

# **An Early Career Teacher's Approach to Designing Learning with Technology**

**Lauren Knussen**

Master of Research

School of Education  
Faculty of Human Sciences  
Macquarie University

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Supervisor: Professor Lori Lockyer

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## **Abstract**

The push for technology integration into primary schools has been shown to place increased pressure on early career teachers. A proposed solution to the increasing complexity of teachers' planning processes lies in the field of learning design. For early career teachers, approaching the planning of learning from a design perspective involves sharing and adapting designs created by more experienced teachers. This may support the development of early career teachers' thinking and decision making during planning. In order to develop learning design strategies or systems for early career teachers, more needs to be understood about the design processes they currently follow.

This thesis presents a case study of an early career teacher's process of designing learning with technology. The analysis of multiple data sources, including interviews and observations of practice, was carried out through the theoretical framework of activity theory. Activity theory facilitates the investigation of the context of an activity. The study found that the teacher approached designing technology-enhanced learning in both systematic and non-systematic ways. The approach was found to differ according to the focus of the lesson, whether delivering content (non-systematic) or addressing the requirements of an assessment (systematic). The teacher's design process with technology was strongly influenced by her students' English language and technology literacy needs. This attention to student needs showed a level of sophisticated thinking influenced by the teacher's context, which reflects recent research in teacher expertise development. Implications for learning design research are that design processes need to be flexible enough to account for contextual variables in order to create effective supports for early career teachers.

## **Author's Declaration**

This declaration is to certify that this thesis comprises only my original work and that I have made acknowledgements in the text to all other material used. No part of this work has been used for the award of another degree at any institution. This thesis meets the Macquarie University Human Ethics Research Committee's requirements for the conduct of research.

Signature:

A handwritten signature in black ink, appearing to read 'Lauren Knussen', written in a cursive style.

Lauren Knussen

Date: 09 October 2015

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## 1. Introduction

As for all education sectors, primary education has been undergoing a rapid period of change and development over the past 10-15 years with the introduction of computer technologies across all areas of the curriculum. While this additional layer of complexity has created difficulties for experienced teachers in their planning processes, the load for early career teachers is arguably greater, as they deal with the steep learning curve presented by their first few years in the classroom (Morehead & Lebeau, 2005).

In Australia, there is concern about the pressure on early career teachers and the proportion of teachers who leave the profession within the first five years (AEU, 2006, APPA, 2007). The Australian Primary Principal Association's extensive study on the state of the primary education sector, *In the Balance* (2007), highlights the pressures placed on the primary curriculum by the introduction of new subject areas such as Languages Other Than English (LOTE) and technology. The report identifies this curriculum pressure as contributing particularly to the stress that early career teachers feel. The strong emphasis on integrating technology across all education sectors has proven to be particularly demanding for teachers.

At international and national levels, government bodies have recognised the need for technology to be integrated into school curricula in order to create more authentic and personalised learning experiences for students (ISTE, 2008, DET, 2010). These steps are acknowledged as essential to ensure that students graduate from school with the technological skills that employers will need in the future. However, there are concerns about the implications of integrating technology into school education, in particular relating to teachers' technology skills and knowledge.

Researchers in the field of education technology note that technology integration into primary teaching is not progressing as anticipated (Jordan & Dinh, 2012). Some suggest this limited technology integration may be a result of initial teacher education and professional learning programs focusing heavily on the technologies and hardware, rather than on supporting teachers to develop

their technological pedagogical knowledge (Jordan, 2011, Mishra & Koehler, 2006, Orlando, 2014). While the development of technology skills for teachers is important, there is also increasing recognition that the teaching context can greatly influence teachers' practices with technology. This concept adds to the complexity of technology integration and has implications for the professional development of teachers in education technology.

For early career teachers, integrating technology into their teaching is identified as an added burden (Bate, 2010) and an area where they are especially lacking in knowledge and expertise (Bate, 2010, Mishra & Kohler, 2006). Teachers in the early years of their teaching careers were found in Bate's (2010) study to have reasonably strong knowledge of learning content, but their knowledge of using technology to deliver content in a pedagogically sound way was minimal. Even when these teachers were personally confident in using technology themselves, their practice with technology in their teaching was found to mirror traditional teaching practices.

### **1.1 Background to the study**

Studies in the field of learning design have drawn comparisons between the way design professionals such as architects approach a design problem and the way teachers design learning environments for their students (Laurillard, 2012). Common factors in both professions are the iterative and chaotic nature of continuously refining a design until it effectively addresses the initial brief or set of desired outcomes. Researchers in learning design seek to identify the key characteristics of teachers' design processes which can then inform the development of strategies and systems to support learning design. The creation and sharing of learning designs can support teacher development by providing access to the ideas and practice of other more experienced teachers. It is anticipated that the development of such systems will help to resolve some of the difficulties around the integration of technology into teaching and learning.

In order for learning design systems and representations to be developed for primary teachers, in-depth studies are needed which can provide rich detail on the design processes of teachers at different stages of their careers. Some studies of this type have been undertaken in the higher education sector,



however little investigation has been completed into the learning design processes of primary school teachers.

This study has been conducted as part of a larger Australian Research Council funded project (DP140100970 - Designing effective learning experiences: Investigating novice and expert teachers' design processes, known as Teacher Design Thinking (TDT) Project). The project seeks to understand how early career (i.e., novice) and experienced teachers engage in the design of learning experiences. The first two phases of the project investigate teachers' design practice. The later phases of the project involve the development of high quality practice examples informed by the units of work designed in the first phases of the project. These will then be used to investigate how novice teachers interact with practice examples and how this influences their design practice and thinking. My study takes a particular focus on how early career teachers consider and design for technology integration and fits within phase two of the TDT project. Within the TDT project, the findings of my study will contribute to the understanding of novice teachers' design practices in the early stages of the project, which will subsequently inform the development of the framework for the practice examples. Beyond the TDT project, my study sheds important light on the design practices and thinking of novice teachers in relation to technology integration in learning.

## **1.2 Research Statement**

This Master of Research study aims to investigate the design processes an early career primary teacher goes through when incorporating technology into a unit of work, prior to, while and after teaching the unit. By focusing on the design process together with the teaching and post-teaching evaluation process, the MRes study aims to uncover key influences and decision-making strategies underpinning the design. It is envisaged that this will lead to a deeper understanding of an early career teacher's thinking about technology in teaching and learning, which may form the basis of further research with a larger group of participants. It is also anticipated that this depth of understanding will contribute to the TDT project by informing the design of learning design strategies and systems for early career teachers, which will in turn help to guide

and support them through the complex process of designing effective learning for their students.

Current research shows that there are significant contextual influences on teachers' learning design processes (Kali et al., 2011). This study uses Engeström's (2001) second generation model of activity theory to investigate the individual components of the context within which the study participant is working. An in-depth explanation of this version of the activity theory model is presented in chapter two. The model facilitates analysis of how the components inter-relate with each other to influence the activity of designing a unit of work for a key learning area (KLA). Within this model, the activity of designing learning is the unit of analysis (Engeström, 2001). This model also allows for the study of internal resources a teacher possesses, such as technological pedagogical content knowledge (Mishra & Koehler, 2006) and schemata acquired through case-base reasoning (Kolodner, Owensby & Guzdial, 2004). The analysis of data on these contextual components and cognitive processes constitute the main focus of this study. The research is guided by the following research questions:

1. How do early career teachers approach the integration of technology into their learning designs?
2. How do the teacher's technology choices affect the overall design?
3. How do contextual factors influence the way in which the early career teacher incorporates technology into a learning design?

### **1.3 Structure of the thesis**

This thesis is structured in the following way. Chapter two presents a review of the literature, which discusses key themes which form the background to the study and demonstrates the rationale for undertaking research in this context. Chapter three presents the methodology undertaken throughout the study, includes a discussion of theory underpinning the research design and explains decisions made through the research process in detail. Chapter four presents the findings of the study. These findings are discussed in detail in the context of the research questions in chapter five, which also presents concluding

ideas from the study. Significantly, it highlights the implications of the findings and proposes directions for further research in the field.

#### 1.4 Definition of terms

The following definitions are important to clarify for the purposes of this literature review:

***Early career teacher:*** This term is used to specify the participant within the study. In the literature, however, the term *novice teacher* is also used. My definition of an early career, or novice teacher is one with up to five years' experience in the profession.

***Technology:*** This chapter refers to the issue of a lack of clear definition of *technology*. For the purposes of this study, my definition is broad and covers devices, applications, communications technology and processes embedded within these. In the literature review, some studies refer to type of technology (e.g. interactive whiteboards) and some leave it to study participants to define. Information communication technology (ICT) is often used interchangeably with technology, however this term might be conceived as being narrower and having a bias towards communication applications.

***Technology literacy:*** This term is used to identify the participant's focus on developing her students' general technology skills in order for them to research and present their work in a range of modes, as specified in the NSW syllabus. It does not specifically refer to the development of digital literacy skills, however there may be some overlap from the perspective of the participant.

## 2. Literature Review

### 2.1 Introduction

This chapter begins by setting out the conceptual framework of the study before presenting the related empirical work. The chapter concludes by situating the study in the field of learning design, with the rationale for how the study addresses current gaps in knowledge being addressed at the end of the chapter.

### 2.2 Conceptual framework

The conceptual framework of activity theory was selected for this study because it allows for the consideration of a wide range of factors influencing an early career teacher's planning of technology-enhanced learning. The framework supports the investigation of the teacher's cognitive resources and processes, as well as the components of context which influence the process. In the next section, the framework is presented and discussed. Within this study, the theories of technological pedagogical content knowledge (TPACK) and case-based reasoning (CBR) are used to investigate the teacher's internal resources, which are considered as *tools* within the AT framework. This introduction to the conceptual framework guides the subsequent examination of empirical literature relating to its contextual components.

#### 2.2.1 Activity Theory

Activity theory (AT) is a framework devised for the study of patterns in human behaviour and how they are influenced by, and in turn influence, a range of constituent components within an activity process. The original model of activity theory included the components of *subject* (the person doing the activity), the *tools* used (both internal and external) and the *object* of the activity (Vygotsky, 1978). During the early 1980s, Yrjö Engeström revisited Vygotsky's model and added the components of *rules*, *division of labour* and *community* to the model in order to facilitate his work on the collaboration of people in teams. This iteration of the activity theory model is known as Engeström's second generation. The *rules* component refers to any procedural or compliance-based processes within which the activity is bound to operate. *Division of labour* allows for the analysis of the team activity in terms of how the individual tasks are divided up between

team members. Finally, the *community* component accounts for the influence of different groups on the activity at the centre of the study (Figure 1).

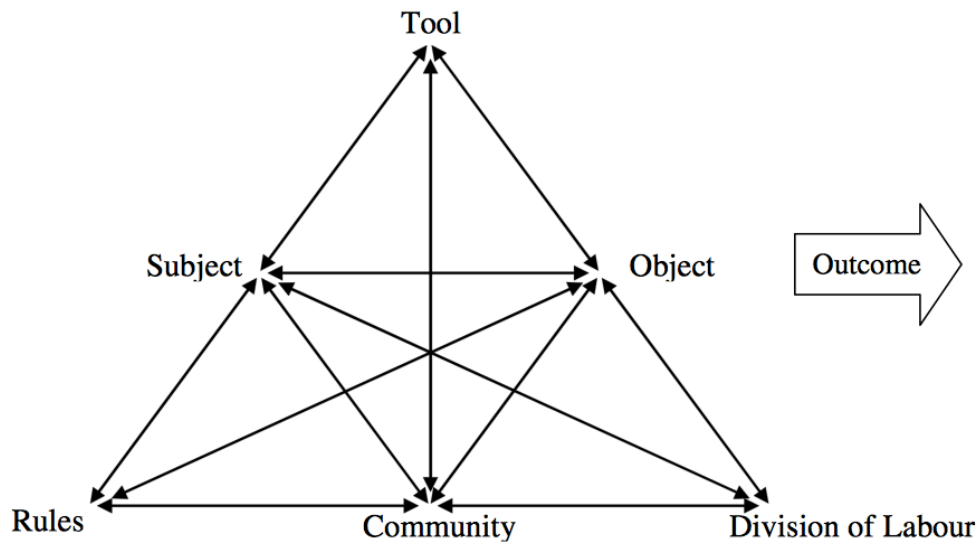


Figure 1: Engeström's Activity Theory Model (Engeström, 2001)

Viewing an activity through the activity theory lens, enables researchers to analyse each component to identify what constitutes the context of the activity and how the components influence each other.

Engeström's research has focused on a broad range of work activities, including within educational sectors. Activity theory has been found to be appropriate for research studies in education, particularly in contexts where technology plays a role (Bellamy, 1996, Scanlon & Issroff, 2005, Murphy & Rodriguez-Manzanares, 2008). The structure of the activity theory model allow for technology to be analysed as one of many contextual components of an activity, thereby ensuring that the activity is not viewed simply from a technocentric perspective. Instead, technology interacts with other contextual components, all of which influence the process of the activity to some extent. Within the activity theory model, there are a set of principles which facilitate the in-depth analysis of the activity system.

A primary concept within activity theory models which adds to the quality of the analysis in this study is that of *disruptions* which are sometimes referred to in literature as *contradictions*. Engeström (2001) identified disruptions or contradictions as

“structural tensions within or between activity systems” (p. 137). This means that there are times within an activity that different elements might clash and give rise to changes in the activity in order to overcome these disruptions. Engeström noted that activity systems are constantly working through contradictions. Much information can be gleaned from the study of disruptions in an activity system in the form of where problems lie for an individual teacher within the activity and how these problems are/are not resolved.

The concept of a hierarchy of activity within the activity theory model allows for further analysis in terms of actions and operations (Figure 2):

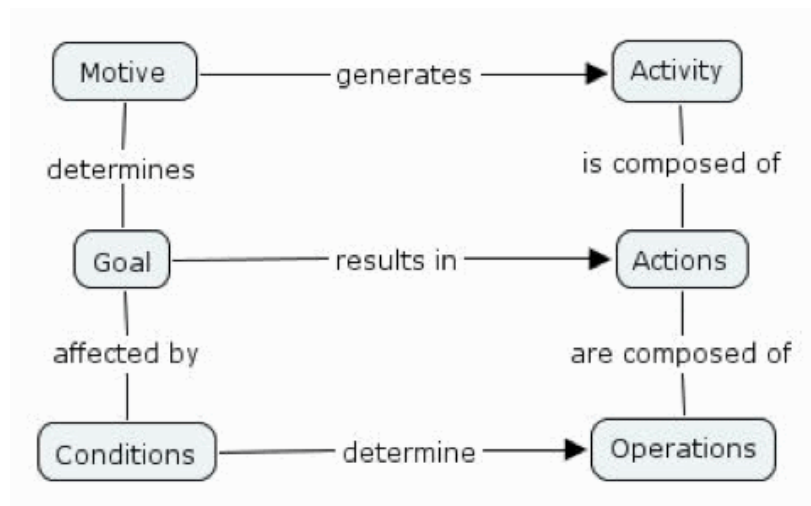


Figure 2: Activity, actions and operations (Wilson, 2006)

The activity is the top of the hierarchy, and comprises a set of actions which lead to the object of the activity being achieved. These actions often comprise operations, which when carried out repeatedly under the same conditions, are automated. The use of this hierarchy in analysis allows for the study of both explicit and implicit elements of the activity.

The concept of mediation by tool or artefact is central to activity theory analysis. Artefacts, or tools, are acknowledged to mediate a person’s behaviour and actions within the activity (Hashim & Jones, 2007). Tools can be physical artefacts, such as a planning proforma document used for planning by a teacher which is supplied by the school. However, tools can also be internal to the subject, in the form of analysis methods,

knowledge sets and 'rules of thumb' (Kuutti, 1996). Kuutti (1996) notes that artefacts carry with them a culture and history, which comes from their having been developed by humans carrying out the activity previously. Mediation in an activity system is viewed as a circle of influence, which Leont'ev referred to as 'Ringstruktur' (Hashim & Jones, 2007). The study of mediation in the activity theory model allows us to identify the influence of the tools or artefacts on the activity system and any changes which occur as a result. For the purposes of this study, I have focused on teacher technological pedagogical content knowledge an internal tool which mediates the activity of learning design.

Research in the field of human-computer interaction has been conducted in studies using the activity theory framework (Nardi, 1996). In her comparative analysis of methods for studying technology in context, Nardi (1996) identified the value of activity theory over others to be the "commitment to understanding things from the user's point of view" and the "attention to broad patterns of activity", rather than focusing on narrow fragments of actions (Nardi, 1996, p. 47). The aim of this study is to investigate the planning process from the teacher's perspective and take a broad analysis of contextual elements which influence that process, which is why activity theory is prominent in my methodology.

### **2.2.2 Teacher technological pedagogical content knowledge (TPACK)**

Teacher knowledge in the area of technology integration into teaching and learning has been widely addressed and the work of Mishra and Koehler (2006) has been significant in the formulation of TPACK. They articulate the belief that technology integration efforts should be structured for particular content ideas in specific classroom contexts (Mishra & Koehler, 2006). The TPACK model integrates the layer of technology into Shulman's existing framework of PCK (Shulman, 1986), in order to identify the types of constituent knowledge which influences the integration of technology into classroom teaching and learning. (see Figure 3):

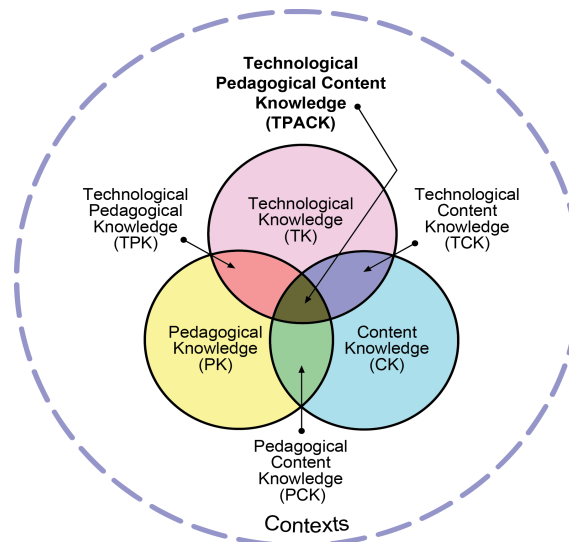


Figure 3: Technological Pedagogical Content Knowledge model (Mishra & Koehler, 2006)

Types of teacher technological knowledge identified within the TPACK model are:

- TK: Knowledge about how to use technology hardware and software for educational purposes.
- TPK: Knowledge of the affordances of various technologies to enable specific pedagogical approaches.
- TCK: Knowledge of the affordances of technology to represent/research and create the content in different ways
- TPACK: Knowledge of using various technologies to teach and represent and facilitate knowledge creation of specific subject content (Mishra & Koehler, 2006, Chai, Koh & Tsai, 2013).

While TPACK has been used to frame studies on teachers integrating technology, some researchers have articulated problems with its use. An over-arching criticism lies with the lack of clearly developed definitions of the components of the model and of the conceptualisation of technology itself. In some cases, this has led to researchers creating their own definitions for the purposes of their studies (Graham, 2011, Chai et al., 2013). A further criticism levelled at the TPACK model is the lack of focus on teachers' consideration of contextual factors. Loveless (2011) highlights this issue in her study which found that teachers are influenced strongly by the community of the school and



the individual needs of the students in their class. Teachers operate in a range of socio-cultural settings, which are dynamic and experience constant rapid change (Bate, 2010, Hashim & Jones, 2007) and this means that we can expect to see contextual factors analysed in studies on teachers' integration of technology.

These issues with the TPACK model highlight that although it is useful as a concept, it can be argued that it is not clear and representative enough of the context in order to stand alone as a conceptual framework for this study.

### **2.2.3 Case-based knowledge**

The concepts of case knowledge and case-based reasoning (CBR) are formed on the idea that we naturally engage our previous experience when we interpret new situations which occur. They also assume we draw conclusions based on contextual similarities with previous situations we have experienced (Kolodner et al., 2004). These ideas reflect the premise that knowledge is constructed and shaped by experience. CBR was originally developed as a model for creating intelligent computer systems, but its value in bringing the perspectives of subject experts to subject novices in professional education settings is extensively recognised (Harrington, 1995).

Teacher knowledge gained through experience, known as *cases*, has been studied extensively through case-based reasoning. Case-based reasoning (CBR) is used as a teaching approach in many fields, including in teacher education. (Shulman, 2004). Case methods have been widely used in educating new teachers (Shulman, 2004, Harrington, 1995). Cases used in such methods can present the experience of others or can stimulate the recall of teachers' own experiences in order to frame, evaluate or suggest responses to new problems (Kolodner et al., 2004). Cases of expert teacher practice are often used to stimulate discussion on specific issues by pre-service or novice teachers in order to deepen their own case-based experience (Levin, 1995). In-depth qualitative studies into the case method of developing teachers' expertise have yielded good insights: The way in which teacher learning tasks using cases are designed is significant, with discussion-based activities resulting in deeper understanding than reading and writing about cases (Levin, 1995). Harrington's (1995) study conducted over a semester using four cases showed that exposure to cases over a longer timeframe can greatly support pre-service teachers in framing a complex problem or case, which leads to more sophisticated

reasoning and reflective decision making. The development and use of CBR was also shown to be significant for teachers following their pre-service training in Levin's (1995) study on pre-service, beginning and experienced teachers.

A deeper understanding of what the case knowledge of experienced teachers equips them to do and precisely how they employ this knowledge in the planning process is extremely important to researchers seeking to develop support tools for early career teachers. Studies have shown that expert teachers are not necessarily able to explain their application of knowledge informally (Berliner, 2004). Yet accessing this tacit knowledge is seen as crucial for the development of support systems for novice teachers (Kolodner et al., 2004). The question then remains that if expert teachers do have difficulty in explaining their practice and actually retain large amounts of tacit knowledge related to teaching and planning, how can this knowledge be fully uncovered and passed on to early career teachers?

### **2.3 Teachers' planning and teaching cognition and practices**

Teachers' work consists of an interconnected set of considerations, decisions and actions taken which influence and are influenced by the planning and implementation of learning. The nature of what constitutes the work of teachers has been rigorously investigated over the last forty years (Carter, Cushing, Sabers, Stein & Berliner, 1988, Clark and Yinger, 1977). The work of creating quality learning activities for students which result in good student learning outcomes is a complex process focused on in detail during teachers' pre-service training. However, what teachers actually do after initial teacher education program can differ from what they are taught (Shavelson & Stern, 1981). This is attributed to how teachers interpret the contextual influences of the school and classroom (Yinger, 1979). In order to fully understand the work of teachers, we also need an in-depth understanding of all factors which influence teacher practice (Shavelson & Stern, 1981).

Much of teachers' work consists of planning and implementing learning for their students. Research on teacher planning and thinking in the 1970s and 1980s showed that teachers do not follow the traditional model of instructional design (objective-procedures-outcome-evaluation), but instead focus on activities, content and materials (Clark & Yinger, 1977) which makes the planning process appear unsystematic and

general in nature (Shavelson & Stern, 1981). The literature of this time notes that this can be a consequence of the need to make the implementation as predictable as possible, which demands tailoring activities to ensure that they will go smoothly. This characterisation of teachers' planning processes appears to imply that they are necessarily unsystematic because of the unpredictability of the classroom context. However, later research in this field shows teacher work to be more complex and influenced by the teachers' beliefs, knowledge and context (Mutton, Hagger & Burn, 2011).

## **2.4 Teacher knowledge**

Research on teacher planning has shown how teachers use their knowledge to plan lessons and programs for their students and how these processes differ between various levels of expertise. Shulman's (1986) pedagogical content knowledge (PCK) framework presented individual knowledge components of pedagogical knowledge (PK) and content knowledge (CK) and how they interrelate to create PCK. Shulman (1986) stated that PCK goes beyond these individual areas and identified knowledge of how to represent the ideas and concepts of the content in a format which is most effectively acquired by learners. This includes knowledge of content-specific teaching strategies and "lateral curriculum knowledge" (Shulman, 1986, p.10). The way a teacher conceives of a subject's content can then influence decisions and behaviour (Shavelson & Stern, 1981).

## **2.5 Consideration of student needs**

Teachers pay attention to the students, how they think and behave, and how a learning activity might impact on them (Westerman, 1991, Berliner, 2004). This level of understanding and knowledge of the students in the class on both a cognitive and a social level is an area which was found by Westerman (1991) to differ greatly between experienced and early career teachers. For experienced teachers, a high level of knowledge about the students in the class, coupled with in-depth knowledge of the demands of a specific learning activity, mean that they are able to easily respond to pedagogical problems in the classroom flexibly and efficiently as they arise (Westerman, 1991, Berliner, 2004). However, Berliner (2004) noted that taken out of their own class context, expert teachers felt much less confident and equipped to teach the class. The picture of the importance of contextual familiarity becomes clear through his work.

While context is identified through these studies as an influence on expert teacher practice, little is known about the micro-level consideration of contextual factors in teachers' planning processes. For those aiming to design supports for early career teachers, this is an area which requires deeper investigation. We need to understand how contextual factors affect both experienced and early career teachers so that we can identify where they differ and consequently at which stages of planning support is required and what form this support might take.

## **2.6 Teacher expertise development & early career teachers**

In order to investigate the work of early career teachers, it is important to understand how teacher expertise is thought to develop. Studies in this field have been carried out over some decades now. Prominent studies have described the development of teacher expertise as staged and occurring in identifiable increments (Berliner, 2004, Dreyfus & Dreyfus, 1986). In Australia, the Australian Professional Teaching Standards<sup>1</sup> interpret research on expertise in their descriptors of teacher performance over four key stages: *Graduate*, *Proficient*, *Highly Accomplished* and *Lead*. For the purposes of efficiently evaluating teacher performance and identifying levels of development, such a scale has its place; the information needs to be easily understood and interpreted in order to set professional goals and discuss achievement in performance appraisals.

The theory of staged development is now being challenged, however. Stage-based views of development assert that teachers begin at a micro-level of development, focusing on classroom routines and the design and implementation of a lesson plan in its simplest form, without accounting for more abstract concepts of students' responses and thinking. Recent studies have contradicted that view and have demonstrated that teachers are capable of such abstract thinking and understanding of contextual sensitivities early in their development stages (Levin, 1995). These findings have led to the consideration of teacher learning as a more complex and flexible process than was previously thought (Levin, 1995). For the purposes of supporting teachers in their day-to-day practice, there is a need for a deeper understanding of expertise development and whether indeed the process is a deeply individual one, which varies greatly

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<sup>1</sup> <http://www.aitsl.edu.au/australian-professional-standards-for-teachers>

depending on the teaching context and experience gained. More in-depth knowledge in this area would influence the design of planning support tools and the level of flexibility which would need to be in-built. While it is not within the scope of this study, it is significant to note the importance of further study of the influence of context on teacher expertise development.

The relationship between the number of years of teaching experience and the development of expertise in technology-enhanced teaching has been shown to develop differently to the development of general teaching expertise. Orlando's (2014) longitudinal study of experienced teachers using technology showed that a lack of confidence in using technology in general impacted on their development, as did a reluctance to change from formal models of professional development to more informal independent peer-to-peer models. The fact that experienced teachers' practices with technology is often not as sophisticated as other aspects of their teaching has implications for the development of early career teachers. We can hypothesise that early career teachers may not have the same opportunities to learn principled technology integration practice from them in the way that they might be able to for other teaching skills. This in turn raises questions about the level and form of support that early career teachers receive in the field of technology.

## **2.7 Teacher work with technology integration**

The benefits of a technology-enhanced learning environment for students are acknowledged by governments, intergovernmental bodies and local education departments (ISTE, 2015). In the literature, these benefits are described in many ways, but most refer to the ways in which technology can promote and facilitate authentic, learner-centred learning environments, which support open-ended learning (Hayes, 2005, Smeets, 2005). Such environments allow students to benefit from both formal and informal learning experiences (Bennett et al., 2014, Laurillard, 2012). While the benefits of well-designed technology-enhanced learning environments for students have been well documented, in order for these experiences to be created for students, the teacher design process needs to be well-supported.

The focus of early attempts to integrate different technologies into education was on the creation of tools and resources, rather than addressing what teachers would need

in their environment in order to begin using technologies in their classrooms. Earlier studies looked at why teachers were resistant to using technology in their teaching. However, while the affect of teachers' attitudes towards technology is acknowledged in studies to play an influential role in how they use technology (Kali et al, 2011, Loveless, 2011), there is an emerging sense that depicting teachers as resistant to change is too simplistic a view of the true situation.

Recent studies have highlighted the impact of teachers' internal resources, such as beliefs, knowledge and experience, as well as acknowledging the influence of contextual factors on the level of successful integration of technology into teaching. In her longitudinal study on teachers' changes in practice with technology, Orlando (2014) found that key dimensions of change for teachers are knowledge, pedagogy and their organisation of learning. Her most telling finding was that it took up to five years for changes in practice to eventuate for most teachers in the study. This finding does suggest that expectations of changes in practice have been unrealistic.

The changes involved in technology integration into education are not insignificant for teachers. Studies conducted on teachers' approaches, beliefs and practices with technology have highlighted that many teachers continue to use teacher-centric approaches with technology in the classroom, despite articulating beliefs in more learner-centred approaches (Bate, 2011, Ertmer, 2005, Kali, Goodyear & Markauskaite, 2011). This indicates that the issue is more complex for teachers than was originally thought. The reconceptualization of technology-enhanced learning activities as open-ended and learner-centred does not simply involve a change of procedure, but puts demands on teachers in terms of their knowledge, technology skills and presents challenges to their pedagogical beliefs (Wang, Ertmer & Newby, 2004, Smeets, 2005). Smeets (2005) showed that teachers' views on technology in education, along with their technology skills, were important variables determining whether meaningful learning experiences with technology are created for students. These studies clearly identify that there are teacher beliefs, skills and knowledge which influence their design of such learning environments. This in turn implies that if this type of learning is to be successfully implemented, then the development of supports which take into account these influences are crucial.

In order to fully understand the challenges technology presents for teachers, it is important to gain a broad picture of which contextual factors influence their decisions and planning. Lim & Chai's (2008) most significant finding related to systemic issues in the education field. They found that systemic aspects such as assessments were a major influence on teachers' teaching approach, and while assessments continued to engender a more traditional style of education, teaching was unlikely to change, regardless of the promotion of technology-enhanced learning in the school. The findings of Bate's (2010) longitudinal study on Australian primary teachers concurred with this, but went further to identify other areas which impact on technology integration in school learning, such as the traditional approach to delivering content as isolated 'subjects' and more broadly, the culture of the school and the school's leadership in technology integration. Other significant studies have also highlighted the role of school leadership and culture as critical support structures or barriers to technology integration in learning (Divaharan & Ping, 2010, Tondeur, Kershaw, Vanderlinde and van Braak, 2012, Laferriere, Hamel and Searson, 2013). Such studies expose the broader range of contextual influences on successful technology integration by teachers. A further implication of these findings is the unique characteristics of the context that each individual teacher is operating within. Contextual variation shows that it would not be possible to prescribe blanket processes to lead teachers through a technology-integration process. Rather it lends support to the concept of planning tools which allow for teachers to make decisions at stages in the process which reflect their individual context.

There are not extensive empirical studies into early career teacher practice with technology. However, some studies have provided insights in terms of their knowledge of technology in education. For early career teachers, there is commonly an imbalance in technological pedagogical and content knowledge (TPACK). Jordan (2011) found that early career teachers tend to rate significantly higher in the area of content knowledge than in others, with technological knowledge, especially technological pedagogical knowledge, rating far lower. This is based on a study of beginning teachers' self-assessment of their TPACK (Jordan, 2011). This finding is supported by Morehead and LaBeau (2005), who concluded that new (i.e. early career) teachers lack the understanding to create model technology-integrated classrooms. While these studies offer some insights, more empirical evidence is needed in order to understand where knowledge gaps lie if we are to design effective tools to support early career teacher

practice. The holistic approach of this study will allow for the simultaneous analysis of both the internal resource of TPACK, as well as the influence of context on the early career teacher's design process.

## **2.8 Teacher beliefs and technology integration in teaching and learning**

Teachers' own beliefs and perceptions of learning are known to affect all aspects of their work. Importantly, this includes influencing teachers' decision-making when planning learning (Clark & Yinger, 1977). For technology-integration in teaching and learning, teachers' beliefs have been shown to be significant (Ertmer, 2005). Ertmer's (2005) work expands on this premise in great detail.

The subject of technology and its role in education is one which often provokes strong views across the wider community in general. Teachers' views, beliefs and experiences of technology are formed both inside and outside of the education sector. Laurillard (2012) notes that few of the technologies which are commonly used in education were originally designed for that purpose, instead many were originally designed for commercial use, facilitating marketing and communication across the community. Pegrum (2009) explains that this factor can influence the ways in which teachers view technology. Through the concept of a series of 'lenses': technological, pedagogical, social, socio-political and ecological, he elaborates on some commonly held views of technology by society as a whole and how they may impact on the views of teachers and their attitudes towards technology. However, society's perspective is not the only influence on teachers' attitudes to technology. Additional layers of beliefs about teaching and learning, and their understanding of the role of technology in education have been found in recent studies to influence teachers in their use of technology in the classroom (Kali et al, 2011, Bate, 2010, Loveless, 2011, Orlando, 2014). Yet as I have already noted, when teachers do hold pedagogical beliefs consistent with constructivist approaches to teaching and learning, it has been shown that this can be insufficient impetus to significantly change teaching practice (Lim & Chai, 2008). This phenomenon reinforces the importance of considering other influences on teachers' integration of technology in their teaching.



## 2.9 Context and technology integration

The importance of contextual factors in successful technology integration has been acknowledged. However, there is a need to explore these factors in greater depth. The identification of context-related barriers can lead to an understanding of how they might be overcome. Studies which focus on the interplay of various contextual factors show that there are often times when contextual components might clash and result in delays and barriers to successful integration of technology (Jordan, 2011). In activity theory, such clashes are known as *contradictions* (Engeström, 2001). Clashes which occur do not only have a negative impact, however, they can also result in efficient resolutions and improvements. (Laferrière et al., 2013). Laferrière et al. (2013), in their study on technology integration in twelve small schools, found that school leadership, department funding, policies and the style of professional development can all be barriers to successful technology integration. Other studies have found socio-cultural factors (Divaharan & Ping, 2010), as well as assessment design (Lim & Chai, 2008) to be factors which can prohibit the development of technology-enhanced learning environments. These studies were all carried out in schools, however, they were in different geographical locations, with associated contextual divergences: rural Canada and Singapore, for example. These studies showed that contextual barriers to technology integration in education vary significantly from school to school and reinforce the idea of the unique contextual environment of each teacher.

Following this review of the literature on internal and contextual influences on teacher thinking and technology integration, I conclude that the case of each teacher is contextually sensitive. The implication of this conclusion is that generalised policies and top-down approaches to professional development in technology integration in teaching and learning would not yield positive results. What is needed is more individualised approach.

## 2.10 Teaching work conceptualised as Learning Design

Over the past decade, the work of teachers and the internal and external influences on their decision-making have led to new conceptualisations of teacher practice. Researchers in the field of teacher thinking and planning have conceptualised teachers' work as learning design (Bennett, Agostinho & Lockyer, 2005, Dalziel, 2008, Goodyear, 2005, Laurillard, 2012), and the cognitive processes involved as teacher

design thinking (Bennett, Agostinho, Lockyer, Kosta & Jones, 2008). This conceptualisation views teachers' work as having much in common with the design processes in other fields, such as architecture. Design practitioners are known to problematise their work and use an iterative, creative process to address the problem, being influenced by both external contextual factors and internal resources (Cross, 1982). The internal resources which teachers have been found to draw on are their beliefs about teaching (Shavelson & Stern, 1981), pedagogical and content knowledge (Shulman, 1986) and past teaching experiences (Borg, 2003). The integration of technology into education has added further complexity to the design process and led to research into the internal and external factors which influence teacher design thinking when approaching technology integration in learning design.

### **2.11 What Learning Designs Represent**

Traditional approaches to planning learning have tended to be linear and to focus on the preparation to teach a particular lesson or tutorial. In contrast, learning design conveys a multi-faceted approach to the design of learning experiences, which synthesizes pedagogical theory and case-based teacher experience into a process which results in the overall design of a program of work. Artefacts such as tasks and assessments may be included and may be adapted or adjusted at any stage of the process; prior to, during and post teaching (Bennett et al., 2014 Lockyer & Bennett, 2006).

The literature reflects the overarching objective of learning design to be the creation of more meaningful, engaging and effective learning experiences for students (Laurillard, 2012). As such, the process involves iterative reflection and adaptations in response to the interaction with students at various stages (Bennett et al., 2014). This process of reflection and refinement is critical if teachers are to succeed in supporting learners to make connections between their learning and the outside world. To build on this existing knowledge, researchers in the field have expressed that further studies are needed to focus on how a teacher uses his/her understanding and assumptions about their students to inform their design processes (Harper, Lockyer, Bennett, Agostinho & Jones, 2011).

## **2.12 Learning Design in Practice**

Two key issues of teacher development that learning design aims to address are how to support teachers in the design process and how to effectively share design knowledge and expertise (Bennett et al., 2005). The development of designs which accurately represent teachers' practice are critical in order to stimulate reasoning and deeper understanding in other teachers. Work in this area aims to produce learning designs in a format which can be shared and reused by practitioners. The representation of designs is an area of learning design which has received much focus by researchers (Conole, Brasher, Cross, Weller, Nixon, Clark, & Petit, 2008; Goodyear, 2005). Electronic systems such as LAMS and IMS-LD have been created to support the design practice predominantly of higher education teachers (Dalziel, 2008, Conole, 2010). These examples have both used systems of diagrams and graphic images in order to stimulate the design processes in the users and to communicate ideas and thinking processes in a way which more closely reflects the thinking of designers (Laurillard, 2012).

While inroads have been made into potential representations of learning designs, there is a general acknowledgement that more needs to be understood about the design processes of teachers in order to uncover and share their implicit knowledge and practice (Bennett et al. 2014). In order to identify how and at which stages of the design process to incorporate supports for the user, further research is needed into the design and decision-making processes of teachers (Agostinho, Bennett, Lockyer & Harper, 2011, Bennett et al, 2014). Most studies so far have been conducted in the higher education sector. It is envisaged that further research into learning design will help in the design of supports for teachers in other sectors. As I have already noted, primary teachers are under significant pressure, especially in the early years of their teaching careers, and therefore there is a great argument for now directing research in this sector.

## **2.13 The impact of learning design**

Researchers in the field of learning design anticipate that the creation of more sophisticated learning designs, which capture the case-based experience of expert teachers, will be able to guide the learning design processes of teachers with less experience (ref). Developments in the field of representation and usability of learning designs are expected to significantly support teachers in mapping technology

integration to their desired learning activities (Laurillard, 2012). The creation of effective learning designs depends on extensive understanding of the design processes of both expert and novice teachers. With this understanding, designs can be developed which meet the decision-making needs of novice teachers at precisely the stage of the design process where they are most needed. Analysing the design process of teachers in real time, in combination with the analysis of all resources employed by the teacher in the process would significantly deepen our understanding of this phenomenon. This study will contribute to the understanding of the complete design process of a novice teacher and their thought processes throughout the activity. It will also allow for the analysis of any amendments made subsequent to the design process, up to and including the point of teaching the unit.

## **2.14 Summary**

This initial review of the literature has highlighted that the influence of context on a teacher's design process is an area which needs more understanding. While the lens of TPACK allows the examination of teacher knowledge in this field, in order to examine the process of learning design with technology, it has been argued that it is important to investigate the influence of the external context on the process. There is also little work on the learning design experiences of early career primary teachers with regard to technology integration. Learning design research so far has concentrated predominantly on the higher education sector. This study aims to uncover the thinking and practice of one early career primary teacher, designing a unit of learning with technology within his/her own school context and therefore to contribute further knowledge to the field where these gaps lie.

### **3. Methodology**

This study was based on a constructivist epistemology which acknowledges that reality is socially constructed by the individuals who experience it, and is shaped by the cultural, historical, political and social norms surrounding the context (Crotty, 1998). The research for this study focuses on investigating how the participant's internal and external contextual elements led to her engaging in the learning design process in the way she did. In order to do this it was important to acknowledge that her working context influenced the way she worked and perceived the nature of the work. Her reality is therefore constructed through her contextual interactions. The literature reviewed for the study identified this to be the case and this supported my choice of theoretical perspective. My own personal experience as a teacher and teacher mentor in the adult English language education sector also influenced my approach to the research design and selection of epistemological foundation.

This chapter begins by presenting an overview of the study aims and research questions before providing a discussion on the theoretical framework as it was interpreted for this study. Following on from the theory section, the approach and design of the study are presented with a rationale founded in research methods literature. The focus of the chapter then turns to the collection and analysis of the data in the study.

#### **3.1 Aim and research questions**

The aim of this study was to investigate the process a novice teacher undertakes when designing a unit of work which integrates technology into the teaching and learning activities. The previous chapter outlined some of the contextual elements which influence this process, such as the access to various ICTs and the school policies related to technology use. The literature also highlighted the cognitive processes, such as case-based reasoning, which are employed when designing and the level of technological pedagogical and content knowledge (TPACK) the teacher has developed.

In order to guide the study of the subtle interplay of these internal and external elements, the following research questions were developed:

1. How do early career teachers approach the integration of technology into their learning designs?
2. How do the teacher's technology choices affect the overall design?
3. How do contextual factors influence the way in which the early career teacher incorporates technology into a learning design?

### 3.2 Theoretical Framework

The theoretical framework used for this study was Engeström's (2001) second generation of activity theory and was comprehensively presented in the previous chapter. For the purposes of this study, the activity theory model was interpreted to focus on the case of an early career teacher designing a unit of work, with the design activity as the unit of analysis. Figure 4 illustrates the activity system in this study.

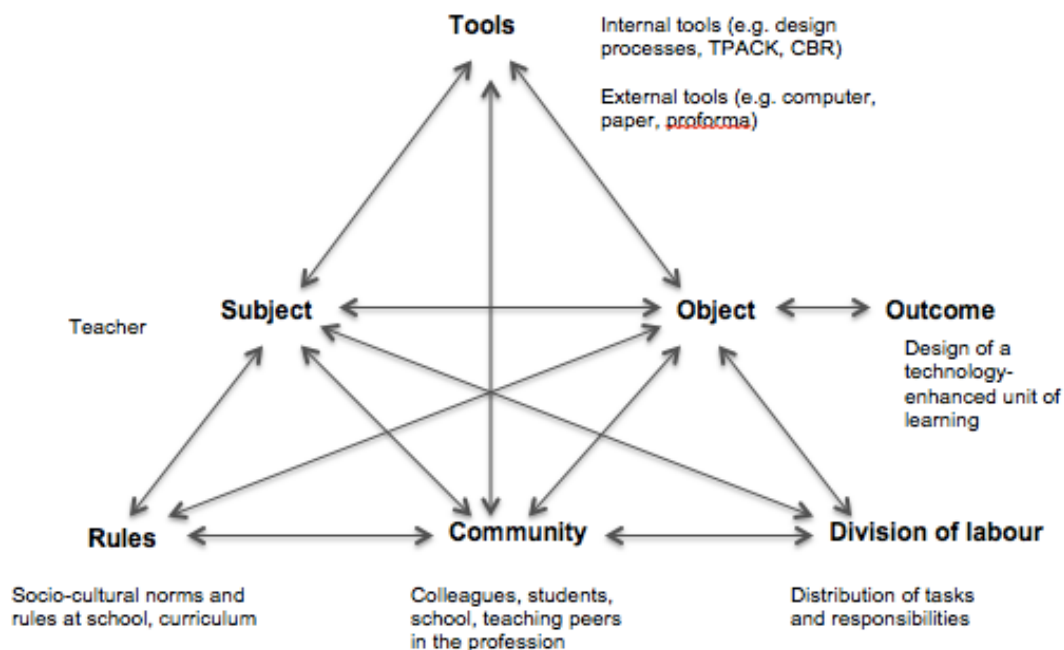


Figure 4: Conceptualisation of activity theory model for this study (based on Engeström, 2001)

Figure 4 presents my initial conceptualisation of the contextual components of my study. During the analysis phase of the research, these components were analysed in depth and a rich picture of the context emerged.

The theoretical framework of activity theory allowed this study to go beyond the boundaries of qualitative analysis of the participant's reported actions by facilitating the analysis of other elements in the activity of learning design. The literature review highlighted the importance of studying context around the processes of teachers designing learning for their students. In activity theory, the activity itself is viewed as the context, a fusion of internal and external components where people and artefacts, or tools, interact (Nardi, 1996). By using a range of data collection methods, I was able to view the activity not only from the participant's perspective, but also through researcher observation and the analysis of artefacts, thereby ensuring a holistic interpretation of the context and activity. This enabled me to collect data on design practice which was evident through observation, but was not articulated in interviews.

The additional study of internal *tools* through the lenses of case-based reasoning (CBR) and technology pedagogical content knowledge (TPACK) allowed for further rigorous analysis of the overall process of learning design. Case-based knowledge and the process of case-based reasoning has long been understood to have significant influence on the development of professional practice and expertise in professions, including teaching. The study of professional scenarios and potential strategies with peers and mentors, is a valued pedagogical approach used in teacher education and is acknowledged to lead to the development of expertise (Kolodner et al., 2004). This informal developmental process often continues during the first years of a teacher's career in Australia, as schools often assign a teacher mentor, or support collaborative planning processes. For the purposes of this study, I sought to understand the level of influence of case-based knowledge and how case-based reasoning is employed in the teacher's learning design process with technology. By using case-based reasoning, I aimed to capture the influence of the participant's own case knowledge and also identify any influence of colleagues' case knowledge. While I acknowledge the value of communities of practice theory to analyse the influence of peers and colleagues on an individual, I felt that it was beyond the scope of this study to incorporate this theory. However, I intend to expand my future doctoral research to investigate this aspect of contextual influence on early career teachers.

The analysis of technological pedagogical and content knowledge (TPACK) as an internal resource of the participant is significant for this study. The influence of teachers' knowledge on the integration of technology into teaching has been studied extensively using this model over the past ten years. As explained in the previous chapter, the TPACK model facilitates the analysis of separate components of teacher knowledge (technological knowledge, pedagogical knowledge, content knowledge) and the extent to which they are integrated, facilitating a more sophisticated level of understanding of teaching practice.

I have previously identified how the use of the TPACK model alone is insufficient for studying a teacher's approach to designing learning with technology. The recognition of the influence of the teacher's work context, i.e. external environmental characteristics, is noted extensively in the literature and is a key criticism of the TPACK model (Loveless, 2011). The study of teacher knowledge in this area is nonetheless extremely valid and for this reason I have allowed for its inclusion in the analysis phase as a tool within the activity theory model.

Through the theoretical model of activity theory, we are able to synchronously analyse the activity of learning design, rather than to analyse teachers' retrospective description of their learning design activity. The framework allows us to move away from the technology itself as the focus of study, and instead to understand the integration of technology as part of a complex learning design activity system, where some elements may clash and have implications for the completion of the object.

### **3.3 Research Approach**

This study took an interpretive approach to the research through the use of a case study design and the collection of qualitative data. In investigating the context of a teacher's learning design practice, this study acknowledges that the design process is contextually situated and as such, the process is constructed and interpreted individually by the participant. This approach to the research is



considered to be appropriate because the aim of the study is to investigate how a teacher interprets and conducts the design process and her thinking throughout the process. A positivist approach would assume there are objective truths to be identified about such a process which are not influenced by the participant's perceptions or beliefs in any way. This would clearly not fit with the aims of the study.

### **3.4 Research Design**

A case study design was chosen to allow for in-depth, holistic investigation of the design process, experience and thinking of one novice teacher. Miles, Huberman and Saldaña (2014) identify a case as a "phenomenon of some sort occurring in a bounded context" (p.28). The aim of this study was to identify the key defining features of a novice teacher's thinking when designing a unit of work which integrates technology in the teaching and learning activities. A case study approach was felt to be appropriate in a study of this kind where the aim is to discover and develop an understanding of the important features of a process, and to conceptualize these features for future use (Punch, 2009). Punch (2009) notes the valuable contribution of case study research in areas where knowledge is "shallow, fragmentary, incomplete or non-existent" (p. 123). This could be said of the use of technology in education. In this case, it is anticipated that the findings will inform the creation of learning design supports and tools for teachers in the primary education sector.

The design of this study focused on setting the participant teacher the task of designing a unit of work for her class, which she would subsequently teach. The main design task took place during a full day's design workshop and was completed in the teacher's own time following the workshop. The research collected data prior to, during and after the design activity and then prior to, during and after the teaching of the unit. This strategy was designed to collect design work and thinking at all stages when design activity was anticipated to take place. The fact that the participant's task was to design a unit of work for her current students, which would then be shared with other teachers in the stage to implement with their students, had two clear advantages. Firstly, the participant would be completing an authentic activity which she was required to do as part of her current workload. This meant that there were not significant

demands on her time beyond what she would ordinarily be doing for work. Secondly, it increased the likelihood that the results would be an accurate reflection of her regular practice, which might not be the case in an artificial 'laboratory' situation.

### **3.5 Participant selection**

Key criteria for selecting a participant for this study were firstly the number of years post-qualification teaching experience the candidate had. In order to be considered an early career teacher, the participant would need to have less than five years' experience, and would ideally have between one and two years' experience. Secondly, it was essential that the participant would be able to complete the design and the implementation of the unit within the limited time available in the study schedule for data collection.

Government and non-government schools from a range of socio-economic areas (as defined by a government coding system known as the index of community socio-educational advantage (ICSEA)) were approached in the Sydney and Illawara regions of New South Wales, Australia, by email, with an attached letter of invitation to participate (Appendices 1.a & 1.b). The email and letter outlined the criteria for participants, as well as background information to the project and information on what participation in the project involved.

Following the initial email and letter, I contacted the school principals by phone to identify whether any teachers in the school met the criteria and were interested in participating in the study. Potential participants were then contacted to schedule a day for the planning workshop to take place. Prior to the planning workshop, the participants were sent an email (Appendix 2) with a participant information pack, which consists of a planning day schedule (Appendix 3) and a participant information and consent form (Appendix 4) attached.

The participant in this study was selected in accordance with the criteria presented above. She was in the middle of her second year of teaching after graduating from a Master of Teaching degree. This meant that she had sufficient experience to no longer be considered a 'beginning teacher', but at the same time

did not have too much experience to no longer be considered to be an 'early career teacher'.

### 3.6 Data Collection Procedure

The study was divided into three distinct stages and involved multiple methods of data collection. Figure 5 shows the data collection stages and schedule, and associated methods:

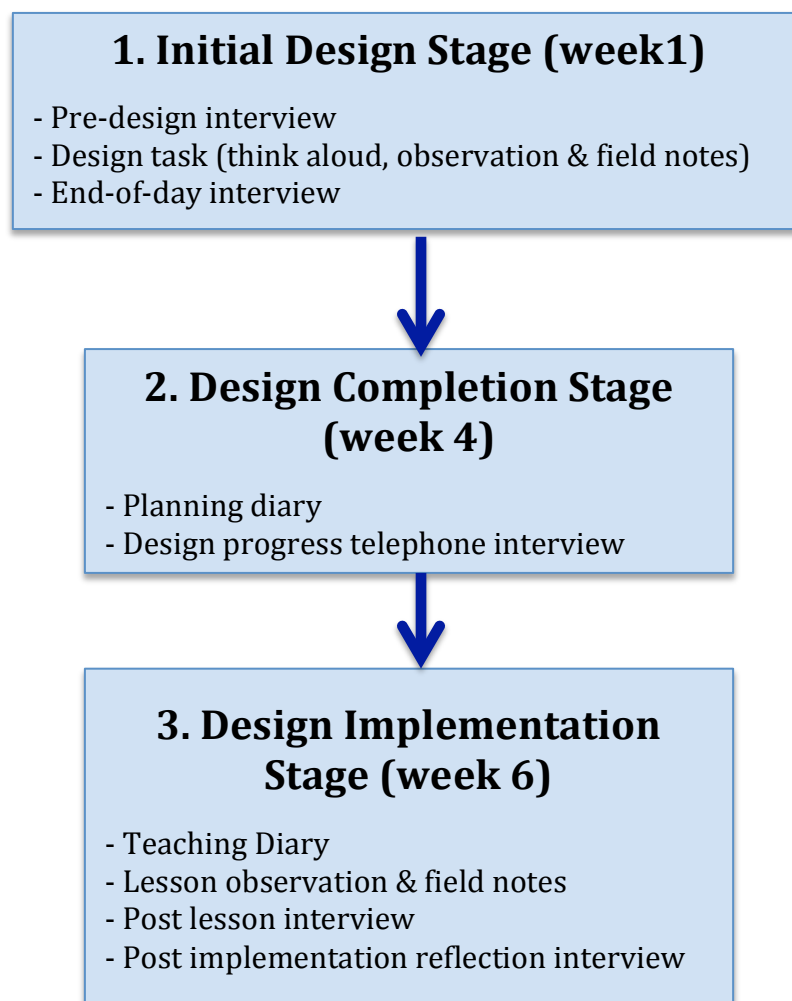


Figure 5: Data collection process

The study's instrumentation was designed in line with the research questions, the definition of the case and the conceptualisation of the theoretical framework (Miles et al., 2014). The interview protocols were semi-structured in design. This approach was selected to align with the purpose of the interviews, which was to gain as rich and in-depth a description as possible of the participant's practice and thinking (Punch, 2009). The design diaries were based on protocols developed by Jones, Bennett and Lockyer (2011) as part of their work on learning design in higher education.

### **3.6.1 Stage 1 – Initial Design**

The first stage of the data collection took place over a full day at the participant's school. In order for the study to adequately capture as much contextual detail as possible, it was important to situate the activity in the participant's normal planning environment. The purpose of stage 1 was to collect information about the participant's teaching background, their usual design process, and to initiate the design task and observe the participant's practice as they engaged in design. The data collection activities for this stage were organised as a planning session held at the participant's school. Paper copies of the information and consent forms were provided and signed at the beginning of the data collection day.

### **The pre-design interview**

The purpose of the pre-design interview was to collect background information on the participant, the school context, how the participant typically approaches the activity of planning a unit of work for a key learning area (KLA) and her plans for the planning activity for that day. The interview followed a semi-structured interview protocol (Appendix 5). It was recorded on a digital audio recorder. At the end of interview the researcher reminded the participant of the design task and provided paper copies of the Design Challenge sheet and the schedule for the day.

## **Design task**

In order to capture the participant's design process and thinking, the participant was observed in her design practice. A think-aloud strategy was employed to intermittently prompt the participant to talk about what she was thinking at certain stages of the design and the reasons for any decisions she made. Think aloud protocols are noted to be useful for identifying cognitive processes in action which are difficult to capture by other means (van Someren et al., 1994).

The design task was recorded using audio-visual equipment, and notes were taken on the participant's design thinking and process using a field notes proforma (Appendix 6). This proforma provided space to record the flow of activity and any notable changes in focus which occurred. Subsequent to the planning session the video recording was transcribed through a process of adding description and key quotes to the field note proforma.

## **End-of-day interview**

A semi-structured end-of day interview (Appendix 7) was used to capture information on the progress of the design activity up to that point in time, inclusions and considerations allowed for specific areas, with specific reference to the integration of technology in the design. The interview also included questions on the participant's plans for completing the unit. At this stage, any artefacts which had been used or produced were collected. Artefacts collected at this point were the incomplete planning proforma and the early version of the assessment task and student assessment instructions..The collection of these artefacts at this stage allowed for the identification of later revisions to the design, which subsequently helped identify changes in the participant's thinking about the design.

### **3.6.2 Stage 2 – Design Completion**

Stage 2 of the data collection procedure was focused on a planning diary. The participant was asked to complete the planning diary (Appendix 8) while she completed the design of the unit up to the time when she would teach the unit. This meant adding information on additions, amendments and new resources added to the unit after the planning day. The planning diary was

shared with the participant online, which meant that as the researcher I was able to track any changes which were being made as she made them. Weekly email reminders were sent to prompt the participant to add any information on additions or changes to the design, and the rationale for these, as she worked on it. Once the planning process was complete and the participant was ready to teach the unit, she was asked to notify me, and I then conducted a short design progress telephone interview to discuss the changes made following the planning day. This telephone interview followed a planned protocol (Appendix 9) and was recorded with the participant's permission. At this stage the pre-implementation version of the planning proforma was emailed to me by the participant. This provided insight into any changes which made over the design phase following the initial design day.

### **3.6.3 Stage 3 – Design Implementation**

Two lessons were observed during the data collection process at the school. The rationale for observing the lessons was to identify how the teaching related to the unit design in terms of approach. I was interested in observing how technology was utilised in the class by the teacher and the students and whether there were any 'on-the-spot' adaptations to the lesson outline in the unit, particularly if they were influenced by the use of technology. While I had guiding questions for the observation on a document in front of me (Appendix 10), I chose to make informal handwritten notes in order not to distract from the lesson in progress.

Data was also collected at this stage through the use of a teaching diary (Appendix 11), which was completed during and following the implementation (teaching) of the unit. In a similar way to the design diary, the participant was asked to record any amendments, additions and new resources she had added to the design of the unit during the teaching phase. The diary was shared with the participant online and email reminders were sent weekly as for the design diary. When the participant had finished teaching the unit, she was asked to notify the researcher who then scheduled a final interview to reflect on the overall design process.

### **Post-Lesson and post implementation reflective interview**

At this point of the data collection, there was a deviation from my original planned instruments for the data collection. Originally, I had planned to conduct a short post-lesson interview to investigate the participant's reflections on the lesson and any amendments she would make to the design. This was then to be followed by a final reflective interview on the whole design process when the participant had finished teaching the unit. This final interview was designed to enable the participant to reflect in a similar way on the teaching of the unit and any resulting changes to the original design.

Shortly before the second lesson I planned to observe, the participant contacted me to say that she would be leaving the school the week after the lesson observation as she had secured a teaching position overseas. This meant that I needed to collect the data for both the post-lesson and final reflective interview at the same time and as a result I combined the interview protocols into one document (Appendix 12). No questions were omitted, although the teacher had not completed the teaching of the unit and so the data reflecting on the unit is likely to be less detailed and comprehensive than it would have been had she completed the unit. Following this interview, I collected the final planning proforma with handmade notes, the final assessment documents and rubric..

### **3.7 Data Management**

All interview audio files were transcribed verbatim following the interviews and the transcripts were checked by the researcher. They were then sent to the participant for checking and to make any amendments she wanted. The design diaries were administered using a shared Google Docs file and recurring email reminders were set up to remind the participant to complete the diaries.

### **3.8 Ethical considerations**

This research had received prior approval through the ethics applications for the ARC Teacher Design Thinking project. The ethics bodies applied to for this approval were Macquarie University Ethics Committee and the NSW State Education Research Approval Process (SERAP). Amendment requests were sent

to Macquarie University Ethics Committee for the instruments designed specifically for this study (Human Research Ethics Committee Ref. No. 5201400490), including the consent form which specified that this data would contribute to my Master of Research. Approval for these amendments was received on 02 June 2015 (Appendix 13).

Ethical considerations taken into account for this study are:

- a) voluntary participation (participant was informed that participation was voluntary. She was also informed that she could review and change her interview transcript after checking)
- b) informed consent (participant received full background information to the study through the consent form)
- c) no harm (consideration was given to avoid any potential harm to the participant)
- d) confidentiality/anonymity (participant's identification was concealed by the use of a participant code in all document labelling. The school name and location was concealed in all reporting).
- e) privacy (I contacted the participant following an initial recommendation for the study by her school principal. Following this I had personal contact with the participant through phone and email with her consent)

### **3.9 Data Analysis**

Data analysis was completed in stages. Some initial analysis was completed concurrently with the data collection. This took the form of making initial notes on the design day. Figure 6 outlines how the instruments, data and analysis relate to the theoretical framework and therefore how they address the research questions.



Conceptual Basis	Data Sources	Analytical Focus	Research Question
Nature of design activities: Activity Theory (AT)	Interviews	Conception of activity motive and outcome (object)	RQ 1
	Observations		
	Diaries	Elements of system	RQ 1
	Other artefacts	Relationship between elements	RQ 1, 2 & 3
		Design process hierarchy (actions and operations)	RQ 1
		Contradictions in system and consequences (resolutions, delays)	RQ 1, 2 & 3
Case based reasoning (CBR)	Interviews	Use of own previous experience in analysing problem and designing a solution	RQ 1 & 3
	Observations		
	Diaries		
	Other artefacts		
		Influence of the experience of others	RQ 1 & 3
Technological Pedagogical Content Knowledge (TPACK)	Interviews	Identification of levels and sophistication of TPACK	RQ 2
	Observations		
	Diaries		
	Other artefacts		

Figure 6: Data analysis matrix

With the above table in mind, the next stage of data analysis was to go through all data sources and identify a set of codes in order to conduct more conceptual analysis. In line with Miles et al.'s (2014) approach, common themes in the data were noted throughout the data familiarisation process and these were subsequently refined by reviewing them through the lens of the analytical categories listed in the table above. Once the codes were established, the next stage was to write descriptions for each code. This was of particular importance because of the intention to engage a colleague for trial coding of one interview.

Once codes and descriptions for the data were finalised, I used the software *HyperResearch* to code all data collected for the study, including artefacts such as the unit of work and the Board of Studies sample unit. After this was done, a colleague also coded one of the longer interviews according to my coding scheme. This was in order to test the validity and efficacy of the coding

scheme and to identify any disparities between that and the initial coding I had done. It also served to reduce the possibility of researcher bias in the study. Following this process, my colleague and I met to discuss and compare our coding results.

### **3.10 The role of the researcher**

The data collection process allowed the study to go beyond investigating a teacher's description of what they do when planning, to capture synchronous, observed data on what teachers actually do when planning. In order for this to occur, as the researcher, my role became more involved in the process, specifically during the videoed observation of the design task. The think aloud procedure meant that I needed to prompt the participant to verbally articulate what she was thinking/doing intermittently during the observation, therefore causing some interruption to the activity in progress. In order to limit the possibility of researcher interference, I ensured these questions were open and restricted to the subject of what the participant was doing/thinking/considering at any particular stage. I was aware throughout the data collection process that my role as researcher risked imposing my 'position' in relation to the study on the participant. However, because my own teaching experience is not in the primary sector, I felt able to approach the subject with a genuine desire to understand rather than any preconceived hypothesis.

### **3.11 Limitations of the study**

One procedural limitation of the study was that the design task may not have been entirely representative of the participant's normal practice, as the task allocated several hours to the activity. The participant commented that her usual planning practice would be to work in multiple shorter periods of time.

One of the key constraints of the study was time, as the study was completed within a nine-month period, during year two of the Master of Research program. This meant that the coordination of data collection and analysis took place in a limited period of time. However, there was time to allow for some flexibility in the timings of interviews to better suit the participant and at the same time ensure the data was collected at the optimum time to meet the study's aims.

### **3.12 Summary**

This chapter outlined the study approach and design, being a qualitative case study of a novice teacher's approach to designing technology-enhanced learning. The theoretical framework enables a holistic, in-depth investigation of this activity of learning design and the contextual elements which influence it. The data collection instruments allow for both the participant's perceptions of the activity to be considered, while also exploring the activity through the perspectives of researcher observation and the unit of work produced. This range of data and perspectives ensures a rigorous process of research, as well as strong external validity of the study.

## 4. Findings

This study set out to gain an in-depth perspective of one early career teacher's process of designing learning with technology. The aim of study was to uncover the considerations and influences which affect an early career teacher's thinking and decision-making throughout the learning design process. More specifically, the study was guided by the following research questions:

1. How do early career teachers approach the integration of technology into their learning designs?
2. How do the teacher's technology choices affect the overall design?
3. How do contextual factors influence the way in which the early career teacher incorporates technology into a learning design?

This chapter presents and examines the data collected over the course of this study. The first section of this chapter presents a comprehensive summary of the case. The second part of the chapter presents the key themes which emerged during analysis of the data. It also presents possible interpretations of the data in relation to each of the themes. The themes presented were selected for their relevance and insights in relation to the research questions.

### 4.1 Case Summary

The case participant for this study was Dawn. She was an early career teacher at a school located in the western suburbs of Sydney. This case summary first describes the school and school community context within which Dawn works. It then provides information about Dawn's background and career. The final part of the summary describes and illustrates the learning design process from the beginning, which includes the initial stage of collaborative planning that Dawn participates in with her grade colleagues. This level of contextualisation is vital if we are to understand and capture the complete range of factors which interact within the activity of learning design in this case.

#### 4.1.1 The school context

Dawn's school was located in a densely populated suburb. Approximately 850 students were enrolled in the school. The school's student community is in a low socio-economic area and the majority (97%)<sup>2</sup> of the students came from language backgrounds other than English. Dominant home languages were Arabic, Chinese and Vietnamese. Each grade at the school had approximately five classes. The school employed some specialist staff including a teacher librarian and classroom support teachers for students who needed extra support in mathematics, reading, and writing (with a focus on English as a Second Language). The school had no specific recommendations or guidelines for teachers in using technology in the classroom.

The school had a strong focus on community engagement and employed a community engagement officer. The school also offered English language classes for parents and literacy and numeracy classes for pre-school children. Classes in community languages were provided for students and there is a tailored program for students who are new arrivals in Australia.

#### 4.1.2 The teacher

Dawn was in her second year of teaching and had been working full-time at this school since graduating. She completed an undergraduate degree in media and communications before immediately continuing on to complete a Master of Teaching (Primary). Dawn taught a Stage 3, Year 5 class. She taught this same grade the previous year (i.e., in her first year of teaching). Dawn had a teacher mentor who advised on all aspects of teaching.

Dawn said that she believed that her first year of teaching contributed significantly to her teaching knowledge. She explained this was because there was a marked difference in the socio-economic status and cultural and linguistic backgrounds of the students she taught at this school, compared with the students at schools in which she taught during her professional experience as a pre-service teacher. During her teacher education degree, Dawn was placed at schools in high socio-economic areas in

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<sup>2</sup> As stated on [www.myschool.edu.au](http://www.myschool.edu.au)

Sydney. She said that students at these schools “... came to school to learn ... prepared and with everything ready.” But, at this school, students often had issues outside of school and “might come here to escape whatever’s happening at home, to play around, to muck up.” (pre-design interview). This consideration of students’ needs and their experiences outside of school was a recurring theme in Dawn’s design thinking and approach.

#### **4.1.3 Learning design process**

Dawn’s approach to learning design involved both collaborative and individual components. For the purposes of this research, Dawn engaged in her usual initial design process which was a collaborative activity and is standard school procedure. Dawn reported on this collaborative design process during the pre-design interview at the beginning of the design session. Subsequent design activities were completed individually.

##### ***Collaborative planning***

Dawn’s school supported the teaching staff in the unit planning process by prescribing a general approach and providing relief from face-to-face teaching for this procedure to take place. At the end of each term, all teachers in each grade held a planning day in which they work together to plan units for key learning areas (KLAs) for the following term. The librarian was involved in the sessions in order to ensure integration of library lessons into the unit plans. The scope and sequence for the units were set by the school executive. The grade teachers’ general approach to planning units of work was to discuss and agree on *learning intentions* (i.e. desired outcomes) for each lesson in the unit and to determine the design of the formative and summative assessments for each KLA together. At this stage, ideas for technology integration were discussed in the context of the assessment.

Following this collaborative planning day, the usual practice in the school was for teachers to work individually to develop units to share later with the whole grade. Just prior to the teaching of the unit, the grade teachers met to review the unit. The grade teachers also meet weekly and discuss the units being

taught, share resources they have found and give feedback on how the lessons are working with their classes. Teachers complete the evaluation column of the unit of work as they teach and this information is shared and stored for future review. The school has a shared drive for teachers to share and organise the resources for their units. All teachers can access the units for all stages and the teachers who are teaching the unit can add resources and their evaluations of the units to the relevant folders in the shared drive.

This collaborative process was followed by Dawn for the unit of work developed during this research study. Prior to phase 1 (initial design) of this study, Dawn had worked with her grade colleagues and agreed that the unit of work that she would develop was to address the History unit 'Australia as a Nation.' With her grade colleagues, she also identified that the unit would involve the summative assessment task of a brochure produced using *Microsoft Publisher* or an online poster created using *Smore*<sup>3</sup>. During this collaborative design process, one of the grade teachers produced a sample of a brochure in Microsoft Publisher as a prototype for the final assessment task and shared this with all teachers at the planning meeting.

### ***Preparation for individual planning***

Dawn brought a range of resources to help her design process including, syllabus documents for History, English and, Science and Technology. She also brought the unit of work from the previous year and the year six History unit. She explained this was "to check whether there is doubling up of information." (pre-design interview). Prior to the design workshop, Dawn outlined sources of ideas for teaching content that she frequently uses. She explained that she typically conducts online searches for lesson ideas and resources. She uses *Google*, *Pinterest*, the resource repository *Scootle*, and also refers to the Australian Curriculum Assessment and Reporting Authority (ACARA)<sup>4</sup> website for sample units for the target KLA. She said she typically makes decisions about

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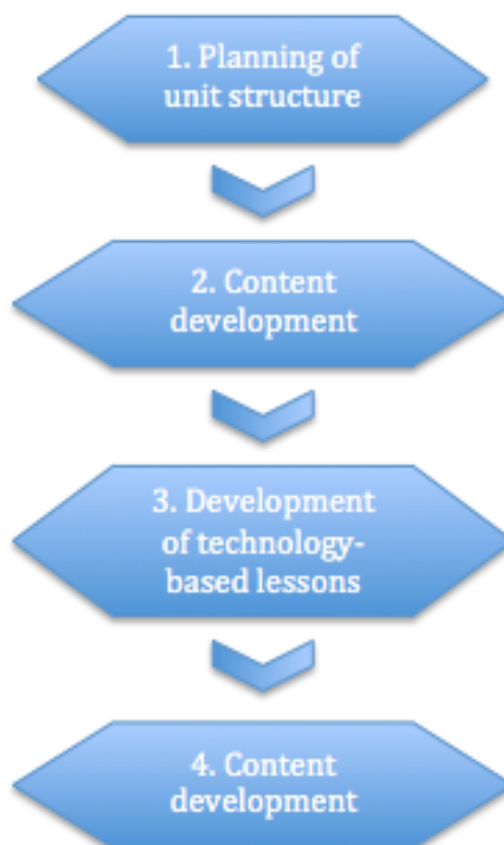
<sup>3</sup> [www.smores.com](http://www.smores.com)

<sup>4</sup> [www.acara.edu.au](http://www.acara.edu.au)

resources and content based on her knowledge of the students and their abilities, capabilities and potential engagement (pre-design interview).

### ***Individual planning***

The individual planning process can be viewed as a series of phases. Each separate phase is characterised by a change in design focus and approach. The focus was evident and articulated as an objective for the design phase, e.g. creating an overview of the unit of work or searching for resources. This data was collected during the observation and using the think aloud method, where Dawn was prompted to articulate her thinking and actions intermittently throughout the activity. Figure 7 gives an overview of the design phases Dawn worked through:



*Figure 7: individual planning process*



The characteristics of each phase are explained below and the phases are detailed in chronological order.

#### Phase 1: Planning of unit structure

The first phase of the individual process built on the work completed collaboratively with the other grade teachers. Dawn continued to build the structure of the unit by adding a single sentence overview to each lesson and by viewing and evaluating the assessments from the previous year's unit of work. Using the curriculum documents, she first identified the main learning outcomes for the unit and then identified the steps the students would need to go through in order to complete the assessment (design observation). She explained her thinking at this point of the planning process:

I had in mind the assessment task so I worked backwards from there, how do I give them as much information as possible for them to be able to complete the assessment task? (end of day interview)

At this point, she considered the needs of those students with literacy difficulties and made changes to some questions in the pre-assessment task. This was evident when comparing the unit from the previous year to the unit Dawn produced on the planning day.

#### Phase 2: Content development

The second phase of the design was less systematic in approach. Dawn moved between changing and adding content from the previous year's unit of work, amending existing resources for the unit, searching online for resources before adding relevant links to the unit of work and viewing technology-based resources to include in the unit. The online sites viewed while searching for resources included both authentic, content-specific sites and teaching resources sites. Examples of those used by Dawn are the Australian Electoral Committee <sup>5</sup>website, which has an educational resources page, and the Board of Studies Teaching and Educational Standards (BOSTES) site<sup>6</sup>, where sample

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<sup>5</sup> [www.aec.gov.au](http://www.aec.gov.au)

<sup>6</sup> [www.boardofstudies.nsw.edu.au](http://www.boardofstudies.nsw.edu.au)

units of work are available for download. The BOSTES site was used as a source of technological resources for the unit, including a *Prezi*<sup>7</sup> presentation and a timeline creator tool. It is also interesting to note during this phase that she included notes to herself on ways in which the content could be reformulated and used in classroom activities outside the time allocated to this unit of work. This might indicate that she was using an in-depth knowledge of her students' needs, combined with her knowledge of ways of approaching the content to achieve the best possible opportunities for her students to learn. This also shows that at this phase of the planning, Dawn moved beyond the boundaries of the unit and considered the integration of this content into other classroom activities. She explained in the end of day interview that she uses familiar classroom routines to introduce new vocabulary and ideas on a daily basis.

### Phase 3: Development of technology-based lessons

This phase was characterised by a more in-depth level and systematic approach to design. The focus lesson was scheduled for week four of the unit, and aimed to provide an introduction to using *Microsoft Publisher* to create a brochure for the final assessment of the unit of work. At this point, Dawn articulated her thinking in far greater detail than at other stages in the design process. She noted her plans to introduce two different types of technologies that the students could use as alternatives to producing hand-drawn brochures. After viewing the online guide to *Publisher*, she immediately began to create the students' resource for the lesson, which was a task overview and instructions. She articulated the problem with students saving work on USBs and made a note in the instructions that they should save their work on the school drive. Dawn then moved from *Publisher* to the online tool, *Smore*. She used this tool to create a brochure and commented that the students will use her model brochure to practice editing in *Smore*. All links were added to the unit of work.

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<sup>7</sup> [www.prezi.com](http://www.prezi.com)

#### Phase 4: Content development

The final phase of the design process on the design day involved content development. It consisted of a similar approach to phase 2 in that Dawn added content from the old unit of work to the new one, viewed online resources for content and resource ideas, added both paper-based and multimedia resources to the unit iteratively. She explained during the design session observation that she was including a video she had found because video engages students and offers the opportunity for them to practice their listening skills in English. In a resource from an authentic information site on Aboriginal culture, she graded the language in the text and reduced the overall amount of text in order to make it more accessible to her students from a literacy perspective.

#### ***Pre-teaching finalisation of unit design***

Following the design day, Dawn spent approximately one hour completing the unit of work. She explained in the design progress telephone interview that this hour consisted predominantly of finalising resources so that they were ready to share with other teachers. The unit was then shared and discussed with the participant's teacher mentor and the other grade teachers, who gave their feedback. This feedback was positive, with no changes recommended. Following this, the unit was uploaded to the school's internal drive so that individual teachers could further tailor the units of work for their own classes prior to teaching. Any changes or notes made by individual teachers during teaching were kept and added to an evaluation proforma for each unit, which was also shared in the unit folder on the drive.

#### ***Implementation of unit design (teaching)***

When discussing her plans for implementing the unit in the design progress telephone interview, Dawn explained that she planned to start teaching the unit in week 2 of the school term. She explained that she needed to retain a level of flexibility with the design to allow for unforeseen issues. The reflection interview showed that this was a good strategy, as disruptions to the lessons did occur. Timing was a source of difficulty for two lessons, which ran over time and resulted in activities being postponed or cut from the design. During the observed lesson, slow internet connection during a computer-based lesson meant that Dawn needed to change the teaching approach from

one of demonstrating a process in an internet-based activity to explaining the process and eliciting ideas from students on how to conduct the process. Student suggestions led to an unplanned variation to the lesson plan to look for alternative courses of action in times when the internet is slow. Dawn noted in the design progress interview that she also needs to be ready to respond to gaps in the students' knowledge and go into more detail on a topic if required. Another influence Dawn noted which sometimes results in a change to the unit design is the behaviour and mood of the class. Dawn illustrated this during the reflection interview using the example of an activity which involving working outside, but which might have to be quickly changed to a different lesson "because they won't do the right thing in an open space". The unit itself did not contain contingency strategies for this type of occurrence, which indicates that these are decisions which are continually during Dawn's teaching and which are dependent on variable contextual factors present at the time.

## **4.2 Key Themes of the Design Process**

In analysing the data from all stages of the design, teaching and reflection process outlined above, there were key themes which emerged and which will be discussed below. These themes were: The teacher's perception of technology in teaching and learning, the teacher's approach to integrating technology and the influence of students' needs on the design process.

### **4.2.1 The teacher's perception of technology in teaching and learning**

Dawn appeared to be a confident user of technology. She explained during the pre-design interview that she regularly uses online resources and social media sites to research and extend her knowledge and ideas about teaching. She did not express any negative perceptions of technology during any of the interviews. When asked about her views of technology in education, Dawn said:

Well I guess nowadays it's a must-thing that you have to use because it's there and that's what the kids are used to. It's an easy way to get through... you know, to make the lesson more engaging, to get the kids more interactive. (pre-design interview)

There's things you can deliver through... where it is like the IWB or the internet or videos, whatever it is, where you might not get the chance to do so verbally... (pre-design interview)

These comments made in the pre-design interview show that Dawn has a general perception of technology being an engaging and more effective way of presenting learning content, as well as presenting more opportunities for students to interact with the content. However, data collected during and after the design process showed that she holds a more sophisticated understanding of the role of technology. When discussing the technology components of the design following the design activity and during the final reflection interview, she noted that the assessment was an impetus for introducing new technologies:

Lesson four jumps into the assessment task so... they have a choice of creating a brochure through *Publisher* or *Smore* so that just introduces them to those two platforms. (end of day interview)

I think because they do have to do a lot of assessment at the moment where they need to do presentations and I've just seen that they're all just Powerpoint, Powerpoint, Powerpoint, death by Powerpoint, yep. So seeing that another platform might work... (end of day interview)

Dawn also commented that offering alternative approaches to presenting work for assessment was a way of:

...giving them an option as well, different options of how they want the end result to look like or how they want the end result to be presented. (reflection interview)

While not specifically stated, this comment implies that Dawn may be motivated to develop learner independence and to help students develop the skill of evaluating different technologies in terms of their affordances for a particular outcome.

The way in which new technologies are introduced to students also reveals a scaffolding approach to technology integration. For the focus unit of work, Dawn created

a *Prezi* to teach new content and expressed that this approach helps to familiarise students with a new technology before they use it themselves:

I see what other ways for them to be able to present their assignment and then introduce that and then get them used to that technology or platform to create whatever it might be. (reflection interview)

With respect to using the software, *Prezi*, Dawn explained in the end of day interview that she intended for students to use it in term four, which would be after this current unit is completed. This suggests that her attention to developing students' technology literacy skills goes beyond the boundaries of individual units of work. Koehler and Mishra (2006) explain that technological pedagogical knowledge requires a "forward-looking, creative and open-minded seeking of technology use for the sake of advancing student learning and understanding (p. 66). Dawn's articulation of ways in which teaching can both explicitly and implicitly support the development of students' technology skills suggest that she has developed a depth of technological pedagogical knowledge which is beyond what she articulates when asked questioned directly on the subject. This in turn raises the possibility that her technological pedagogical knowledge is significant, yet tacit, and might not have been uncovered if the study had relied on the predesign interview alone.

#### **4.2.2 A dual approach to integrating technology**

The observation of the design process in the design workshop shows both systematic and non-systematic approaches to integrating technology in a unit of work, with each approach being employed during different phases of the design process. Phase two shows a process where technology-based resources are searched for, evaluated and included in the unit in the same way as paper-based resources. The types of technology included in this process were tools to depict a timeline, *Powerpoint* presentations which include videos to present content, and a word cloud to introduce new vocabulary. The first two of these were found on online education sites and were added as links to the unit of work proforma or downloaded as necessary. The word cloud tool was one which Dawn was familiar with and had previously used to support literacy in other subject areas. This process was fully integrated with the process of searching for and adapting

non-technology-based resources for the unit and appeared to consist of iterative phases of viewing, evaluating and incorporating the resources into the design.

In contrast, the process of developing technology-enhanced lessons for the assessment appeared to be more systematic and involved, with little or no 'jumping around' in search of resources. For these lessons, one of the principal influences articulated by Dawn was the development of the students' technology "literacy".

I think it's computer literacy; it's for them to be able to use the technology, be not afraid of, you know, sussing it out and seeing what's there for them and what they can do with it. (reflection interview)

Her approach to introducing a new tool for the purposes of presenting their assessment builds on this idea and highlights the approach of breaking down the students' learning into stages:

...if the assessment requires students to use, say Publisher, Microsoft Publisher, then we'd do a couple of lessons where we introduce the students to what is Publisher (*sic*), how to use it and then give them another lesson where they're free to do a set task. So it has to be a balance. (Pre-design interview)

So there would be a task or a set of tasks where it will just be teacher-directed so you watch and do and then they will have a go at it on their own... (end of day interview)

During the lesson observation, following the initial presentation of the tool and its functions, the teacher took the opportunity of students asking whether they could hand draw their assessments to lead a discussion on the advantages and disadvantages of using *Publisher* to present work. This decision provides evidence of the teacher's motivation to expand students' capacity to evaluate technologies in terms of the task outcomes, which in turn seems to reflect a higher goal of helping students to develop their skills and independence in using technology. It is one example of Dawn's beliefs and knowledge of technology in learning being translated into and reflected in her actions. Further evidence emerged over the course of the data analysis.

In the lesson design, after students have experienced using the tool and are comfortable with it, the next stage was the presentation of another tool for creating brochures. This was a change from the previous year's unit of work and was incorporated to offer students the experience of using different technologies for one task:

I see other ways for them to be able to present their assignment and then introduce that and then get them used to that technology or that platform to create whatever it might be. (reflection interview)

The post-design and reflection interviews add substantial evidence of this teacher's broader motivation to develop students' technology literacy and independence with technology. This evidence shows even more clearly that this is a goal which goes beyond the boundaries of individual units of work:

If they are able to resize an image, can they do that, for example, if they want to create a website? (reflection interview)

So for example if they come knowing how to use all those three or four (tools), then how about we do for example create a –what is it – a Weebly, so like a website page. (Reflection interview)

She notes that this approach is effective in helping students develop their technology literacy skills:

I can see them, you know, finding other ways of being able to apply this information or other ways of them being able to use whatever program that's available for them. (reflection interview)

Later in the unit, the teacher added a presentation of content using *Prezi* and mentioned to the students that it is another way of making presentations. She did not ask the students to use *Prezi* in this unit, but rather used it as an opportunity to introduce the tool. This is an example of a stage in the learning design where that the focus on technology begins to move beyond the requirements of the unit and adds further evidence of the higher motivation to build students' skills with technology:



What I use I try to get them involved in using as well so they understand how it is made. (end of day interview)

The evidence presented above illustrates a congruence of Dawn's knowledge, beliefs and actions in the field of technology integration in learning design, and is an indicator of her deeper pedagogical knowledge and skills. We know from research in the field that early career teachers' beliefs and knowledge about technology in education do not automatically translate into pedagogical practice (Bate, 2010; Lim & Chai, 2008) and so this is a significant finding for a teacher early in her career.

The integration of technology into the unit of work is constrained by access to computers and devices within the school. The order of the *Microsoft Publisher* lesson was determined by the scheduling of the class in the computer laboratory and the scheduling of the following lesson in the library in order to ensure students had sufficient opportunity to use the computers to complete the Publisher tasks. The use of iPads in the unit is noticeably minimal. There are six iPads for the grade and five classes in the grade. Dawn commented in the pre-design interview that she routinely used iPads for tasks which can be rotated in class and usually involve research. The limitations of access to iPads suggested that there were considerable constraints on Dawn's capacity to use technology for her stated goal of increasing interactivity in class. Her most commonly used technology in her own classroom is the interactive whiteboard and this was used to present content in the form of *Powerpoint* or *Prezi* presentations, and multimedia resources such as video. This means that she needed to maximise the opportunity of using the computer laboratory and library computers. It is possible that this impacted on the design process involving the Publisher lesson, in that the lesson was developed in an in-depth, systematic way in order to ensure that access to the required technology was maximised.

#### **4.2.3 Consideration of students' needs dominated the design process.**

The students in the class were a significant influence on the design of the unit. A key characteristic of the students is that the majority are from a low socio-economic backgrounds, where most families speak languages other than English at home. Dawn notes that there is a stark contrast between the demographics of the students at this

school and those of the school where she completed her practical experience at university. Specifically she explained that:

The units that I may have planned, you know, during uni, they would not work in this school because of the different demographics, the different situations... (pre-design interview)

One result of the different situations of students at this school is noted to be behaviour. Reference to this aspect is made extensively in the pre-design interview:

There's a lot of things kind of holding them back so learning is not their priority. So they might come here to escape whatever's happening at home, to play around, to muck up or whatever it is. (pre-design interview)

This idea that behaviour management is a common issue in the class is referred to again in the reflection interview, when she notes the need to be flexible with the lesson:

... I can see that they will not go outside and do what I expect so then we'll quickly jump and change to a different lesson where they're required to sit in one spot and really concentrate...(reflection interview)

It is clear from the pre-design interview, the design activity and the post-design interview that the students' literacy (ESL) needs and their backgrounds influence the design process significantly. From a language perspective, the resources viewed and incorporated into the design were often changed to grade the vocabulary for ESL learners and this included resources which had been in the unit the previous year:

Comments that the questions are going to be too challenging for her students and changes them. (design observation notes)

Creates Stolen Generation timeline in Word... Grades language and reduces amount of text. (design observation notes)

This action shows that although Dawn is designing the unit for the whole grade, her own students are the greatest influence on the design, rather than the grade level in general. It also shows that while she was considering differentiation for the skills and abilities of her own students, she was not considering the needs of students in other

classes. This may mean that the questions in the assessment and the text were too low a level for some students in other classes. This is an area which may improve with experience, especially within the planning procedures that the school has put in place allowing for feedback and weekly meetings where units are discussed as they are taught.

Dawn supports students to develop their topic-related vocabulary by incorporating it into routine classroom activities. This detail was not captured in the unit documents, but she made separate notes relating to vocabulary and concepts to include. She explained that the class spends half an hour every morning talking about general topics and they create a sentence of the day incorporating vocabulary and ideas from teaching content:

So we include points that just build background knowledge and that when we actually do a lesson, children might know who, you know, Graham Bell is. (pre-design interview)

Dawn also referred to the fact that many students were new arrivals to Australia and that she was mindful of this when introducing new content. She noted in the pre-design interview that she approaches Australia-specific content by having a mini-discussion where she asks multiple questions to ascertain what the students' background knowledge is and where there might be gaps. She was also mindful of this throughout the teaching and notes that she needs to be ready to adapt the lesson content accordingly:

For example, if I do for example this and then see that, you know, my class would not know what the definition of ... what a federal government is... so I'll do a mini lesson on 'federal government', not just federal and state... you have to make it different because some of the kids don't have any background knowledge of any topics. (pre-design interview)

In terms of students' knowledge and skills with technology, I have previously noted the careful consideration Dawn gave to building the students' technology skillset. During the implementation phase of the study, she was surprised by the knowledge the students did have and how they used this knowledge to learn a new application:

They did sort of not struggle a lot with how to use the computer, how to use Publisher or how to save or how to insert pictures. So they did bring a lot of their own experiences with technology... (reflection interview)

This discovery led to Dawn noting that she should not assume that the students “don’t know much, because they are very surprising. They do bring a lot of their knowledge or it might be from home or classes of past years.” She went on the note further implications for the design process with technology:

I think as a point, not limiting them to one form of ... to producing something like not to one form of platform or whatever... giving them an option as well.. (reflection interview)

### 4.3 Summary

This chapter presented a contextual description and the key findings of this study. The findings showed that Dawn has a deeper understanding and conceptualisation of the role of technology in learning than she perhaps articulated at the beginning of the study. This was demonstrated in her highly detailed approach to designing the learning activities which aimed to prepare students for the summative assessment: the creation of a brochure using *Microsoft Publisher* or *Smore*. This was shown to contrast with her approach to selecting technology-based resources for delivering content, which was less systematic and contained less in-depth consideration of the students. The needs of her students were an important influence on Dawn’s design process generally, with consideration of the development of their technology literacy and their English literacy needs having considerable impact on Dawn’s thinking and decision-making. These key themes will be discussed in more detail in the next chapter.

## 5. Conclusion

The previous chapter outlined the key themes which emerged from the data analysis including: the teacher's perception of technology in teaching and learning; the teacher's approach to integrating technology; and the influence of students' needs on the teacher's design thinking and process. In this chapter, these themes are discussed with respect to the research questions and in light of the theoretical framework that guided the study. Following the discussion, this chapter discusses the limitations of this study, and presents implications, both in practical terms and in relation to future research.

### **5.1 Research Question 1: How do early career teachers approach the integration of technology into their learning designs?**

This overarching question that guided the study presented the opportunity to view the design process in a holistic way. This included a consideration of the teacher's internal resources engaged in the process, her consideration of students' needs, and the actual approach taken. The data relating to this question was collected using a range of instruments, including interviews, observations and diary notes. The use of the think aloud process during the design activity, where the participant was prompted to articulate her thinking at various stages, allowed for teacher thinking to be collected synchronously, rather than being reported after the activity. This enabled the identification of tacit knowledge and beliefs which were not reported in the interviews. In answer to the first research question, two themes were found to be of particular significance. These are discussed in the next two sections.

### 5.1.1 Two distinct approaches to integrating technology

Analysis of the design activity highlighted two different approaches to integrating technology into the unit of work. The first can be categorised as a content-based approach, where the search for, evaluation and adoption of technology-based content was conducted in a non-systematic way. Both technology-based and non-technology-based resources were viewed at this point, with frequent switching between several resources. Information about the resources incorporated into the unit was minimal, often a link and one line description. Content integrated into the unit was often video or presentation-based, and focused on the presentation of new content. The second approach, where the focus of the lesson was on preparing for an assessment task, was more considered and detailed and Dawn spent far more time considering how the technology would be introduced to the students and how the students would interact with the technology in the class.

Dawn initially articulated her rationale for integrating technology into her learning design to be higher levels of engagement for students, more effective communication of the lesson content and more interactivity for the students with the lesson resources. This viewpoint was not consistent with comments made frequently throughout the design process, however, which identified the development of students' technology-literacy to be a key factor in integrating technology into the unit of work.

If we view these findings through the lens of the TPACK framework, we can identify possible reasons for this duality of approaches. It is possible that Dawn's technological pedagogical knowledge is better developed than her technological content knowledge. A well-developed level of technological content knowledge is identified as having an in-depth understanding of how technologies may be selected and used in order to address subject-matter learning (Koehler & Mishra, 2006) While she does refer to some content-related aims for the technology through the design, such as using video to improve the students' listening skills, there is a lack of evidence of the use of technology to allow students to fully engage with the content in a meaningful way. This is consistent with many studies which found that teacher beliefs about teaching with

technology often do not translate into practice (Kali et al, 2011 and Lim & Chai, 2008). Bate (2010) found this to be particularly common among early career teachers. Evidence of technological pedagogical knowledge is greater, however, with the level of detailed pedagogical steps in the design which support students to approach and execute their summative assessment. There are differing perspectives in the literature on what constitutes the final frontier for technology integration, with some believing it to be teacher beliefs. However, Lim & Chai (2008) refer to assessment as the final frontier, with most teachers teaching to the assessment to a significant degree. This study appears to support this theory by highlighting the level of attention paid by the teacher to the technology integrated into the assessment preparation activities.

In the activity theory framework, the *tools* used by the participant (or *subject*) is one contextual component of the activity system, and we can also find evidence of other components in these two approaches to the design activity. In the second design approach outlined in this section, the process was heavily influenced by the assessment (*rules* component in AT), the needs of the students themselves (*community* component in AT) and the availability of the technology at the time of the lesson (computers to use *Microsoft Publisher* and *Smore*). In addition to differences in development of TPACK components, it is also possible that the change in approach was due to the rigour necessitated by the high stakes of the assessment and the needs of the students in order to be able to complete the assessment.

Some researchers have suggested that teacher beliefs and knowledge are contextually sensitive (Kali et al, 2011). It could be argued that this is the case in this study, in that the contextual components of the assessment and the students' perceived high needs have engaged a more detailed and sophisticated level of thinking by the teacher than at the other stage, where the focus was less contextually-dependent. For Dawn, the thinking appeared to reflect ideas about teaching which went beyond the unit of work. Her overall teaching approach was to seek out opportunities for building students' technology literacy in the same way she sought out opportunities for English literacy skills work.

### 5.1.2 Consideration of students' needs

The needs of the students were found to be a strong influence on Dawn's design thinking and practice. These needs were found to be in the areas of literacy, with the majority of students coming from non-English speaking backgrounds, and technology literacy. In the activity theory model, we can identify here the interplay between the contextual components of *community* and also *tools*, as Dawn's teaching schemata, shaped by her teaching experience came into play. In case-based reasoning (CBR), the internal tool engaged here, a teacher increases her knowledge by exposure to new situations and issues in the professional domain (Levin, 1995, Kolodner et al., 2004). This study found that Dawn was impacted greatly by the differences between the students at the schools where she completed her professional experience and her current school. This heightened awareness of how students' experiences can impact their learning was shown to influence her teaching and planning so that the needs of her current students were at the forefront of her thinking.

This level of consideration of students' needs concurs with more recent studies on teacher expertise development, which critique the traditional view that teachers progress through a series of linear developmental stages. These more recent studies show that expertise development is more contextually sensitive and that novice teachers are capable of considering students' needs as long as they have been exposed to processes which facilitate this (Levin, et al., 2009). This study shows that an early career teacher is absolutely capable of considering students' needs when planning and implementation of learning. This may be partly due to the processes in place at the school that foster collaboration and reflection with colleagues in the grade. However, Dawn's recognition of her students significant needs in certain areas is a clearly strong influence.



## 5.2 Research Question 2: How do the teacher's technology choices affect the overall design?

This research question aimed to identify any changes made to the learning design as a direct result of the selection of a particular technology. Research in teachers' planning of technology-based learning shows that teachers planning to incorporate technology into learning approach it in a "technocentric" way, meaning that their starting point is the selection of the technology tools and resources to be used (Harris & Hofer, 2009). This study did not find that the teacher began from the technology. Instead, Dawn searched for and selected technology according to the content focus, and she selected technologies according to its suitability for the assessment task. However, she also deliberately introduced a range of technologies for students to use in the assessment with the intention of expanding their technology skills.

The fact that these two processes were led by either the content or the assessment meant that the unit was not shaped to fit the technology and therefore its effect on the overall design of the unit was minimal. The noteworthy impacts of the integration of technology were twofold. Firstly, in practical terms, the impact was the need to ensure access to any hardware or equipment required. For the work on *MS Publisher*, this meant scheduling the lessons on days when the class was due to have a library session.

The second impact was the consideration of the students' technology skills and the background knowledge they might need to be able to use the technology effectively. In activity theory terms, we can see evidence in this study of the *community* (students) having a direct effect on the design of the lesson stages. The overall design therefore incorporated a scaffolded approach to delivering the content where the students were required to use less familiar technologies.

### **5.3 Research Question 3: How do contextual factors influence the way in which the teacher incorporates technology into a learning design?**

This final research question was included to address the need identified by many researchers in the field of learning design to investigate the influence of contextual factors on technology integration in learning designs (Harper et al., 2011, Kali et al., 2011, Laurillard, 2012). The components of context were investigated in this study through the lens of activity theory and are discussed in relation to literature in this field below.

#### **5.3.1 School support for technology integration into teaching and learning**

The case summary presented in the findings chapter of this study outlined the way in which the school facilitated collaborative stages of planning for teachers. The study also identified that the school had no specific guidelines or support for teachers in using technology in the classroom. School leadership is identified in the literature as being a key criterion for successful technology integration in schools (Hayes, 2003, Tondeur et al., 2013, Divaharan & Ping, 2010). Despite the lack of overt leadership in this area, the fact that the school had prescribed processes for the collaborative preparation for and reflection on the units of work means that provisions were made which support these important stages of learning design. Pedagogical reflection is shown to have a positive effect on the development of teachers' practice with integrating technology into learning (Earp & Pozzi, 2006). By espousing individual and collaborative reflection on the units, the school was facilitating the development of their teachers' case-based knowledge, both generally and in relation to technology integration. In activity theory, this is an example of the *community* interacting with the *tool* of CBR to more sophisticated design thinking during the activity. One important point to make here is that Dawn's knowledge and thinking in technology integration is mostly being developed through her own practice, rather than through the mentorship of more experienced teachers. The literature highlighted that experienced teacher knowledge and skills in integrating technology are often low in comparison with other areas of teaching. (Jordan, 2011). This raises the question of how successful general mentorship is

in supporting early career teachers in the principled use of technology in teaching.

### 5.3.2 Availability of technology

The availability of the technology hardware in the school did place restrictions on the design of the unit. I have already described the impact of access to computers on the schedule of the lessons throughout the unit. Access to iPads impacted on the learning design further still. With only six iPads available for grade five and six classes in the grade, the access to this technology can be described as restrictive. In activity theory, issues such as this are viewed as contradictions between the contextual components. Here we can identify a contradiction between the *rules* (school schedule for iPad use) and *tools*. In this context, the limited access to the iPads meant that Dawn's technological knowledge was not able to be engaged in the provision of tablet-based learning activities. The result of this was evident in the classroom with limited use of technology for interactive learning. The interactive whiteboard was the most commonly used technology in Dawn's classroom and this is mostly used in a teacher-centric way to present new content. Activity theory shows that such contradictions can result in resolutions and consequently improvements in the activity system (Murphy & Rodriguez-Manzanares, 2008). However, in this case study, there was no evidence that such a resolution and improvement was found.

## 5.4 Conclusion

The aim of this study was to conduct an in-depth and holistic investigation into an early career primary teacher's approach to designing learning with technology. It was anticipated that such a study would reveal important insights into the thinking and decision-making processes involved in designing learning with technology, as well as into how various contextual factors influenced the process. These areas have been noted as gaps in knowledge by researchers working in the field of learning design. Learning design is itself relatively new in the primary education sector, with many researchers identifying it as a potentially significant source of support to teachers who feel increasingly under pressure in their first few years of teaching.

An awareness of the fact that teacher thinking is often not fully articulated in direct interviews guided the research design to include a range of data collection instruments which would capture tacit knowledge and thinking along the way. The use of the think aloud procedure during the observation was particularly successful and led to the identification of the teacher's different perceptions of technology in teaching and learning, as well as her thinking in real time. The discussion of the analysis of the teacher's internal resources engaged in the learning design activity highlighted that it was carried out using the frameworks of technological pedagogical content knowledge (TPACK) and case-based reasoning (CBR). These formed part of the *tools* component of the activity theory model which was used to analyse the interplay of various components of the activity (learning design) context.

The findings of the study indicated that this early career teacher's approach to designing learning is strongly influenced by her students and their needs. Her perception of technology in education has been shown to differ at various stages of the design process according to the focus of the stage. Different approaches to the design of technology-based activities were also evident in accordance with these stages. These findings points to the influence of contextual components of the design activity which were highlighted through the lens of the activity theory model.

#### **5.4.1 Limitations of Study**

This was a single case study and as such is not generalizable in the context of other early career teachers and their approaches to technology integration. I acknowledge that the teaching context for each teacher will differ to some extent from this case. However, by focusing on a single case, I have been able to analyse in depth the thinking processes the teacher engaged through her practice, what influences individual stages of the design process, and I was able to capture that information as the design activity was taking place. The design of the research to include several data collection instruments has enabled the triangulation of the data, which strengthens the validity of the findings.

Limitations should also be noted in the context of the participant. She was originally a volunteer for the ARC Discovery project and as such might be presumed to have a particularly positive attitude and commitment towards teaching, which is unlikely to be the case for all teachers.

In terms of limitations regarding myself as the researcher, I acknowledge that having worked closely with the participant over a number of weeks, there is the possibility of researcher bias. I have attempted to reduce the potential for bias by having some interview protocols coded by a fellow researcher.

#### **5.4.2 Implications of Findings**

This study raises both practical and theoretical implications. In relation to learning design, which this study aimed to inform, there are significant implications. Firstly, regarding early career teachers' practices with technology integration, learning designs should support decision making which guides the development of technological pedagogical content knowledge. Guiding teachers through a process which leads them to make less arbitrary decisions about technology would support the development of their knowledge in all areas of TPACK. Such guidance could also support their thinking about students' technology literacy at a higher level of pedagogical consideration than the unit of work they are currently focusing on.

Learning design tools should facilitate the consideration of students and their individual needs. While this teacher paid close attention to the needs of her own students, such tools can be designed to ensure that this consideration is undertaken in a principled way and accounts for the needs of all students the unit of work is designed for. They can also be designed to ensure that care is taken not to duplicate or omit work through the integration of other teaching, such as library lessons.

The findings also showed that a degree of flexibility is needed within learning design tools to account for the fluidity of thinking at different stages of

the design process. This could be accomplished by allowing teachers to make design decisions at stages of the process which suit them and their context.

Regarding theory, this study was limited to the investigation of one activity system. Engeström's third generation of activity theory allows for the study of multiple activity systems interacting with each other. Investigating the school's teacher support system as a separate activity system which interacts with the teacher's design activity system could produce further insights into the contextual influences in this case.

#### **5.4.3 Significance and Future Research**

This research highlights some important aspects of an early career teacher's learning design process when incorporating technology. It highlighted the role of the assessment task as a stimulus for the choice of technology in the unit of work, the extent to which an early career teacher can anticipate and cater for the needs of her students, and the different cognitive processes which are engaged at different stages of the design process. These findings enhance our understanding of an individual teacher's design process at a detailed level and could contribute to future research in the field of learning design in the primary education sector.

The limitation of a single case study suggests clear areas for research in this area to be carried out in the future. Future studies could extend to more participants in order to examine whether there are similarities with the design practice of the participant in this study. Results from a study of this kind could contribute significantly to the development of learning design supports for early career teachers, by adding to our understanding of the stages or processes within the learning design process which would benefit from the greatest support. A further study could focus on the broader community aspect of individual teachers' design by investigating a group of teachers designing collaboratively. This is the area that I am hoping to investigate in a doctoral study.

#### **5.4.4 Concluding Statement**

This study set out to conduct a holistic investigation of an early career teacher's approach to designing learning with technology and aimed to identify which factors influenced her practice. The findings showed that this teacher was capable of quite sophisticated consideration of her students' needs, and that this led to a level of technology integration which was developed to meet these needs through the design of the technology-based learning activities. These findings support theories of teacher expertise development which show that the teaching context plays a major role in the process (Levin, 1995). The influence of contextual factors in this teacher's learning design practice highlights the need for learning design tools to be flexible enough to accommodate and allow for decisions which reflect a teacher's individual context.

## References

- Agostinho, S., Bennett, S., Lockyer, L., & Harper, B. (2011). The future of learning design. *Learning, Media and Technology*, 36(2), 97–99. <http://doi.org/10.1080/17439884.2011.553619>
- Australian Primary Principals Association (2007). *In the balance: The future of Australia's primary schools* - Retrieved April 11, 2015, from <http://www.appa.asn.au/reports/In-the-balance.pdf>
- Bate, F. (2010). A Bridge Too Far? Explaining Beginning Teachers' Use of ICT in Australian Schools. *Australasian Journal of Educational Technology*, (7), 1042–1061.
- Beetham, H., & Sharpe, R. (2013). *Rethinking Pedagogy for a Digital Age: Designing for 21st Century Learning*. Routledge.
- Bellamy, R. K. E. (1996). Designing Educational Technology: Computer-mediated change. In *Context and Consciousness: Activity theory and human-computer interaction* (pp. 123–146). MIT Press.
- Bennett, S., Agostinho, S., & Lockyer, L. (2005). Reusable learning designs in university education. In T. Montgomerie & J. Parker (Eds.), *Proceedings of the IASTED International Conference on Education and Technology* (pp. 102-106). Anaheim, CA: ACTA Press.
- Bennett, S., Agostinho, S., & Lockyer, L. (2015). Technology tools to support learning design: Implications derived from an investigation of university teachers' design practices. *Computers & Education*, 81, 211-220.
- Bennett, S., Agostinho, S., Lockyer, L., Kosta, L., Jones, J., & Harper, B. (2008). Understanding university teachers' approaches to design. *Faculty of Education-Papers*, 65.
- Berliner, D. C. (2004). Describing the Behavior and Documenting the Accomplishments of Expert Teachers. *Bulletin of Science, Technology & Society*, 24(3), 200–212. <http://doi.org/10.1177/0270467604265535>
- Borg, S. (2003). Teacher cognition in language teaching: A review of research on what language teachers think, know, believe, and do. *Language Teaching*, 36(02), 81–109. <http://doi.org/10.1017/S0261444803001903>
- Buchanan, J., Prescott, A., Schuck, S., Aubusson, P., Burke, P., & Louviere, J. (2013). Teacher Retention and Attrition: Views of Early Career Teachers. *Australian Journal of Teacher Education*, 38(3). <http://doi.org/10.14221/ajte.2013v38n3.9>



## References

- Carter, K., Cushing, K., Sabers, D., Stein, P., & Berliner, D. (1988). Expert-Novice Differences in Perceiving and Processing Visual Classroom Information. *Journal of Teacher Education*, 39(3), 25–31.  
<http://doi.org/10.1177/002248718803900306>
- Chai, C. S., Koh, J. H. L., & Tsai, C.-C. (2013). A Review of Technological Pedagogical Content Knowledge. *Educational Technology & Society*, (2), 31–51.
- Clark, C. M., & Yinger, R. J. (1977). Research on Teacher Thinking. *Curriculum Inquiry*, 7(4), 279–304.  
<http://doi.org/10.2307/1179499>
- Conole, G. (2010). Learning design – Making practice explicit. Sydney, Australia. Retrieved from  
<http://cloudworks.ac.uk/cloud/view/4001>
- Conole, G., Brasher, A., Cross, S., Weller, M., Nixon, S., Clark, P., & Petit, J. (2008). A new methodology for learning design. Association for the Advancement of Computing in Education (AACE). Retrieved from <https://lra.le.ac.uk/handle/2381/9781>
- Cross, N. (1982). Designerly ways of knowing. *Design Studies*, 3(4), 221–227. [http://doi.org/10.1016/0142-694X\(82\)90040-0](http://doi.org/10.1016/0142-694X(82)90040-0)
- Crotty, M. (1998). *The Foundations of Social Research: Meaning and Perspective in the Research Process*. SAGE.
- Dalziel, J. (2008). Opening Up Education: The Collective Advancement of Education through Open Technology, Open Content, and Open Knowledge - \_\_opening\_up\_education\_-\_ebook.pdf. Retrieved from  
[http://www.faithformationlearningexchange.net/uploads/5/2/4/6/5246709/\\_\\_opening\\_up\\_education\\_-\\_ebook.pdf#page=397](http://www.faithformationlearningexchange.net/uploads/5/2/4/6/5246709/__opening_up_education_-_ebook.pdf#page=397)
- Darling-Hammond, L. (2000). Teacher Quality and Student Achievement. *Education Policy Analysis Archives*, 8(0), 1. <http://doi.org/10.14507/epaa.v8n1.2000>
- Darling-Hammond, L., & Hammerness, K. (2002). Toward a Pedagogy of Cases in Teacher Education. *Teaching Education*, 13(2), 125–135. <http://doi.org/10.1080/1047621022000007549>
- Divaharan, S., & Ping, L. C. (2010). Secondary school socio-cultural context influencing ICT integration: A case study approach. *Australasian Journal of Educational Technology*, 26(6).  
<http://doi.org/10.14742/ajet.v26i6.1040>
- Dreyfus, H., Dreyfus, S. E., & Athanasiou, T. (1986). *Mind over machine*. Simon & Schuster.
- Engeström, Y. (2001). Expansive Learning at Work: Toward an activity theoretical reconceptualization. *Journal of Education and Work*, 14(1), 133–156. <http://doi.org/10.1080/13639080020028747>

## References

- Ertmer, P. A. (2005). Teacher Pedagogical Beliefs: The Final Frontier in Our Quest for Technology Integration? *Educational Technology Research and Development*, 53(4), 25–39.
- Ewing, R., & Manuel, J. (2005). Retaining quality early career teachers in the profession: New teacher narratives. Retrieved from <http://ses.library.usyd.edu.au:80/handle/2123/4529>
- Foster, P. N. (2002). Using Case-Study Analysis in Technology Education Research. *Journal of Career and Technical Education*, 19(1).
- Goodyear, P. (2005). Educational design and networked learning: Patterns, pattern languages and design practice. *Australasian Journal of Educational Technology*, 21(1).  
<http://doi.org/10.14742/ajet.v21i1.1344>
- Graham, C. R. (2011). Theoretical considerations for understanding technological pedagogical content knowledge (TPACK). *Computers & Education*, 57(3), 1953–1960.  
<http://doi.org/10.1016/j.compedu.2011.04.010>
- Harper, B., Lockyer, L., Bennett, S., Agostinho, S., & Jones, J. (2011). *Designing learning in higher education: Improving the quality of student outcomes*. Presented at the 3rd International Conference of Teaching and Learning (ICTL 2011), INTI International University, Malaysia.
- Harrington, H. L. (1995). Fostering reasoned decisions: Case-based pedagogy and the professional development of teachers. *Teaching and Teacher Education*, 11(3), 203–214.  
[http://doi.org/10.1016/0742-051X\(94\)00027-4](http://doi.org/10.1016/0742-051X(94)00027-4)
- Harris, J., & Hofer, M. (2009). Instructional Planning Activity Types as Vehicles for Curriculum-Based TPACK Development (Vol. 2009, pp. 4087–4095).
- Hashim, N. H., & Jones, M. L. (2007). Activity Theory: A framework for qualitative analysis. *Faculty of Commerce-Papers*, 408.
- Hauge, T. E. (2014). Uptake and use of technology: bridging design for teaching and learning. *Technology, Pedagogy and Education*, 23(3), 311–323. <http://doi.org/10.1080/1475939X.2014.942750>
- Hayes, D. N. A. (2007). ICT and learning: Lessons from Australian classrooms. *Computers & Education*, 49(2), 385–395. <http://doi.org/10.1016/j.compedu.2005.09.003>
- International Society for Technology in Education (2015). *Learning, teaching and leading A comparative look at the ISTE Standards for Teachers and UNESCO ICT Competency Framework for Teachers*, retrieved from:  
<https://www.iste.org/resources/product?ID=3612&name=Learning%2c+teaching+and+leading>

## References

- Jeffrey Earp, F. P. (2006). Fostering reflection in ICT-based pedagogical planning. Presented at the First International LAMS conference.
- Jensen, B., Sandoval-Hernández, A., Knoll, S., & Gonzalez, E. J. (2012). *The Experience of New Teachers*. Paris: Organisation for Economic Co-operation and Development. Retrieved from <http://www.oecd-ilibrary.org/content/book/9789264120952-en>
- Jonassen, D. H., & Hernandez-Serrano, J. (2002). Case-based reasoning and instructional design: Using stories to support problem solving. *Educational Technology Research and Development*, 50(2), 65–77. <http://doi.org/10.1007/BF02504994>
- Jones, J., Bennett, S., Lockyer, L., Jones, J., Bennett, S., & Lockyer, L. (2011). Applying a learning design to the design of a university unit: A single case study. In *World Conference on Educational Media and Technology* (Vol. 2011, No. 1, pp. 3340-3349).
- Jordan, K. (2011). Beginning teacher TPACK knowledge: Influence of school type (pp. 1–13). Presented at the ACEC2012: ITs Time Conference, Australian Council for computers in Education (AACE). Retrieved from <https://researchbank.rmit.edu.au/view/rmit:18501>
- Jordan, K., & Dinh, H. (2012). TPACK: Trends in current research (pp. 1–15). Presented at the (AACE) 2012 It's time conference, Australian Council for computers in Education (AACE). Retrieved from <https://researchbank.rmit.edu.au/view/rmit:18507>
- Kali, Y., Goodyear, P., & Markauskaite, L. (2011). Researching design practices and design cognition: contexts, experiences and pedagogical knowledge-in-pieces. *Learning, Media and Technology*, 36(2), 129–149. <http://doi.org/10.1080/17439884.2011.553621>
- Koehler, M. J., & Mishra, P. (2010). What Is Technological Pedagogical Content Knowledge? *Contemporary Issues in Technology and Teacher Education (CITE Journal)*, (1), 60–70.
- Kolodner, J. L., Owensby, J. N., & Guzdial, M. (2004). Case-based learning aids. *Handbook of Research on Educational Communications and Technology*, 2, 829–861.
- Kuutti, K. (1996). Activity Theory as a potential framework for human- computer interaction research. In *Context and Consciousness: Activity theory and human-computer interaction* (pp. 17–44). MIT Press.
- Laferrière, T., Hamel, C., & Searson, M. (2013). Barriers to successful implementation of technology integration in educational settings: a case study. *Journal of Computer Assisted Learning*, 29(5), 463–473. <http://doi.org/10.1111/jcal.12034>
- Laurillard, D. (2012). *Teaching as a Design Science: Building Pedagogical Patterns for Learning and Technology*. Routledge.

## References

- Lawson, B. (2004). Schemata, gambits and precedent: some factors in design expertise. *Design Studies*, 25(5), 443–457. <http://doi.org/10.1016/j.destud.2004.05.001>
- Leinhardt, G., & Greeno, J. G. (1986). The Cognitive Skill of Teaching. *Journal of Educational Psychology*, 78(2), 75–95.
- Levin, B. B. (1995). Using the case method in teacher education: The role of discussion and experience in teachers' thinking about cases. *Teaching and Teacher Education*, 11(1), 63–79.  
[http://doi.org/10.1016/0742-051X\(94\)00013-V](http://doi.org/10.1016/0742-051X(94)00013-V)
- Levin, D. M., Hammer, D., & Coffey, J. E. (2009). Novice Teachers' Attention to Student Thinking. *Journal of Teacher Education*, 60(2), 142–154. <http://doi.org/10.1177/0022487108330245>
- Lim, C. P., & Chai, C. S. (2008). Teachers' pedagogical beliefs and their planning and conduct of computer-mediated classroom lessons. *British Journal of Educational Technology*, 39(5), 807–828.  
<http://doi.org/10.1111/j.1467-8535.2007.00774.x>
- Lockyer, L., & Bennett, S. (2006). Understanding roles within technology supported teaching and learning, in n J. O'Donoghue (ed.), *Technology Supported Learning and Teaching: A Staff Perspective*, 210–223.
- Loveless, A. (2011). Technology, pedagogy and education: reflections on the accomplishment of what teachers know, do and believe in a digital age. *Technology, Pedagogy and Education*, 20(3), 301–316.  
<http://doi.org/10.1080/1475939X.2011.610931>
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2013). *Qualitative Data Analysis: A Methods Sourcebook*. SAGE Publications.
- Morehead, P., & LaBeau, B. (2005). Successful Curriculum Mapping: Fostering Smooth Technology Integration. *Learning & Leading with Technology*, 32(4), 12–17.
- Murphy, E., & Rodriguez-Manzanares, M. A. (2008). Using activity theory and its principle of contradictions to guide research in educational technology. *Australasian Journal of Educational Technology*, 24(4).  
<http://doi.org/10.14742/ajet.v24i4.1203>
- Mutton, T., Hagger, H., & Burn, K. (2011). Learning to plan, planning to learn: the developing expertise of beginning teachers. *Teachers and Teaching*, 17(4), 399–416.  
<http://doi.org/10.1080/13540602.2011.580516>
- Nardi, B. A. (1996). Studying Context: A Comparison of Activity Theory, Situated Action models, and Distributed Cognition, in *Context and Consciousness: Activity Theory and Human-computer Interaction*. MIT Press.

## References

- OECD. (2009). *Creating Effective Teaching and Learning Environments*. Paris: Organisation for Economic Co-operation and Development. Retrieved from <http://www.oecd-ilibrary.org/content/book/9789264068780-en>
- Orlando, J. (2014). Teachers' changing practices with information and communication technologies: an up-close, longitudinal analysis. *Research in Learning Technology*, Vol 22, Iss 0, Pp 1-15 (2014).
- Pegrum, M. (2009). *From blogs to bombs: The future of digital technologies in education*. UWA publishing.
- Punch, K. F. (2009). *Introduction to Research Methods in Education*. SAGE.
- Scanlon, E., & Issroff, K. (2005). Activity Theory and Higher Education: evaluating learning technologies. *Journal of Computer Assisted Learning*, 21(6), 430–439. <http://doi.org/10.1111/j.1365-2729.2005.00153.x>
- Shavelson, R. J., & Stern, P. (1981). Research on Teachers' Pedagogical Thoughts, Judgments, Decisions, and Behavior. *Review of Educational Research*, 51(4), 455–498. <http://doi.org/10.3102/00346543051004455>
- Shulman, L. S. (1986). Those Who Understand: Knowledge Growth in Teaching. *Educational Researcher*, 15(2), 4–14. <http://doi.org/10.2307/1175860>
- Shulman, L. S. (1992). Toward a pedagogy of cases. *Case Methods in Teacher Education*, 1–30.
- Smeets, E. (2005). Does ICT contribute to powerful learning environments in primary education? *Computers & Education*, 44(3), 343–355. <http://doi.org/10.1016/j.compedu.2004.04.003>
- So, H.-J., & Kim, B. (2009). Learning about Problem Based Learning: Student Teachers Integrating Technology, Pedagogy and Content Knowledge. *Australasian Journal of Educational Technology*, 25(1), 101–116.
- Sweeney, T. (2013). Understanding the use of interactive whiteboards in primary science. *Australasian Journal of Educational Technology*, 29(2). <http://doi.org/10.1234/ajet.v29i2.26>
- Tondeur, J., Kershaw, L. H., Vanderlinde, R. R., & Braak, J. van. (2013). Getting inside the black box of technology integration in education: Teachers' stimulated recall of classroom observations. *Australasian Journal of Educational Technology*, 29(3). <http://doi.org/10.1234/ajet.v29i3.16>
- Van Someren, M., Barnard, Y., & Sandberg, J. (1994). *Think Aloud Method*. Academic Press London. Retrieved from [http://echo.iat.sfu.ca.simsrad.net.ocs.mq.edu.au/library/vanSomeren\\_94\\_think\\_aloud\\_method.pdf](http://echo.iat.sfu.ca.simsrad.net.ocs.mq.edu.au/library/vanSomeren_94_think_aloud_method.pdf)
- Vygotsky, L. S. (1978). *Mind in society: The development of higher mental process*.

## References

- Wang, L., Ertmer, P. A., & Newby, T. J. (2004). Increasing Preservice Teachers' Self-Efficacy Beliefs for Technology Integration. *Journal of Research on Technology in Education*, 36(3), 231–250.  
<http://doi.org/10.1080/15391523.2004.10782414>
- Westerman, D. A. (1991). Expert and Novice Teacher Decision Making. *Journal of Teacher Education*, 42(4), 292–305. <http://doi.org/10.1177/002248719104200407>
- Wilson, T. D. (2006). *A re-examination of information seeking behaviour in the context of activity theory*. Retrieved from <http://www.webcitation.org/mainframe.php>
- Windschitl, M., & Sahl, K. (2002). Tracing Teachers' Use of Technology in a Laptop Computer School: The Interplay of Teacher Beliefs, Social Dynamics, and Institutional Culture. *American Educational Research Journal*, 39(1), 165–205.
- Yinger, R. (1979). Routines in Teacher Planning. *Theory into Practice*, 18(3), 163–169.

## Appendices

### Appendix 1a: Participant recruitment email to school principal text

Dear <Principal's name>,

Researchers at Macquarie University and the University of Wollongong are conducting a study of teachers' thinking and design processes when planning a unit of work for their class. We are now approaching schools who might be interested in participating the study.

In 2015 we are entering Phase 2 of the study. In Phase 2 we would invite participants to participate in a full-day planning workshop to be held at the participant's school. They will be asked to plan a unit of work that fits their choice of one of the Australian Curriculum areas of English, Mathematics, Science or History for upper primary (Stage 3). A member of the research team will interview and observe them over the course of the day. Also, in this phase we ask that the teachers actually implement the unit of work they planned and we will follow the teachers' processes through the implementation stage.

For this phase we are interested in participants who are either

1. Early career teachers – teachers who have graduated and commenced teaching within the last 5 years. Or
2. Experienced teachers – teachers with 10+ years of experience and are considered to have expertise in Quality Teachers and the integration of technology.

We would be aiming to conduct the Phase 2 workshop in Term 2, 2015 with the aim of implementing the unit the following term (i.e. Term 3).

I have attached a letter of invitation to you to Phase 2.

We hope you will consider participating in our project. If and your staff are interested or you have any questions please contact Professor Lori Lockyer ([lori.lockyer@mq.edu.au](mailto:lori.lockyer@mq.edu.au), 02 9850 9816) . A member of the research team will be in contact shortly to further discuss your potential participation.

Kind regards,

Lauren Knussen

Appendix 1b: Letter of invitation to participate – Principals



**MACQUARIE**  
University



<<Principal's name>>

<<School name>>

Dear<<Principal's name>>,

With my colleagues Professor Sue Bennett and Dr Shirley Agostinho at the University of Wollongong, I am working on a project investigating how teachers think about and design teaching and learning experiences – we're interested in how teachers think about the 'big picture' of teaching.

We would like to invite your school to participate in Phase 2 of our project. We are seeking your assistance to identify potential participants. We are looking for teachers who are either:

- early career teachers who have graduated and commenced teaching within the last 5 years, or
- experienced teachers who have been teaching for more than 10 years and are considered to have expertise in quality teaching and the integration of technology.

We will invite teachers to participate in a full day planning session at your school where they will be asked to plan a unit of work for Stage 3 to fit with the NSW Syllabi for the Australian Curriculum in English, Mathematics, Science or History. We will also request that they then teach the unit of work with their own class.

We will ask them to provide information as they participate such as through interviews and researcher observation of their process.

The University will pay the school for one-day release for their participation in the project.

A member of the research team will contact you shortly to discuss your school's potential participation. I can be contacted by phone 02 9850 9816 or email [lori.lockyer@mq.edu.au](mailto:lori.lockyer@mq.edu.au) if you have any questions.

We hope you will consider your teachers' participation in this project as a potential benefit to them and your school in providing support for both unit development and professional reflection.

Best regards,

Professor Lori Lockyer

Head, School of Education & Vincent Fairfax Family Foundation Chair in Teacher Education



Appendix 2: initial email to teacher

Dear <<<teacher's name>>>,

<<<principal's name>>> indicated you were interested in participating in the project: Designing effective learning experiences. We appreciate your interest and are very much looking forward to working with you on this project.

Participation in this project involves a days release for you to plan a unit of work. Specifically, you will be asked to plan a unit of work comprising learning activities and assessment which fit your choice of one of the Australian Curriculum areas of English, Mathematics, Science or History for upper primary (Stage 3 in NSW). You will be asked to implement your unit of work with your class.

A member of the research team will attend your school for the day to conduct a brief interview with you at the beginning and end of the day, as well as some observations of your planning and taking photos of the teaching setting.

The planning day will be arranged on a day during Term 2 that is most convenient to you. In your response could you please indicate two or more possible dates that would be suitable to conduct the planning day.

Attached is an information sheet that outlines more details of the project. If you would like to ask any questions or would like more information, please do not hesitate to contact me by phone (<<insert phone number>>) or email (<<[insert email address](#)>>).

I look forward to speaking with soon.

Many thanks,

<<Investigators name>>

### Appendix 3: Planning day information and schedule

#### **Project Title: Designing effective learning experiences: Investigating novice and expert teachers' design processes**

#### **Phase 2: Introduction and overview of the day**

Thank you for agreeing to participate in our research project on Designing Effective Learning Experiences.

The aim of our project is to find out how early career and experienced teachers approach the design of learning experiences for their students

Your Design Challenge for today:

We are asking you to plan a unit of work comprising learning activities and assessment which:

- fit your choice of one of the NSW syllabuses for the Australian Curriculum in English, Mathematics, Science or History for upper primary (Stage 3 in NSW)
- Consider cross-curricular opportunities
- Cater for multiliteracies
- Integrate technology

We don't expect you to complete the unit today – just get as far as you can.

We realise this is a somewhat artificial process but it allows us to observe you and ask you questions to enable us to form some preliminary findings about teacher design thinking.

The process will be as follows:

- We will ask you some questions about your teaching and past experience in planning units of work
- Then you will have time to design a unit of work. You are free to work as you would normally – thus please take a break whenever you like, we have provided you with morning/afternoon tea, etc...
- During this process we will ask you what you are thinking or what you are doing and this will be video-recorded.
- When there is 30 minutes remaining we will let know.
- We would like to take a copy of what you produce so if you haven't finished it, that's completely fine.
- We will then finish off with a short interview to ask you to reflect on what you have done.
- Then we will discuss next steps with you.

Research Project: **Designing effective learning experiences: Investigating novice and expert teachers' design processes**

The Design Challenge

Your challenge is to plan a unit of work for upper primary (Stage 3). You should:

- Choose a key learning areas from the NSW syllabuses for the Australian Curriculum - English, Mathematics, Science or History.
- Consider multi-curricular opportunities
- Integrate technology
- Cater for multiliteracies

Schedule for the day

8:45	Welcome, introduction and overview of the day
9:15	Pre-design interviews
9:45	Morning design session
11:15	Break
11:30	Mid-morning design session
1:00	Lunch break
1:30	Afternoon design session
2:45	End of day interview and next steps
3:30	End of day

Appendix 4: participant information and consent form

Chief Investigator: Professor Lori Lockyer

**Participant Information Form  
(Phase 2)**

Name of Project: **Designing effective learning experiences: Investigating novice and expert teachers' design processes**

You are invited to participate in Phase 2 of a study of teacher design thinking. The purpose of the study is to understand how teachers engage in the design of learning experiences informing the development of improved strategies and resources for initial teacher preparation and on-going teacher professional learning.

The study is being conducted by Professor Lori Lockyer, School of Education, Faculty of Human Sciences, Macquarie University, +61-2-9850 9816, [lori.lockyer@mq.edu.au](mailto:lori.lockyer@mq.edu.au); Associate Professor Susan Bennett, School of Education, Faculty of Social Sciences, University of Wollongong, +61 2 4221 5738, [sbennett@uow.edu.au](mailto:sbennett@uow.edu.au); Doctor Shirley Agostinho, School of Education, Faculty of Social Sciences, University of Wollongong, +61 2 4221 5512, [shirleya@uow.edu.au](mailto:shirleya@uow.edu.au). The study is funded by an Australian Research Council Discovery Project Award. Your involvement will also contribute to a Masters Research study being undertaken by Ms Lauren Knussen (supervised by Professor Lockyer).

If you decide to participate, you will be asked to participate in a planning task within your school environment. You will be asked to plan a unit of work comprising learning activities and assessment which fit the Australian Curriculum for English, Mathematics, Science or History for upper primary (Stage 3 in NSW). You will be asked to implement your unit of work with your class.

A member of the research team will attend your school for the day to collect the relevant data. This will entail the following,

- An interview will be conducted prior to you undertaking the design task (pre-design interview).
- Observations will be carried out during the session that focus on how you approach the design task.
- An interview will be conducted at the end of the day (end-of-day interview) to discuss your approach to the task and the product created.
- You will also be asked keep a planning diary to track development of your program and the details of its implementation.
- Providing copies of draft and final unit of work documents.
- Just prior to implementation a member of the research team will conduct a brief progress interview via telephone to discuss the development of the program in the time since the last interview.
- Finally, a reflective interview will be conducted to capture what happened during implementation of the unit of work

We would like to observe one of the lessons you teach as part of the unit. For this, we would follow this procedure:

1. A pre-teaching discussion to outline your plans for the lesson.
2. An observation of the lesson by a researcher.
3. A post-teaching discussion to reflect on the lesson.

With your permission the interviews will be recorded for later transcription. You will have an opportunity to review the transcription and make any clarifications you wish. Also, audio and video recordings will also be taken during the planning task to record the dialogue between the teacher/researcher and to capture how you create artefacts of the design process.

Any information or personal details gathered in the course of the study are confidential. No individual will be identified in any publication of the results. Only members of the research team and a professional audio transcription service will have access to the data. A summary of the results of the study can be made available to you on request – please let the researcher know if you would like this summary.

The findings of the study will be published in academic and professional teaching journal and presented at academic and professional teaching conference

Participation in this study is entirely voluntary: you are not obliged to participate and if you decide to participate, you are free to withdraw at any time without having to give a reason and without consequence.

### Participant Consent Form (Phase Two)

I, \_\_\_\_\_ (*participant's name*) have read (*or, where appropriate, have had read to me*) and understand the information provided about the *Investigating teacher design process* project coordinated by Professor Lori Lockyer from the School of Education at Macquarie University. I have had an opportunity to ask any questions I may have about the research and my participation and, any questions I have asked have been answered to my satisfaction.

I understand that consent to participate involves

- Participation in a design task to be held at my school during which I will be asked to create a unit of work that will be used in subsequent phases of the study.
- A pre-design interview about my background and experience.
- A member of the research team observing me as I design the program – the researcher will record field notes about that process. I understand that this process will also be audio and video recorded so the researchers can capture how I go about designing the program.
- An end-of-day interview for approximately 10 minutes about how I approached the design of the units and my considerations. I understand the interviews will be recorded for later transcription. I will have an opportunity to review the transcription and make any clarifications that I wish.
- Maintaining a design diary to track the progress of my program and details of its implementation
- Providing copies of draft and final unit of work documents.
- A brief telephone interview prior to implementation.
- A pre-teaching discussion to outline your plans for the lesson.
- An observation of the lesson by a researcher.
- A post-teaching discussion to reflect on the lesson.
- A final reflective interview after implementation

I understand that the following measures will be adopted to protect the identities of participants in the study:

- data collected will be stored securely in a locked filing cabinet in the School of Education, and will only be accessed by the researchers,
- my name will be replaced with an assigned pseudonym in all data (observations and interviews) collected during the project. Should I refer to a colleague or school by name during data collection, this information will also be replaced by pseudonyms. At no time during analysis or reporting of data will my name or associations be revealed.

By signing this form, I am indicating my consent to participate in the project as it has been described to me in the information sheet. I understand that my participation in this research is voluntary. I am free to refuse to participate and I am free to withdraw from further participation in the research at any time without consequence. I have been given a copy of this form to keep. If I have any enquiries about the research, I can contact Professor Lori Lockyer by email at [lori.lockyer@mq.edu.au](mailto:lori.lockyer@mq.edu.au).

Participant's Name: \_\_\_\_\_  
(Block letters)

Participant's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Investigator's Name: \_\_\_\_\_  
(Block letters)

Investigator's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

The ethical aspects of this study have been approved by the Macquarie University Human Research Ethics Committee. If you have any complaints or reservations about any ethical aspect of your participation in this research, you may contact the Committee through the Director, Research Ethics (telephone (02) 9850 7854; email [ethics@mq.edu.au](mailto:ethics@mq.edu.au)). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

Appendix 5: Pre-design interview

**Investigating Teacher Design Thinking**

**Phase 2: Pre-design Interview Schedule (Novice teacher)**

The focus of the interview today is on how you plan units of work, that is, the process you follow and what things you consider. Would you mind if I recorded the interview so that I can concentrate on our conversation rather than taking notes? *(If yes, start the recording).*

**Let's start off by talking a bit about your teaching experience.**

1. How long have you been teaching?
2. Where did you complete your training as a teacher?
  - a. Was it an undergraduate or graduate-entry program?
3. Is this your first school?
  - a. If no, at which other schools have you taught?
  - b. In what capacity did you teach at those schools – casual, temporary or permanent?
4. What years/stages have you taught?
  - a. Have you taught a particular stage more than others?
  - b. What stage have you most recently taught?
  - c. Tell me a bit about your thoughts and experiences using technology for teaching.
5. Tell me about your experience teaching Stage 3.
  - a. And, can you tell me about your experience with the NSW Syllabus for the Australian Curriculum?
6. Do you have any specific areas you work in such as special needs, gifted and talented, reading recovery, ICT coordinator etc.
  - a. What are they?
  - b. How did you get into that?
7. Have you ever held a non-teaching role in a school (e.g. administration, teachers' aide)?

*[Probe for what the role was, how long it was for and what it involved, what were the responsibilities]*
8. Have you ever held a non-teaching role out of school (e.g. another career, as a consultant etc.)?
  - a. Can you give an example and explain a bit about it?



9. Let's talk about your current teaching. Can you tell me a little bit about your current school?
  - a. What class/stage are you teaching at the moment?
  - b. Do you have a teacher mentor?
    - i. If yes, who is that and how do they support you?
  - c. Do you teach on your own or with someone else?
    - i. Are there specialist teacher who teach or support particular KLAs or other areas?
  - d. Are you involved in planning programs or units of work or are they prepared by someone else?
    - i. If they prepare... how do you usually plan programs or units of work for you class?
      1. Do you do it by yourself? Is anyone else involved?
    - ii. Do you have a choice on how you go about planning your units of work i.e. selecting assessment activities, in class activities, content and resources to include, etc.?
 

*[Probe:*  
*- Ask for more detail to get a sense of the 'division of labour' and how the staff community functions in the school*  
*- Ask for more detail about any specific influences mentioned. (Eg., syllabus)]*  
*(LK Probe:*  
*- What kinds of technology do you have access to for your teaching?*  
*Does the school have any policies or strategies about using technology for learning and teaching?*
  - e. When you're planning lessons for the unit, do you do that by yourself or with other teachers?
 

*(LK Probe:*  
*What do you consider in terms of teaching with technology when you are planning a unit?)*
  - f. What role does the school executive or your supervisor and/or your mentor (if they have one) play in the planning of your units?
10. I'd like to talk to you about the last time you planned a unit of work at the school we've just been talking about. Do you have one in mind
  - a. What was the unit of work?
  - b. Did you plan it yourself or did you work with others?
  - c. What is your starting point?
  - d. What did you do after that? *(Probe for the steps followed on at a time).*
    - i. Probe for what influences the decisions made for the unit.
    - ii. Probe for – where do you get your ideas from about how to teach the unit? *[Prompt: if needed: something you've taught before, from a colleague, from a book or article, from a course]*  
*(LK Probes: At what point do you start to consider if or how technology will be used in the unit?)*

*What influences your decisions about using technology?)*

- e. Would you say this is typical of what you usually do when you're planning a unit? *(Probe for similarities and differences)*
  - f. Once you've planned a unit,
    - i. What do you do before you teach it? (i.e. How do you prepare to teach it?)
    - ii. Do you find yourself changing it while you're teaching it?
      - 1. What kind of changes do you make? Can you give me examples? What prompts you to make those changes?
  - g. After you've taught it do you think about changes you'd make in the future?
    - i. How do you keep track of those possible changes?
11. Is there anything we haven't talked about that you think is relevant to how you go about planning units of work?

**Okay, now it is time for you to plan a unit of work today**

12. Can you tell me what you have in mind for the unit you're going to work on today?  
*[pause and wait for response and probe to get them to describe how they see the 'design problem' they're about to work on, and then go on to the further prompts]*
- a. What syllabus will you be working from?
  - b. Why have you chosen to focus on this?
  - c. Tell me about what resources you have brought with you today
  - d. Overall, how much thinking have you given the unit of work before coming here today?
  - e. Is there anything in particular you want to get out of this unit for yourself as a teacher? *[Prompt for new skills, knowledge, resources, practice or experience in something, trying a new approach/task.]*

**Close**

Now it's over to you. The next step is to move into planning the unit of work for a Stage 3 class based on the Australian Curriculum.

I'm going to turn the video camera on. It's going to generally record what you are doing and I'm going to take some notes about the process. Just go about your planning as if the video was not on. We are going to take a break around 11:15 but you can take a break anytime. And, please feel free to let me know what you are doing or ask any questions along the way.