digital portfolio could be mapped to MPRA, and they provide a comprehensive mapping of teacher reasoning against the elements of MPRA. As the focus of the digital portfolios was on the teachers use of ICT for the requirements of achieving a *Smart Classrooms Professional Development Framework Digital Pedagogical Licence - Advanced*, Smart et al. pose the question - could this be termed TPR?

Consequently, from the early career teacher's story presented in this paper, the authors of this paper ask – should MPRA with technology be redefined as a Model of Technological Pedagogical Reasoning and Action (MTPRA)? Given the expanding TPACK literature base and its influence in informing teacher education and professional learning, it is worthwhile considering whether or not TPACK and MTPRA complement each other and add to the shift from PCK to TPACK, by suggesting a shift from MPRA to MTPRA.

The praxis emerging from the teacher's story presented in this paper can be considered in terms of MRPA through identification of the teacher's comprehension, transformation, instruction, evaluation, reflection and new comprehension. However, when discussing MPRA, Mark indicated that technology was now integral to his planning and implementation, and that TPACK was the conceptualisation which most appropriately reflected his use of technological knowledge, content knowledge, and pedagogical knowledge.

He illustrated with an interesting example of praxis and TPR in relation to the use of digital technologies and the virtual classroom in the pedagogy, assessment and feedback process with students and parents/carers. Both Mark and Julie (not her real name), the teacher in the next classroom, used a very similar assessment and feedback model. This process involved a process of assessing for diagnostic purposes, teaching and instruction, using ongoing assessment, providing feedback, and allowing students to target areas of concern and enacting learning improvements. Students then submit their summative assessment item, and feedback is again provided, giving students an opportunity to improve on areas of concern, and/or aim for a higher result based on the explicit feedback provided.

While Mark used technological affordances, Julie is in a traditional classroom. They compared their reflections after their classes had both completed a recent assessment item. Mark's students used the online journals, while Julie's students used a print resource to write their responses and findings. When comparing

the final submissions of students from both classes through moderation processes, it was evident that both sets of students demonstrated similar levels of knowledge and understanding. However, it was also evident through discussions, evaluation and reflection, that the use of the virtual classroom streamlined the feedback process and students found it considerably easier to go back and make adjustments to their responses. Students also found it considerably easier to access the feedback online. As this process was simplified for students through the virtual classroom, they were more likely to make these adjustments and make more effective adjustments, in comparison to students working from the traditional, print resource classroom. These findings are now being used to inform future actions. Julie is examining introducing the use of MacBooks and iPads, which she has access to, with the intent of developing a similar online model. This assists with constructive and effective alignment of curriculum intention, pedagogy, assessment and the use of technology, reflecting TPR.

Mark estimates that he engages as a professional well beyond the hours which would be reasonably expected of a teacher. Mark believes that this is due to his commitment as a professional, and is largely due to implementing an online approach which requires substantial work intensification beyond face-to-face teaching, through, for example, communications with parents/carers which, in a paper-based, more traditional form of schooling was not possible or expected. Mark has also found throughout his almost 5 years of teaching that he personally selects, develops, creates, and acquires resources, often at his own personal expense. He views his investment in both time and money as necessary ingredients in providing a best practice blended learning approach. He understands that teaching, prior to using the technologies we have today, it might have been sufficient to develop PCK and employ MPRA. However, he is excited by the environment and possibilities now available for teaching and learning, not possible in earlier times. Through the transaction which occurred in the conversations undertaken to gain his story, Mark believes that TPACK and MTPR makes sense to him through adding new dimensions of technological knowledge (TK) and TPR, as these help to frame his story.

## 6. CONCLUSION

This paper established that there is a significantly expanding TPACK literature base, and argued for research which acknowledges the importance of teacher stories to assist in our understanding of what TPACK looks like in practice. The Australian early career teacher's story presented in this paper provided interesting insights in the ways in which the teacher drew upon technological knowledge as being integral to his pedagogical approach to teaching and learning in all of the learning areas which his students undertake.

Relationships between TPACK, the *Australian Professional Standards for Teachers*, and the *ICT Elaborations* developed through the TTF Project were examined and discussed. By drawing upon the recent work by Smart et al. (2013), and reflecting upon the teacher stories presented, it was suggested that TPACK which builds upon Shulman's PCK, might be assisted by the conceptualisation of a Model of Technological Pedagogical Reasoning and Action (MPRA) to accommodate the importance and influence of the technological changes since Shulman theorised a Model of Pedagogical Reasoning and Action (MPRA).

To conclude, the authors encourage the reader to engage in praxis, to draw upon the TPACK conceptualisation and convey their stories of praxis, and their stories of challenges, solutions and initiatives to improve learning and teaching in the complex educational contexts in which they teach.

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