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The Effect of De-Privatisation of the Mathematics Classroom on the Teacher

By

Jennifer Chu

A thesis presented to The University of Notre Dame Australia
in partial fulfilment of the requirements for the
Degree in Masters of Philosophy (Education)

Supervisors:

Mr Tim Perkins

Associate Professor Boris Handal

The University of Notre Dame Australia

School of Education

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Abstract

To improve teacher quality and student outcomes, teachers involved in the Reading and Mathematics Project (RAMP) in Catholic schools in the Archdiocese of Sydney have been required to de-privatise their classrooms so that teaching and learning can be observed by, and studied with, other educational colleagues within their own school. This study sought to ascertain how this approach to professional learning has impacted teachers, from their perspective, in the context of primary mathematics education. Teachers were able to voice the conditions under which de-privatisation would be most conducive to their learning and to improvements in the teaching of mathematics across their schools.

Employing case study methodology, data was collected through an online survey from 43 teachers who had participated in RAMP (Mathematics) in 2012-2013. Following this, 3 teachers were also individually interviewed. The data was analysed using both quantitative and qualitative methods to determine how de-privatisation was being enacted in schools, including the types and frequency of different forms and the effects it was perceived to be having on professional learning and mathematics teaching practice at an individual and whole school level.

The study found that teachers believed that de-privatisation was having a very positive effect. Specifically, the frequency of certain forms significantly affected teachers' perceptions and the forms of de-privatisation integral to RAMP, namely, in-class support from a Numeracy adviser and Instructional Rounds were viewed to be most beneficial. It also showed that overall teachers perceived 'Observing' a class rather than 'Being observed' as more influential to changing the way they taught mathematics.

Furthermore, the research indicated that when situated within a teacher inquiry model involving teachers collaborating in professional learning communities, these forms of de-privatisation have the potential to improve the teaching of mathematics at the classroom and school level.

Declaration of Authorship

This full research master's thesis is the candidate's own work and contains no material which has been accepted for the award of any degree or diploma in any other institution.

To the best of the candidate's knowledge, the thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

A handwritten signature in blue ink, appearing to read 'J. Chen'.

Candidate's Name

14·7·2015

Date

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Chapter 1: Introduction

Traditionally, classrooms have been the realm of the individual teacher. Whilst exposing practice has been an essential part of pre-service education for aspiring teachers, once they have graduated, they have typically worked autonomously in their own little boxes. Whilst with their colleagues outside the classroom, they may have planned, engaged in professional development and certainly de-briefed about their successes and challenges, when it came to teaching, it was a case of each to their own students, in their own room (City, Elmore, Fiarman & Teitel, 2009; Darling-Hammond & Ball, 1998; Elmore, 2004; Fullan, 2009; Hattie, 2015a; Hiebert, Gallimore & Stigler, 2002; Stigler and Hiebert, 1998, 2009).

This indeed was predominantly my experience for the first twenty years of my teaching career as a primary school teacher. Of course, there were occasions when I combined my class with another and taught alongside a colleague for various purposes, however the bulk of the instruction delivered to my students, I did independently. I must admit that there was definitely a sense of freedom that came with this approach which I enjoyed. However, particularly when challenges presented, I found the classroom to be quite isolating.

Over the last four years, I have worked in the role of Numeracy Adviser (mathematics coach). My role has been to build the capacity of teachers within my region of schools in the learning area of mathematics. As part of this, I have had the privilege of working with teachers in their classrooms, modelling teaching, team teaching or observing teaching and providing feedback. I have learned so much from seeing others in action and as a result, have undoubtedly become a more accomplished and effective practitioner. It has also amazed me, how much others have

professed to have learned from witnessing my teaching. So often, it has been the little things that have been an incidental part of my teaching, day in, day out, over the years, which have been embraced as revelations, by others. I have come to appreciate that the classroom can be a very powerful learning environment for teachers.

Furthermore, my role has thrown me into the world of educational research, a world that I had very rarely ventured into during my teaching career, not because I lacked interest, but simply because I did not have the time or energy to go there, when immersed in the busy and complex environment of school. In exploring current research, particularly in the areas of professional learning and mathematics education with other practitioners, I have been able to make links between theory and practice, providing explanations for why things work or interrogating why I do the things I do. I have been enlightened to the great growth possible when theory, research and practice are connected in the classroom setting.

These experiences have been my motivation for this research which focuses on de-privatisation. De-privatisation of classrooms has become increasingly prevalent in schools and across systems in education as a strategy for improving the quality of teaching and ultimately, improving student outcomes, as is evident in the employment of people like myself. However, being counter-cultural, it has been confronting for teachers and challenging for schools and systems who have not been accustomed to engaging or leading this type of learning. Considering de-privatisation is an emerging phenomenon in Australia, it is worthy of investigation.

The notion of de-privatisation has emerged from research that asserts that professional learning will only lead to sustainable change in teacher practice if it: (a) is embedded within the school context (Darling-Hammond & Ball, 1998; Fullan, 2009; Hiebert, Gallimore & Stigler, 2002;

Stigler & Hiebert, 2009; Timperley, 2008; Timperley, Wilson, Barrar & Fung, 2007) and furthermore, (b) requires teachers to “open their classroom doors, so teaching can become a shared object of study” (Stigler & Hiebert, 2009, p. 36). It is radical in education in the western world, considering that professional development has typically been delivered to teachers external to the school, or at least external to the classroom.

It particularly became apparent that de-privatisation could be useful to teachers in the western world after the large scale *Trends in International Mathematics and Science Study* (TIMSS) video study in 1995 by Stigler and Hiebert (1998) that highlighted the significant differences in student learning and teacher learning between Japan, Germany and the United States. In the context of mathematics, it found that Japanese students were performing significantly better than their counterparts and furthermore, the nature of professional development for Japanese teachers was also very different. Typically, teachers in Japan had been participating in lesson study, a school-based professional development approach that involved teachers collaboratively devising a lesson to be observed and critiquing its effectiveness to inform future practice (Stigler & Hiebert, 1998, 2009). This process involved intense lesson planning drawing on multiple resources, including research, as well as de-briefing after the observation, usually including feedback from an expert, external to the school. The results of this study led to lesson study being strongly advocated across the world (Hiebert et al., 2002; Lewis, Perry & Hurd, 2004). Since then, other forms of de-privatisation have also been developed to ground teacher learning within their school contexts. These include the use of mathematics coaches (Higgins & Parsons, 2011; Obara, 2010; Obara & Sloan, 2009; Palmer, 2013; Russo, 2004) and Instructional Rounds (IR) (City et al., 2009).

De-privatisation as a form of professional learning for teachers has also been a characteristic of other high performing countries in TIMSS. Interestingly, China who is one of a number of other East Asian countries that has consistently outperformed the high achieving Japan and other countries over the last two decades (Mullis, Martin, Foy and Arora, 2012), also has an established culture of school-based professional learning. Teachers belong to ‘Teacher Research Groups’ which engage in regular collaborative planning and peer observation in ‘open class lessons’ to collectively build expertise (Gai, 2014; Lim, 2007; Yang, 2009). Furthermore, to support teachers in the implementation of its reformed mathematics curriculum, China has implemented a multi-level professional development plan on scale, including job-embedded training via mathematics coaches and observation visits to other schools (Gai, 2014). Other consistent high performers, like Singapore, Hong Kong and Korea have been quick to take up Lesson Study or adopt their own culturally suitable versions (Cheng and Yee, 2012).

This idea of de-privatisation as a professional learning strategy for teachers is especially worthy of investigation in mathematics classrooms as the established culture of teaching and teacher learning (Stigler & Hiebert, 2009) has been identified as a major contributor to weakening student achievement and increased student disengagement in mathematics in Australia (MCEETYA, 2008; National Numeracy Review, 2008; Sullivan, 2011). Despite an abundance of research showing that students learn mathematics better when they can construct meaning through engaging in collaborative inquiry and reasoning (Wood, Cobb & Yarkel, 1991), traditional approaches characterised by transmission and practice, disconnected to life have been predominantly used (ACARA, 2009; National Numeracy Review, 2008; Stacey, 2010; Stigler & Hiebert, 2009; Sullivan, 2011).

Politically, in an effort to improve teacher quality quickly and on a large scale, Australian government policy has been supporting the use of de-privatisation in schools by requiring teachers to observe each other's practice to evaluate the effectiveness of each individual's teaching against the National Teaching Standards for Teachers (AITSL, 2011; NSW DEC, n.d., 2013a). Serious questions have been raised about the potential effectiveness of these reforms, as they have presumed that imposing standards or assessments and rewarding with financial incentives will motivate teachers and lead them to improved skill development (Elmore, 2004; Fullan, 2011a; Hattie, 2015b; Masters, 2014). However, current research has indicated that it is in showing respect to the teaching profession and supporting school leaders to build collaborative cultures that facilitate collective learning amongst teachers through professional learning communities (PLCs) within schools, that they will be successful (Fullan, 2011a; Hattie, 2015a; Masters, 2014).

It is within this current context that this research has sought to ascertain how the de-privatisation of classrooms is impacting teachers and to identify the conditions under which teachers find it most conducive to enhancing their learning and improving their practice, thus hopefully informing professional learning models employed by schools and systems in the future.

This study focuses on teachers involved in the Reading and Mathematics Project (RAMP); an innovative professional learning initiative that has been employed in Catholic Schools in the Archdiocese of Sydney. RAMP has insisted that teachers de-privatise their classrooms. Not only has it combined the approaches of mathematics coaching and IR but when these have been embedded in the *Teacher inquiry and knowledge-building cycle to promote valued student outcomes* professional learning model (Timperley et al, 2007), it has also shared similarities with lesson study. Through RAMP, Catholic Education in Sydney has endeavoured to support schools

to set up structures, like PLCs and teacher inquiry processes that “situate the energy of educators...as the central driving force” for change (Fullan, 2011a, p.3). This approach has emerged from a breadth of current research that: (a) acknowledges that it is the quality of teaching that has the biggest effect on student learning (Dufour & Marzano, 2011; Hattie, 2009) and (b) that rather than imposing accountability demands on teachers, goals of reform need to be aligned with the “intrinsic motivation of its participants” (Fullan, 2011a, p. 3). A system that has pushed for de-privatisation needs to respect its practitioners and tune in to what is motivating their learning. This research has provided a voice for teachers and has been concerned about understanding their experiences as they occur in their contexts.

Teachers who had participated in RAMP (Mathematics) in primary schools across the Archdiocese of Sydney during 2012-2013 were invited to complete an online survey which acquired information about the types and frequency of different de-privatisation experiences in their schools, their feelings about these and the perceived impact that these had had on their professional learning, their teaching practice and the teaching of mathematics across the school. They were also able to provide advice about the conditions under which they believed de-privatisation would be most helpful to teachers in the future. In addition, the survey invited teachers to participate in a follow up interview to further discuss their ideas about de-privatisation. Across the schools in the three regions, 43 teachers submitted surveys and 3 of these were interviewed.

Quantitative and qualitative methods were used to analyse the data. The analysis found that teachers were overwhelmingly positive about the effects of de-privatisation on their professional learning and their teaching of mathematics. In particular, de-privatisation of classrooms for the purposes of visits from numeracy advisers and for IR, were found to be most helpful. Moreover,

teachers indicated that the frequency of de-privatisation experiences impacted significantly on their learning. Most teachers also indicated that they believed that opening classrooms had led to positive changes in the teaching of mathematics across the school, although it was acknowledged that there was still plenty of room to grow. A set of conditions was identified to support further improvement in the future.

The results of this research have raised implications for how de-privatisation can be included within professional learning models and for system and government policy. They have reinforced many of the themes that have been emerging from current research about the helpfulness of teacher learning within school-based PLCs. Recommendations for future research about de-privatisation have been made.

Following is a review of literature (Chapter 2) which begins by highlighting the need for cultural change in the teaching of mathematics, the professional learning of teachers and in whole system improvement by employing de-privatisation. The notion of de-privatisation is then explored in relation to the theories of ‘communities of practice’ and ‘professional learning communities’. Next, three contemporary approaches to de-privatisation are explored and RAMP is established as a suitable context for this research study.

The particular methodology adopted in this study is then extensively explained (Chapter 3). The analysis which follows begins by examining the quantitative data using both descriptive and inferential statistics (Chapter 4), followed by the qualitative data using thematic analysis (Chapter 5). Finally, the results are summarised in relation to the research questions and the implications for theory development, teacher professional learning and system improvement are discussed (Chapter 6).

1.1 Definition of Terms

Table 1 provides a list of definitions that will be used throughout this manuscript.

Table 1

Operational Definitions

Term	Description
De-privatisation	The opening of classrooms so teachers can ‘observe’ or teaching and learning can ‘be observed’ by one or more other educational practitioners.
RAMP	An acronym for the ‘Reading And Mathematics Project’. This is a professional learning initiative that has been developed by the Catholic Education Office, Sydney for schools in the Archdiocese of Sydney. It aims to improve student outcomes in reading comprehension (in Years 5 & 6 - Stage 3) and mathematics content and pedagogy (in Years 5-8 – Stages 3 & 4). This research focuses only on the primary mathematics (Years 5-6 – Stage 3) component of RAMP.
Professional Learning	A broad term that refers to learning by teachers that is not restricted to particular activities, times or places (as professional development courses are) but is shaped by the context in which the teacher practices.
Professional Learning Communities (PLCs)	A group of educators who “develop shared mission, vision and values; engage in collective inquiry; build collaborative teams; take action; and focus on continuous improvement...” (Dufour & Eaker, 2009, p. 20) and who evaluate their success on the basis of student results.
Instructional Rounds (IR)	A systematic process that involves a group of educators inquiring into a problem of practice by observing teaching and learning in their colleagues’ classrooms. Teachers then debrief by analysing the observational data collected, to determine relationships between teacher instruction and student learning and plan their next level of work. This process requires educators to follow a set of protocols that enable them to engage in frank professional dialogue and build up a culture of collaboration. Developed by City, Elmore, Fiarman & Teitel (2009), originally to engage school leaders across a district to develop a shared vision for large scale improvement, in RAMP, it primarily focuses on teachers within PLCs in a school.

Chapter 2: Literature Review

Some schools and systems are employing professional learning approaches that require teachers to de-privatise their classrooms; that is open their classroom doors so that teaching and learning can be observed by one or more educational professionals. In de-privatising the classroom, the act of teaching can be examined and learned within a collective and collaborative environment (Elmore, 2004; Stigler & Hiebert, 2009). This is a radical move, considering that for the last hundred years, in the western world, classrooms have been the domain of the individual teacher (Hiebert et al., 2002; Stigler & Hiebert, 2009). However, this break from tradition is an attempt to facilitate cultural change in school education that has been characterised by ingrained and stable teaching practices (Stigler & Hiebert, 1998, 2009) and improve teacher quality and ultimately, student outcomes. In instigating such significant change, it will be important to investigate the impact of de-privatising classrooms on teachers and the extent to which it is facilitating professional learning and improving their teaching.

This literature review intends to examine de-privatisation in relation to the mathematics component of the curriculum. It begins by exploring the significance of de-privatisation as a mode for enhancing the professional learning of teachers on a large scale, particularly in the context of mathematics education in Australia. It then considers the idea from the theoretical perspective of Lave and Wenger's 'communities of practice' (1991). Next the focus turns to three de-privatisation approaches that have been developed and used throughout the world in recent times; mathematics coaching, lesson study and Instructional Rounds. In identifying both the benefits for the professional growth of teachers and the challenges and questions that research has raised about the practicalities of each, the literature review concludes by examining

RAMP; an innovative professional development model that has drawn on and combined elements of the three approaches, highlighting it as a most suitable research situation.

2.1 The Need for Cultural Change

2.1.1 Teaching as a cultural activity

Stigler and Hiebert (1998, 2009) asserted that teaching is a cultural activity. They argued that within a culture, people share a perception or “cultural script” of what teaching is like. The shared cultural script is underpinned by specific beliefs about how students learn and how the teacher should teach and evolves implicitly through experience over a long period of time.

Consequently, it becomes so embedded within the complexity of society that it is very difficult to change. The result has been that teachers very often teach in the way they have been taught.

Through their large scale *Trends in International Mathematics and Science Study* (TIMSS) 1995 video study, in which they videotaped 8th grade mathematics lessons in Japan, Germany and the United States, Stigler and Hiebert, (1998) were able to describe the cultural scripts of the various countries and highlight the core cultural beliefs about teaching mathematics. They noted extreme variations between the cultural scripts of the American and Japanese lessons, with the characteristics of the German scripts falling between the two, although aligning more with the Americans. They found that typically, a lesson in the United States was characterised by students being taught procedures that they then practised applying to various problems. Teachers in the United States were concerned about maintaining control, keeping students engaged and attentive and dealing with the challenge of catering for the various needs of individuals within the class. In contrast, Japanese teachers had their students developing their own methods for problem solving. Students were encouraged to grapple with problems, discuss the different ways they solved them

and most importantly, see connections between the processes and concepts. The Japanese teachers considered confusion as a natural part of the problem solving process and individual differences between students a natural part of belonging to a group. Most importantly, to create optimal opportunities for students to gain understanding, there was a concern that one part of the lesson flowed to the next and that the lesson was devoid of external interruptions.

Studies in Australia have exhibited a trend consistent with the United States. In 2003, Hollingsworth, Lokan and McCrae filmed 87 Australian Year 8 teachers during their mathematics lesson in the TIMSS Video Study (ACARA, 2009). They found that the problems presented to students were predominantly low in complexity, simply requiring students to practice procedures and with limited connection to the real world. These findings have been reinforced by the work of Stacey (2010) who reported that middle school classrooms typically were characterised by ‘the shallow teaching syndrome’; repetitive problems requiring virtually no student reasoning.

Furthermore, Stigler and Hiebert (2009) highlighted the ingrained and stable nature of teaching when they repeated their video study in 1999, this time focusing on a larger number of high achieving countries. They found that despite the employment of significant initiatives to improve teaching in the United States and a belief amongst many teachers that they had indeed made positive adjustments to their pedagogy, there was no significant difference and furthermore, that the observed patterns reflected a tradition in teaching spanning over 100 years. They also noted widespread differences between the teaching methods amongst high performing nations, highlighting that what these countries had in common were not particular teaching strategies or methods, but a shared commitment to engaging “students in exploring mathematical relationships and wrestling with key mathematical ideas” (p. 36). Consequently, they concluded

that the key to improved achievement was not necessarily altering teaching techniques but developing a shared understanding amongst educators of how students learn.

Such findings are supported by the research of Clarkson, Bishop, FitzSimons and Seah (1999) who investigated teacher values in mathematics education. They defined culture as an “organised system of values” (p. 2). They identified three types of values which are transmitted both implicitly and explicitly when one teaches: the general educational (societal values like honesty and good behaviour), the mathematical (for instance, rationalism and openness) and the mathematical educational (like showing working out and calculating mentally before using a calculator). Furthermore, they reported that there is a complex and two-way interaction between the values in the mathematics classroom, educational institutions and the society in which they are situated which also influences the interactions in a classroom. Until recently, unlike other learning areas like science or literacy where teachers were in tune with many of their values as they intended to formally teach them, mathematics was perceived as “a value-free and culture-free subject” (p. 3). Teachers had a narrow understanding of the values they were imparting to their students in mathematics and many believed that they were not teaching values at all in this learning area.

Clarkson et al. (1999) argued that as values equip the individual with “cognitive and affective lenses” (p. 3) that shape how the world is perceived and influence how one acts, if the quality of mathematics is to be improved, teachers need to gain more control over their own values teaching. Even now, as the important place of values in mathematics education is beginning to be acknowledged, much work needs to be done towards developing a shared language such that they can explicitly be discussed.

2.1.2 Teacher learning as a cultural activity

When exploring ways to improve teacher quality it becomes apparent that not only is teaching a cultural activity but so is teacher learning (Stigler & Hiebert, 2009). In countries like the United States and Australia, professional development has typically been characterised by workshops or courses delivered by experts or leaders, with an expectation that teachers take the learnings provided and apply them to their particular contexts (Darling-Hammond & Ball, 1998; Stigler & Hiebert, 2009). The assumption has been that the teachers have the necessary knowledge and skill to attend to the gap between the theory presented and practice in the classroom. This assumption has failed to acknowledge the reality that teaching is a complex activity that involves the individual applying their content knowledge, knowledge of the students and how they learn and pedagogical knowledge, to practice in a context that naturally also imposes its own demands (Timperley, 2008). This approach has also presumed that the teachers' beliefs or theories about teaching and learning have been shared by the professional development providers, which generally has not been the case (Darling-Hammond & Ball, 1998; Fullan, 2009; Givvin & Santagata, 2011; Santagata, Kersting, Givvin & Stigler, 2011; Timperley et al., 2007). Such professional development has been ineffective in sustaining changes to teacher practices and improving student outcomes (Fullan, 2009; Givvin & Santagata, 2011; Santagata et al., 2011).

In recent years, numerous researchers and educational leaders have recognised the need for cultural change, with the emphasis moving away from professional development towards professional learning (Fullan, 2009; Timperley, 2008). Whilst professional development is typically fragmented, short term and distanced from the teacher's school and classroom reality, professional learning is a broader term that acknowledges that learning is an ongoing, complex process that is not restricted to particular activities, times or places (Fullan, 2009; Scott, Clarkson

& McDonough, 2012). It has been agreed that professional learning is shaped by the context in which the teacher practices; the classroom, the school and the wider community. Therefore, learning opportunities for teachers will be most relevant and have the most impact when they are focused on the classroom (Darling-Hammond & Ball, 1998; Fullan, 2009; Stigler & Hiebert, 2002; Timperley, 2008; Timperley et al., 2007). As Fullan (2009) asserts, “professional learning ‘in context’ is the only learning that changes classroom instruction...” (p. 3).

There is extensive agreement on the important principles of programs that facilitate professional learning (Darling-Hammond & Ball, 1998; Fullan, 2009; Hord, 2009; Stigler & Hiebert, 2002; Timperley, 2008; Timperley et al., 2007). Essentially, professional learning:

- deepens teachers’ knowledge and leads to changes in their pedagogy;
- focuses on addressing student learning needs in practice;
- engages teachers in investigating practice; and
- involves professional discourse with colleagues about teaching and learning which can lead to shared standards of practice.

Rather than professional development being imposed from above, for improvement in teacher quality “schools need to work from the classroom outward... [it] works when it is school based and embedded in teacher’s daily work” (Fullan, 2009, p.3). Learning opportunities need to be provided for teachers to collaborate and inquire about teaching and learning. For this to happen most effectively, some would argue that teachers need to be willing to “open their classroom doors so teaching can become a shared object of study” (Stigler & Hiebert, 2009, p. 36). In other words, they advocate that classrooms need to be de-privatised for the learning culture of teachers to change. As Elmore (2004) explains:

The problem... [is that there is] almost no opportunity for teachers to engage in continuous and sustained learning about their practice in the setting in which they actually work, observing and being observed by their colleagues in their own classrooms and in the classrooms of other teachers in other schools confronting similar problems of practice. (p.127)

For the professional learning of teachers to be facilitated they require opportunities to both observe other practitioners in the act of teaching and be observed by their peers in their own classroom.

In summary, the research presented suggests that for an improvement in mathematics teaching and teacher learning, the ingrained practices within the teaching profession need to be changed. Cultural change is difficult and there are no quick fixes. Despite the research showing that students learn better when they are able to acquire deep understandings by constructing meaning through engaging in problem solving and inquiry processes and reasoning with others, on the whole they have stuck to traditional approaches involving the transmission of information, presenting mathematics as rule-oriented, with an absence of mathematical reasoning and no clear link to real life (Sullivan, 2011; Stacey, 2010; Wood et al., 1991). Likewise, teacher learning has focused on a model where information has been presented to educators with the expectation that they will be able to apply it in their multifaceted school context, when research is advocating that such a process is very complex and for professional learning to happen, teachers need to be able to engage in inquiry about their particular students' learning, with colleagues in their own teaching environment (Cobb, Wood, & Yackel, 1990; Darling-Hammond & Ball, 1998; Hattie, 2015a; Timperley, 2008).

2.1.3 System improvement as a cultural activity

It seems that beyond teaching and teacher learning, there also needs to be a cultural shift for large scale improvement in whole systems. At a time when significant global economic, technological and social changes characterise our world, new demands are being placed on our education system to ensure that Australian students will be prepared for these current and future challenges (MCEETYA, 2008; National Numeracy Review, 2008). This has especially been true for mathematics education. In 2006, the Council of Australian Governments commissioned a National Numeracy Review, acknowledging that numeracy levels are strongly associated with success at school and that the strengthening of these would contribute to the national reform agenda of increasing the nation's productivity and participation in the workforce (National Numeracy Review, 2008, p. xi).

This national educational reform agenda comes at a time when Australian students are performing well in mathematics when compared to their peers internationally (National Numeracy Review, 2008; Sullivan, 2011). However, whilst overall achievement results on the world stage remain quite strong, certain trends have emerged as a concern. Australia's ranking in comparison to other countries has declined in recent years with less students achieving at the top levels and results declining, whilst some neighbouring countries' especially in East Asia are strengthening (Masters, 2014). Furthermore, the large difference between the strongest performing Australian students and the weakest, that has been evident in Australia for some time (National Numeracy Review, 2008; Sullivan, 2011), has not been reduced. The lowest performing cohort continues to be disproportionately represented by students of Indigenous and low socio-economic backgrounds and the results of both groups have declined in parallel

(Masters, 2014). Consequently, there has been a renewed determination to strive for excellence and to address inequity issues (MCEETYA, 2008; Masters, 2014).

Within Australia, another major concern has been the disengagement of students in mathematics in the middle years of schooling, a trend that has continued into the senior years and beyond, with fewer students opting to study specialised mathematics or proceeding onto tertiary mathematics (ACARA, 2009). Whilst a number of possible reasons for this trend have been identified, some studies have attributed this to the nature of the curriculum that has placed an emphasis on the acquisition of routines and algorithms (ACARA, 2009; National Numeracy Review, 2008; Stacey, 2010; Sullivan, 2011). In essence, Australian students need to develop abilities to work adaptively, so they have the confidence to apply their understandings to solve problems and use reasoning processes to solve challenges in real contexts (ACARA, 2009; National Numeracy Review, 2008).

In order to foster large scale educational improvement, the Australian government has begun to implement a range of strategies to achieve its educational goals. These involve the establishment of a National Curriculum, the National Assessment and Reporting Authority and the Australian Institute for Teaching and School Leadership (AITSL), with the emphasis on strengthening teaching standards, assessment and monitoring; increasing accountability for schools and teachers, and measures for individual teacher and leadership quality. In NSW, the government has documented its aspirations in *Great Teaching, Inspired Learning: A blueprint for action* (NSW DEC, 2013a). Building on today's widely accepted view, that it is the quality of teaching that has the biggest effect on student learning (Dufour & Marzano, 2011; Hattie, 2009), it hopes to improve teacher quality by lifting the standard of entrants to the profession and the quality of their pre-service training, supporting beginning teachers with induction programs and

recognising teacher achievement, especially school-based, throughout their career (NSW DEC, 2013a). Central to its plans is the accreditation of teachers against the *Australian Professional Standards for Teachers* (AITSL, 2011). Indeed, in NSW, the process of accrediting teachers against standards has been in place for new graduates since October, 2004 (NSW DEC, n.d.). In being provided with a set of standards, it is hoped that teachers will develop a better understanding of what quality teaching is (AITSL, 2011), and furthermore, that they will be motivated to achieve the standards, especially given that recognition will be provided in the form of remuneration and promotions.

It remains to be seen whether such strategies will make a difference. However, research comparing how improving countries have driven reforms suggests that these initiatives will fail (Fullan, 2011a; Masters, 2014). Fullan (2011a) explains that “No successful system in the world has ever led with these drivers” (p. 7). He argues that whilst the goals are admirable, the strategies or “drivers” of change will be ineffective because predominantly they do not target “changing the day-to-day culture of school systems” (p. 8). They represent ploys to attain quick results and reflect a view that imposing standards or assessments will foster motivation and increased skills. He argues that it is in generating intrinsic motivation, by showing respect for the teaching profession rather than applying external pressures that a difference will be made. He reinforces the views of Elmore (2004) who emphasises that issues of accountability are reciprocal. He argues that the consequences could be

...disastrous if schools and school systems respond to demands for increased performance by pushing harder on the existing structure of schooling and demanding more from school personnel without acknowledging that few, if any, people actually know how to do the improvement work that must be done. (p. 132)

To drive successful reforms the focus must primarily be on improving instruction by building teacher capacity and furthermore, rather than attending to individuals, it is in employing collaborative practices, which allow educators to share knowledge, collectively problem solve and learn from each other, that this process will be accelerated (Elmore, 2004; Fullan, 2011a; Masters, 2014).

In recent times, these views have been reinforced by Hattie (2015a) who argues that too much emphasis has been placed on “fixing the teacher” (p. 5), rather than developing collaborative expertise within the school. Furthermore, he contends that systems and policy-makers have been distracted by the data highlighting the difference between schools when the variance of student achievement within schools is far greater (Hattie, 2015a; Hattie, 2015b). This is the case in Australia and other western countries. A major cause of this variance is the inconsistency in the effectiveness of teachers within schools, a variability which is generally not acknowledged overtly (p. 1, Hattie, 2015a). Whilst “autonomy to choose how to teach” has been considered a teacher’s right, he argues that this right should be earned through providing evidence of impacting student progress. It needs to be recognised that certain teachers have a higher impact on student growth than others and certain practices have a higher probability of success. He stresses, “...we must stop allowing teachers to work alone behind closed doors and in isolation in the staffroom and instead shift to a professional ethic that emphasises collaboration” (p. 23).

Schools need to set up collaborative structures which engage teachers in collectively evaluating the impact they are having on student progress and pooling their collective wisdom to establish shared expectations of what a positive impact looks like and how it can be achieved. This will reduce variability and “build a profession that allows all to join the successful” (p. 22).

In summary, for improvement in student outcomes, it is necessary to help teachers learn and to make the necessary adjustments to their pedagogy to attend to student needs. Therefore, resources should target the classroom within the context of the school (Darling-Hammond, 1998; Elmore, 2004; Fullan, 2009; Hattie, 2015b; Stigler & Hiebert, 2009; Timperley, 2008). Moreover, schools and systems should foster collaborative practices amongst teachers, setting up structures that encourage them to work together to respond to the learning needs of their students (Dufour & Marzano, 2011; Fullan, 2009, 2011a; Hattie, 2015a; Timperley, 2008). Some argue that whilst collegial communities can lead to improved instruction, it is necessary to go even further, insisting teachers de-privatise their classrooms, so they can observe and learn from each other's practice (Elmore, 2004; Fullan, 2011b; Stigler & Hiebert, 2009). These views are calling for radical changes to the culture of the teaching profession. It seems that beyond teaching and teacher learning, there also needs to be a cultural shift in whole systems for improvements at large scale.

Whilst changing a culture may seem overwhelming, systems that have altered their approach from primarily imposing accountability pressures and focusing on individual teacher quality, to building collaborative practices with a focus on improving teacher knowledge and skills in the classroom, have made very significant gains in a matter of years and the shifts required have been highly manageable (Fullan, 2011a; Fullan, 2011b; Fullan and Langworthy, 2014; Hattie, 2015a; Masters, 2014).

Recent research has shown that excellent leadership is essential in establishing favourable conditions within schools to foster cultural change and consequently, student performance growth (Masters, 2014). The recent development of the Commonwealth government endorsed, *National School Improvement Tool* (Masters, 2012) is an acknowledgement that school leaders

need significant support to achieve this goal. It provides a summary of priorities against which schools can review, reflect and work towards in order “to improve quality in classroom teaching and learning” (p. 1).

2.2 Theoretical Frameworks

2.2.1 Communities of Practice

The concept of a ‘community of practice’ was devised by Lave and Wenger (1991). Wenger (2006) defined communities of practice as “groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly” (p. 1). A community of practice naturally emerges out of an interaction between a ‘domain’ of knowledge, a ‘community’ of people and shared ‘practice’. It has an identity defined by a shared domain of interest. The members value collective competence and learn from each other because they are committed to a joint enterprise (Wenger, 1998a, 1998b, 2006). The members build relationships so they can learn together and in the process, these practitioners, over time, develop a repertoire of communal resources (experiences, tools, language, routines) which essentially become a shared way of doing (Wenger, 1998a, 1998b, 2006).

This concept assumes that people are social beings, knowledge is competence (being able to do something that is valued within the domain), knowing is a matter of actively engaging with the world and through this engagement meaning is acquired (Wenger, 1998a, p. 4). Knowing comes from active participation in social communities, through critical reflection on experiences with others (Wenger, 1998a, p. 10).

Theoretically, the concept of communities of practice is consistent with a social perspective on learning. Learning is an inherent part of lived experiences and it is determined by context and social interaction. Lave and Wenger (1991) assert that learning involves participating in communities of practice. Learning is not viewed as knowledge acquired by individuals but it is a process that takes place in a “participation framework.... It is mediated by the differences of perspectives among the co-participants. It is the community...who learn” (p.15). Basically, it is the nature of the social engagements in a particular *context* that impacts significantly on the learning process.

In exploring the notion of apprenticeship in the learning process, Lave and Wenger (1991) used the concept of “legitimate peripheral participation” to explain how apprentices or newcomers move towards full participation in the practices of the community. According to those authors, “A person’s intentions to learn are engaged and the meaning of learning is configured through the process of becoming a full participant in a socio-cultural practice. This social process, includes, indeed it subsumes, the learning of knowledgeable skills” (p. 29).

According to this theory, for learning to be enhanced, there is a need to cultivate communities of practice. It follows that to bring about the cultural change required to align research and effective teaching practices in schools, communities of practice could benefit from being “cultivated” in systems, schools and classrooms. Wenger (1998a) asserts that whilst “learning cannot be designed” as “ultimately, it belongs to the realm of experience and practice, ... there are few more urgent tasks than to design social infrastructures that foster learning” (p. 225).

Wenger (1998a) explains that communities of practice are important because it is within these communities that knowledge resides. Knowledge is shared and created and modified within and

among these communities. The communities of practice within an organisation, mobilise ideas, information and skills. They have the potential to spread best practices and facilitate effective feedback between participants (Wenger, 1998b). Furthermore, knowledge within communities of practice is “living”. It is there, in practice within the local situation, so it is relevant and meaningful to practitioners who share the context. Within these communities, collaborative inquiry occurs as participants invest energy to resolve their shared concerns and people develop their identities (Wenger, 1998b). Therefore, if systems, schools and classrooms can develop communities of practice, then knowledge can be shared, developed and spread.

Because communities of practice cannot technically be established, organisations can only really nurture them as they evolve. As relationships form within communities of practice, organisations can try to develop knowledge at the core of the community or alternatively at the periphery. In any community of practice there will be experts at the centre and other less active participants on the edge. Both of these groups have the potential to develop new insights and foster learning. Organisations need to support the development of knowledge and thwart these communities from becoming insular, possibly perpetuating ineffective practices or the spreading of inaccurate information (Wenger, 1998b).

Wenger (1998b) also highlights the importance of leadership within communities of practice. Just as communities arise spontaneously, leadership also naturally emerges. These roles may be formal or informal, however they have “intrinsic legitimacy” (p. 7), within the community. “Recognised experts” (p.7) are necessarily part of the community of practice because they validate it as a place for sharing and acquiring knowledge. Therefore, organisations can benefit from working with the leaders within a community of practice.

If effective learning is to be encouraged, organisations certainly would benefit from cultivating communities of practice. However, this is clearly not always easily achieved (Borg, 2012).

Organisations can employ a variety of strategies to sustain them, assuming that they can identify them. These include legitimizing participation by providing time for members to work together, supporting them with resources like external experts, technology and meeting spaces and eliminating barriers to participation (Borg, 2012; Wenger, 1998b).

2.2.2 Professional Learning Communities

In the context of education, the formation of professional learning communities (PLCs) has been strongly advocated as a means of cultivating communities of practice. Dufour and Eaker (2009) describe a professional learning community (PLC) as a group of educators who “develop shared mission, vision and values; engage in collective inquiry; build collaborative teams; take action; and focus on continuous improvement...” (p.20). Furthermore, a PLC evaluates its success on the basis of results rather than just good intentions.

In recent times, many schools and systems have formed PLCs in an endeavour to create collaborative cultures in local contexts and ultimately, improve the quality of teaching and learning. Research on how effective PLCs have been in practice, have highlighted benefits for teachers (Borg, 2012; Brodie & Shalem, 2011; Edwards, 2011; Hord, 2009; Lieberman & Miller, 2011; Timperley et al., 2007). For instance they have:

- provided opportunities for teachers to work in new ways together, breaking down teacher feelings of isolation;

- allowed educators to build mutual relationships of trust and respect, consequently encouraging the sharing of classroom experiences, collegial support and accountability, affirmation, reflection and growth; and
- provided opportunities for collective inquiry about student learning and the construction of shared knowledge and a vehicle for change.

However, not all professional learning groups have been associated with positive outcomes for students (Givvin & Santagata, 2011; Santagata et al., 2011; Timperley et al., 2007). Teachers have not necessarily appreciated being “put” into a team, particularly when their values and beliefs did not align with those of the group (Givvin & Santagata, 2011; Santagata et al., 2011). Whilst providing teachers with time to collaborate may have been a vehicle for facilitating change, there was no guarantee of improved teaching and learning. Sometimes the status quo could be reinforced, with encouragement to change resisted or misunderstood, or less effective pedagogy being promoted (Timperley et al., 2007). Increases in collective responsibility have sometimes been perceived as undermining teacher autonomy as teachers have felt accountable to the goals of others and pressured to comply with mandates. Problems can occur if the group is focused on adhering to rules or external monitoring that conflict with teacher reflection on effective practice and the impact on student learning (Elmore, 2004; Lieberman & Miller, 2011; Timperley et al., 2007).

Timperley et al. (2007) stressed that when PLCs successfully improved teacher and student learning, educators were supported to process new understandings and to reflect on the implications of these for their teaching. Teachers’ beliefs about their teaching were challenged and alternative perspectives were provided, often by an external expert. She highlighted the importance of incorporating expertise from outside the immediate community to engage in the

professional dialogue, stating that “all studies of professional communities that did not lead to improved outcomes for students lacked external input” (p. 203). They also explained that for success there must be a focus on analysing the impact of teaching on student learning. Teachers needed to draw on real data to assess their work and that of their students. They needed to believe that their practice could have an impact on student learning and there were established norms for collaboration and collective responsibility of students.

Fullan (2011a) and Hargraves and Fullan (2013) highlight the power that PLCs have to improve student learning. Referring to the work of Leana (2011) in the context of mathematics education, he reports that schools that invested in ‘social capital’; building trusting relationships amongst teachers and leaders that focus on professional dialogue about instruction, achieved better results than those that focused primarily on building ‘human capital’; teachers’ individual qualifications, experiences, knowledge and skills. Whilst teachers with high ability (high human capital) outperformed their low ability counterparts, even low ability teachers performed as well as more capable teachers if they had high social capital. “Being in a school around others who are working effectively rubs off on teachers and engages them” (Hargraves and Fullan, 2013, p. 37). Using the group to strengthen capabilities of the group also impacts on the capacity of the individual. In essence, both human and social capital are very important, however social capital is more powerful and also has the potential to boost human capital. Furthermore, by investing in social capital as well as human capital, by attracting and then nurturing high achievers, the gains can be compounded. This has been evidenced by the school system in Finland which has implemented a long term policy to attract high quality candidates to the teaching profession, in addition to investing in collaborative, classroom-based professional learning (Masters, 2014).

Based on examinations of the strategies that high performing systems and schools have employed, Hargreaves and Fullan (2013) emphasise that whilst investing in social capital is a most efficient and effective strategy to improve teaching within a school and indeed, a system, and investing in human capital can accelerate improvement, decisional capital; the capacity to make judgements, is also important. They explain that enthusiasm and dedication as well as teaching experience contribute to a teacher's ability to make good decisions. Teachers at different stages of their careers have different needs but all, especially those often most neglected in the middle years of their careers need to be supported and stretched. Ultimately, the aim of leaders should be to increase professional capital which is an interaction of human, social and decisional by "nudging", using highly supportive strategies and structures to enable and encourage people to work together (p.39). These strategies align to those required to cultivate communities of practice.

In summary, when PLCs evolve into communities of practice they facilitate modifications to teaching practices and improved levels of student achievement. Therefore, it is absolutely essential for schools to build opportunities for collaborative practices into their day to day routines for teachers and students. However, it is clear that if PLCs do not assume specific qualities they can become ineffectual or indeed detrimental to improvement. Some would argue that if the members of a PLC are truly going to grow professionally, they must enter the domains of each other's classrooms to learn about teaching by studying it in their local context.

2.3 Approaches to Enhance Professional Learning

The following part of this chapter will examine three approaches that have been developed to enhance professional learning and facilitate cultural change in systems, schools and classrooms by doing just this; mathematics coaching, lesson study and Instructional Rounds (IR).

2.3.1 Mathematics Coaching

Some schools and systems have employed mathematics coaches, also referred to as external experts or specialists, in an effort to promote the professional learning of teachers. This approach has become very popular in the United States over the last ten to fifteen years (Russo, 2004) and has also been adopted in Australia (Palmer, 2013). Mathematics coaches have been hired to provide job-embedded training to teachers in their classrooms, often whilst they are in the act of teaching, to help them make shifts in their practice that will translate to improved student outcomes (Higgins & Parsons, 2011; Obara, 2010; Obara & Sloan, 2009; Olson & Barrett, 2004; Palmer, 2013; Russo, 2004).

There have been a variety of models used, with coaches working across schools for blocks of time or solely being based within single schools, however whatever the model, the use of coaches has begun de-privatising classrooms. The advantage has been that in working one-to-one with practitioners, they have been able to provide differentiated teacher support in the teacher's context at the point of need (Obara, 2010; Obara & Sloan, 2009; Palmer, 2013). However, like most intrusions into the classroom, they have often initially been met with suspicion and resistance (Obara & Sloan, 2009; Palmer, 2013). Consequently, research has shown that the key to this approach is the coach's ability to build rapport and trust with educators and earn receptivity in classrooms and this requires regular and intensive contact (Obara & Sloan, 2009).

Furthermore, if they are going to lead to teachers making adaptations to their practice, external experts need to be able to develop relationships such that they can converse candidly with teachers and challenge their personal theories (Timperley et al., 2007). Olson and Barrett (2004) found that coaches needed to be able to question practitioners and evoke pedagogical curiosity such that they considered why students responded in certain ways in order to provoke changes to teacher practice.

The use of coaches has been viewed as a way to tackle the widespread concern that many primary school teachers do not have adequate mathematical content knowledge and attempts to move teachers away from traditional approaches to mathematics teaching have been hindered by this (National Numeracy Review, 2008). Programs that have been successful in mathematics have especially developed teachers' knowledge of mathematics and how students think mathematically (Timperley et al., 2007). It has been widely acknowledged that teachers require sufficiently strong mathematical content knowledge as well as pedagogical content knowledge if they are going to be able to respond to the needs of their students (Anthony & Walshaw, 2009; Coe, Aloisi, Higgins & Major, 2014; National Numeracy Review, 2008; Stacey, 2010, Sullivan, 2011).

Shulman (1986) classified the different types of knowledge that teachers need to be effective, highlighting the importance of subject matter knowledge, pedagogical content knowledge and curricular knowledge. He emphasised that teachers not only need to know the content of what they are teaching, why it is important and how it fits within the curriculum but also the ways to make the content comprehensible to students. According to Anthony and Walshaw (2009), teacher pedagogical content knowledge is that knowledge of how to teach mathematical ideas so learners can develop deep understandings. There is a connection between the content knowledge

and the way the particular content is taught (Coe et al., 2014; National Numeracy Review, 2008). Teachers use this knowledge to generate effective tasks and choose appropriate resources and it influences classroom discourse and the way a teacher interacts with the students. Teachers with strong pedagogical content knowledge in mathematics are able to help students make connections between mathematical concepts and link them to prior understandings, as well as anticipate possible student misconceptions. They can provide students with strategies to help them reason and problem solve. Such knowledge requires that teachers themselves have a solid grasp of mathematics (Coe et al., 2014).

As coaches are embedded in the classroom, they can model effective teaching, providing commentary as well as observing teachers in action, providing immediate feedback and hopefully, building up the competence and confidence of the individual teacher in the subject and especially strengthening their teacher pedagogical content knowledge.

Whilst most studies do not conclusively link coaching to increased student achievement, they do show that coaching has helped teachers to strengthen their own knowledge and skills and make changes to their practice (Obara, 2010; Obara & Sloan, 2009; Russo, 2004). In particular, the availability of immediate support and feedback has encouraged teachers to trial new approaches (Obara, 2010; Obara & Sloan, 2009). The presence of the coach in the classroom has led teachers to reflect on their practice and teachers have reported that they have altered their teaching when the coach was present (Obara & Sloan, 2009).

One of the main benefits of coaching is that it can facilitate collaborative practices in the school and encourage collegiality amongst staff members. When the coach was able to work with groups of teachers together, promote professional dialogue about teaching and learning, teachers

were able to learn from each other and were motivated to explore new strategies in their practice (Obara, 2010; Obara & Sloan, 2009). Higgins and Parsons (2011) report that when the approach employed by the external expert engaged teachers in collaborative inquiry about their practice, there were significant gains for teachers and students. In fact, Timperley et al. (2007) state that for PLCs to affect change in student learning, an external expert is necessary. Even schools or groups of schools who have established PLCs cannot presume that they have teachers and leaders with the depth of pedagogical content knowledge within their ranks to provide the adequate support to their colleagues.

However, ultimately, it seems the success of employing mathematics coaches rests on the quality of each individual coach. The role is a complex one and demands a high level of knowledge and skill (Higgins & Parsons, 2011; Obara, 2010). Not only do they require solid leadership and interpersonal skills and deep pedagogical content knowledge in mathematics, these experts also need knowledge of the curriculum and current research. As Higgins and Parsons (2011) explain:

They need to be able to make new knowledge and skills meaningful to teachers and manageable within their practice contexts, to connect theory to practice and develop teachers' ability to use inquiry and assessment data to inform their teaching decisions.

(p. 71)

Schools that opt for this approach to professional learning, whilst de-privatising the classroom, must also address a number of significant challenges. Finding and recruiting such experts can be difficult (Russo, 2004) and invariably it means drawing from the limited pool of effective classroom teachers (Obara, 2010). Clear role descriptions need to be established (Obara, 2010; Russo, 2004). These specialists require ongoing training and support to remain abreast of new

research, practices and curriculum developments and their employment can be costly (Higgins & Parsons, 2011; Obara, 2010; Russo, 2004). Furthermore, they must address the question of what constitutes as adequate time and quality support to bring about sustainable shifts in teaching and learning (Higgins & Parsons, 2011). It seems that further research is required to support schools and systems in addressing these practicalities when employing mathematics coaches.

Fullan and Knight (2011) argue that coaches are change agents that are a crucial part of whole-system reform in education. They report significant success in improving literacy and numeracy results and building a peer culture amongst teachers that fostered increased teaching capacity and collaboration and became “the source of energy and innovation” (p. 53) within schools. However they emphasise the importance of coaches being part of plans at a system, rather than at an individual school level. They need to be system leaders working alongside school leadership teams using their instructional knowledge, knowledge of the school and the system, to foster professional learning, improvements in instruction and ultimately, cultural change.

2.3.2 Lesson study

2.3.2.1 Japanese lesson study

Lesson study is an approach to professional development for teachers that has been dated back to the early 1890s in Japan (Shimizu, 2013). It is predominantly a school-based approach that pervades primary schools across the country and involves groups of teachers working together to research their own practice with colleagues. It aims to develop and maintain quality classroom instruction and can be practised across all key learning areas, however it is most commonly practised in mathematics (Doig & Groves, 2011; Shimizu, 2013). During the process, teachers collaboratively develop a lesson to be observed, focusing on key aspects of mathematical

knowledge: knowledge about the content, knowledge about the learners (how the students think and learn) and knowledge about the best ways to teach (Hunter & Back, 2011; Shimizu, 2013).

Japanese lesson study is a cyclical problem solving process for teachers that has distinctive stages: (1) Goal setting and defining the problem; (2) Planning the lesson; (3) Implementing the lesson and collecting data; (4) Discussing, analysing and evaluating the lesson (Doig & Groves, 2011; Hunter & Back, 2011; Shimizu, 2013).

Goal setting and defining the problem

The teachers begin by considering their long-term goals for their students' learning and development, often in light of the school plan or mission statement. These could relate to improving students' learning of a particular mathematical concept, enhancing students' attitudes towards mathematics or developing mathematical skills. They then define the problem they wish to address by identifying the area of greatest need for their students. This process is very important because the identified problem will be the focus for the group's study for an extended period of time; usually months or possibly years.

Planning the lesson

The teachers then collaboratively develop a lesson plan for their specific context over a series of meetings. The lesson plan is detailed and extensive and includes analyses of the task/s to be presented – the links with previous lessons and curriculum, anticipated student responses to the tasks, including possible misconceptions and the specific teaching strategies to be used to address these, and resources to be used and assessment strategies. To inform the plan, the teachers explore a broad range of materials. These could include textbooks, curriculum resources, previously used and evaluated lesson plans and student assessments. During this

process, the teachers not only develop a deep understanding of the subject matter but also explore a range of curriculum resources.

A critical part of the planning is to carefully select a single problem (referred to as the ‘hatsumon’) that will be the focus for the lesson. The group is aware that during the lesson the students’ thinking needs to become visible to the observers. Their aim is to develop a task that will engage the students in problem solving and elicit a variety of responses.

Implementing the lesson and collecting data

The lesson is taught by one teacher, whilst other members of the group observe. In addition, other educators from the school and even neighbouring schools also participate in this process.

The lesson follows a pattern distinctive to Japanese classrooms. Typically, after revising the previous mathematics session, a single problem is presented as the focus for the lesson. The students then work individually or in small groups to solve it. This is called ‘kikan-shido’ which means ‘instruction at students’ desks’. During this time the teacher will monitor the students’ progress and ‘purposefully scan’ their work to see which strategies they are employing. The teacher strategically plans a sequence for the whole class discussion (neriage) which will follow. At this time the teacher will invite particular students to share their responses in a well-considered order, so that misconceptions as well as efficient and effective problem solving methods can be illustrated. The students are encouraged to interrogate their peers or validate their thought processes. The teachers’ role is to ‘polish up’ the students, helping them to make connections. Finally, the lesson concludes with the teacher summing up the lesson (matome) by reviewing what has been shared and highlighting the key understandings.

The Japanese also place great emphasis on the blackboard which by the conclusion of the lesson will display a record of all that has been taught. This helps students to make connections, organize their thinking and provides them with a model of how to record their work.

Whilst the lesson is being taught, the observers take detailed notes about the lesson, without interacting with the students. Their main focus is on the students' learning. Therefore, the actions, utterances and recordings of the students are all important pieces of data to be documented.

Discussing, analysing and evaluating the lesson

Often an external expert is also invited to facilitate the post-lesson discussion. At this time, data that has been collected during the observation is shared and used to illuminate student learning. The group explores how the lesson could be improved and it is often further developed or re-planned, to be re-taught to another group of students, so the lesson is constantly improved. The lesson plan becomes part of a bank of lesson studies that can be accessed by teachers.

Over its century long history, variations have steadily crept into the way lesson study has been conducted across the country (Hunter & Back, 2011; Lewis, Perry & Murata, 2006; Shimizu, 2013). These may have been influenced by differences in school contexts. In recent years, particularly as interest in this form of professional development has spread to other countries, lesson study, which had traditionally been initiated by teachers, has sometimes been sponsored by institutions outside of the school (Lewis et al., 2006; Shimizu, 2013). For instance, universities have affiliated themselves with schools to test new approaches to teaching. Furthermore, pre-service teachers have been required to participate in lesson study as part of their training.

2.3.2.2 The potential of Japanese lesson study

In releasing the results of the TIMSS Video Study, Stigler and Hiebert (1998) provoked much interest in this Japanese tradition from across the world. The study of Japanese lessons highlighted a different way of going about teaching, and lesson study emerged as a potentially more effective way to enhance professional learning for teachers. It became apparent that just as a constructivist approach to mathematics teaching might be better for student learning, such a perspective could also be applied to teacher education. Over the last decade, adopting this approach in other parts of the world has been strongly advocated (Hiebert et al., 2002; Lewis et al., 2004; Stigler & Hiebert, 1998, 2009).

Lesson study fits nicely with the community of practice framework and the notion of a professional learning community. Through participating in the social process of lesson study, practitioners develop their identities as teachers and learn. Teachers as researchers within a collaborative group have the power to take more responsibility for their own professional learning. As it is a non-hierarchical process that is initiated within the school, teachers can enter the process with colleagues with differing levels of expertise and feel supported, rather than judged.

Hiebert et al. (2002) have backed Japanese lesson study as a way of strengthening the knowledge base of the teaching profession and consequently, improving classroom teaching. They explain that due to predominantly working in isolation, teachers have generally not drawn from a shared knowledge base, instead developing their own understandings derived from their own practice. They quote John Dewey, who even almost a century ago was lamenting:

... the successes of [excellent teachers] tend to be born and die with them: beneficial consequences extend only to those pupils who have personal contact with the gifted teachers. No one can measure the waste and loss that have come from the fact that the contributions of such men and women in the past have been thus confined (pp. 11-12).

Nor have teachers accessed the mass of educational research available, which is apparent in the traditional style mathematics lessons that still pervade American and Australian classrooms. They expose the significant gap between “craft” or practitioner knowledge and educational research knowledge and suggest that rather than dwelling on the profession’s failure to tap into research, it should explore ways of transforming practitioner knowledge into professional knowledge. They propose that lesson study is a great vehicle for this.

Hiebert et al. (2002) highlight the “concreteness and contextual richness” of practitioner knowledge (p. 3). It is detailed and specific and useful for practice because its creation has been motivated by problems that have emerged in the classroom and consequently it is directly connected to the processes of teaching and learning. Moreover, this “craft” knowledge respects the complexity and interwoven nature of knowledge that a teacher needs to draw on from moment to moment in a day; knowledge of the subject matter, knowledge of the pedagogy and knowledge of the students. This is precisely the type of knowledge that is observed when the classroom is de-privatised.

However, Hiebert et al. (2002) explain that for this knowledge to be truly useful and indeed acceptable beyond its immediate context, it needs to be turned into professional knowledge. They assert that, first and foremost, this means that the craft knowledge needs to be made public. This inevitably occurs when teachers engage in collaborative practices because knowledge is

shifted out of the realm of privacy and communicated with others. Furthermore, they believe that practitioner knowledge needs to be shareable, storable, accurate, verifiable and continually improving. Professional knowledge is theoretical. Therefore, it is important that craft is analysed and theories of practice are devised that can be referred back to, tested in various contexts and developed further. This can occur when teachers enter into an inquiry process about problems in their practice and begin hypothesising about their pedagogy. Finally, they insist that mechanisms need to be in place to ensure that the knowledge generated is correct. Local communities can become insular and believe that their beliefs and understandings are right when in fact they may not be. In order to guard against this, they propose that communities should draw on expertise from outside the community and focus on continually improving their practice.

Stoll (2012) emphasises that it is the nature of the learning conversations that occur within a PLC that are critical to whether there is a production of “collective intelligence” (p. 7). She explains that these conversations need to be purposeful, have a structured process and engage participants in genuine problem solving (inquiry) about how they can change their practice to improve student learning. She also reinforces that they should draw on external knowledge and experience, if new knowledge is going to be stimulated. When focusing on evidence from practice, teachers need to be able to respectfully challenge each other like a critical friend who pushes one out of their comfort zone with the best interests of the other at heart. It is within this setting, as practitioners draw on their prior knowledge and experience and try to make meaning from scrutinising evidence through talk, that knowledge is created. It is the social process that helps “transform tacit knowledge (what we know but don’t articulate) into explicit knowledge” (p.9).

Similarly, Harris and Jones (2012) emphasise that effective PLCs provide the conditions for the generation of new knowledge. They particularly insist that the work of the PLC is to be innovative and “push the boundaries of professional learning” (p. 15) such that practice is transformed. It needs to be constructive, rigorous and structured. Whilst the main purpose of a PLC is to “connect to learn”, they argue that often minimal consideration is given to the need for teachers to learn “how to connect” (p. 16). If the professionals do not have a common approach to, and shared methodology for professional learning, then new and helpful knowledge is unlikely to be generated, nor the PLC sustained. City et al. (2009) and Stoll (2012) also stress the importance of carefully established protocols and the development of dialogic skills. If these are in place, then the craft knowledge can more likely be turned into theories of action.

Lesson study, as earlier described, has the capacity to allow this knowledge transformation to take place. However, considering the cultural nature of teaching and teacher learning, it cannot be assumed that Japanese lesson study can simply be adopted and applied to another context (Shimizu, 2013).

2.3.2.3 Adapting Japanese lesson study into other cultures

Questions about how easily lesson study can be transferred from one context to another have been answered to a degree, through research that has emerged from around the world (Doig & Groves, 2011; Hunter & Back, 2011; Lewis et al., 2004; Lewis et al., 2006). Since the TIMSS video study in 1999, lesson study has been widely adopted as a form of professional development especially in the United States, and also in other countries around the world, including some parts of Australia (Doig & Groves, 2011; Lewis et al., 2004; Lewis et al., 2006). Indeed, Lewis et al. (2006) report that within four years, lesson study was being used in over 335

schools, across 32 states in the United States. Whilst these experiences have highlighted many benefits for teachers and often, even students, they have also unearthed some underlying cultural traditions about Japanese lesson study.

One of the most significant cultural differences is that teaching is a private activity in Australia, whilst in Japan it is public (Stigler & Hiebert, 1998, 2009). In addition, the students in the Japanese classroom are viewed “as a community of learners” who problem solve and learn together, with and from each other, whereas there is more of an emphasis on individuals in the Australian classroom (Doig & Groves, 2011; Stigler & Hiebert, 1998). Furthermore, in Japan there is an ingrained lesson structure that radically contrasts that of the typical Australian classroom. Namely, there is a specific emphasis on placing students in the role of ‘problem solver’ and then eliciting student thinking, however opportunities for student reasoning in Australian classrooms are highly limited (Stacey, 2010). Therefore, for teachers to get the full benefit of lesson study, significant changes to lesson structure are needed.

The Japanese education system has not been exposed to the volatile environment that Australia has and consequently, lesson study has evolved and been sustained. There, it is understood that lesson study requires a long term commitment (Doig & Groves, 2011). In Australia, new forms of professional development are continuously being explored. Goals being pursued are typically short term with almost immediate results required (Fullan, 2011a). Pursuing a long term goal for student learning has been highlighted as one of the most essential aspects of lesson study, yet this characteristic has “often been overlooked in other countries” (Doig & Groves, 2011, p. 80).

Another key cultural difference between Australia and Japan is the curriculum. Doig and Groves (2011) point out that “in contrast to the crowded Australian curriculum, the ‘frugal’ Japanese

mathematics curriculum affords both opportunities for, and dispositions towards, a detailed study of mathematical content” (p.81). Teachers study concepts over an extended period of time in detail and explore teaching materials. Consequently, they are knowledgeable enough to draw out student thinking and appreciate the variety of thought patterns students share. Doig and Groves (2011) also noted that when trying to replicate lesson study in an abbreviated form with international participants, many teachers demonstrated limited content knowledge, showing that more opportunities for deep exploration of mathematical content were needed.

Even so, despite the significant challenges of using Japanese lesson study in other countries, it has been successful in a variety of contexts and high hopes are held by many that this mode of professional development could lead to improvement in teaching and learning on a large scale (Hiebert et al., 2002; Lewis et al., 2006).

It is easier to understand the process and improve it, by participating in it. Lewis et al. (2004) stress that it is not just important to understand “an innovation’s visible features” like the lesson study cycle of planning, observing and re-teaching or even the way to structure a problem solving lesson, but the key is understanding the “pathways that link the innovation to instructional improvement” (p. 19). Through interviewing Japanese teachers and exploring recent American studies involving lesson study, Lewis et al. (2004) have identified some of these. To begin with, they have found that engagement in the lesson study process has led to increased teacher subject knowledge. In the context of mathematics, the process begins with educators examining key concepts and mathematical resources, which invariably has led to a more in depth focus on the content to be taught. Furthermore, in having the experience of being able to observe a lesson they have contributed to planning, the teachers also learn much about how to improve their instruction, as well as being able to carefully focus in on how individual or small groups of

students are thinking. Hunter and Back (2011) in their Australian study reinforced that through the sharing of their careful observations, teachers reflected on their students' understandings of key mathematical ideas, their misconceptions of these and the connections students were making between key ideas and the tasks and problems they were engaged with. Teachers were also able to more carefully tune into classroom discourse, listening to student questioning, as well as observing social interaction patterns within the classroom. Consequently, this led to them to recognise examples of effective pedagogy and to consider ways that teaching could be improved to promote better learning.

In addition, lesson study can lead to stronger collegial networks (Lewis et al., 2004). Teachers commented that they were able to work with their colleagues in a deeper way, sharing ideas and resources, providing feedback and engaging in reflection about teaching and learning (Hunter & Back, 2011; Lewis et al., 2004). This has led to the development of shared goals, a common understanding of what constitutes effective teaching, an improved commitment to inquiry and a shared responsibility and motivation to improve learning amongst colleagues (Doig & Groves, 2011; Lewis et al., 2004). Lewis et al. (2004) argue that "lesson study circumvents a common roadblock to improvement" (p. 21), namely, that certain improvement strategies do not get applied because teachers do not perceive them as aligning with their beliefs or values or assume they will not work. However, through the planning and observation process, teachers' views can be broadened and beliefs challenged as teachers are exposed to new ideas and alternative approaches in action; ideas and approaches that they might otherwise have prematurely dismissed (Hunter & Back, 2011; Lewis et al., 2004).

2.3.3 Instructional Rounds

2.3.3.1 The role of Instructional Rounds

Instructional Rounds (IR) is a new kind of professional learning which originated with a network of superintendents in Connecticut in 2001. Like lesson study, it involves groups of educators visiting classrooms to “look at instruction in a focused, systematic, purposeful and collective way” (Teitel, 2009, p. 1). However, unlike lesson study, IR has been developed primarily to engage school administrators (leaders) from various schools in a district, in networks. IR has been built on the belief that has recently emerged from research (Fullan, 2011b; Fullan & Knight, 2011; Robinson, 2011; Timperley et al., 2007), that the effect educational leaders have on student learning is determined by the degree to which they participate as “learner(s) in working with teachers to make improvements” (Fullan, 2011b, p. 3). And just as teachers learn best from each other, schools also would benefit from sharing their collective knowledge. Hence, the process is not about researching the impact of a well-planned lesson that in its crafting has involved teachers strengthening their mathematical content and pedagogical knowledge but rather connecting leaders with the core work of a school; teaching and learning, and de-privatising classrooms in an endeavor to develop a shared vision for large scale improvement.

City et al. (2009) strongly acknowledge that the tradition of teachers autonomously educating students in isolation from each other has hindered their professional growth and the achievement levels of their students, however they also emphasise that once classrooms begin to become de-privatised, there needs to be a shared understanding of what quality teaching is and the ways it leads to learning. They explain:

Slowly, the image of the teacher behind the closed classroom door is giving way to an image of an open door, but many educators are not sure what to look for when they open the door and what to do with what they see. (p. 3)

The IR process aims to develop “coherence” within schools and organisations so educators can establish agreed goals and expectations for student learning and together they can directly link instruction to school improvement or more specifically, student learning (City et al., 2009, p. 8).

The IR process has been developed at a time when governments and systems have been imposing more accountability pressures like teaching standards and external student and school assessments attached to rewards or punishments (Fullan, 2011a). Whilst these pressures have not led to improved school performance (Fullan, 2011a), they have forced school leaders to consider entering classrooms, or to at least provide teachers with more support within their classrooms (City et al., 2009; Elmore, 2007). Against this political backdrop and a tradition of closed classroom doors, it is understandable that teachers have been skeptical and resistant to visitors, especially superiors (City et al., 2009; Fullan, 2011a). However, the IR process is “an explicit practice” or set of protocols and processes that “is designed to develop a language and a culture for breaking down the isolation of teachers’ practice” (City et al., 2009, p. 9). City et al. (2009) appreciate that in engaging in IR, practitioners will be discomforted at least to begin with, however they assert that a certain degree of imbalance is required if a change in culture is to be brought about. They argue that whilst the norms of privacy are being challenged, teachers need to be assured that leaders are working in collaboration with them, supporting them in their practice. Everyone is learning together by doing the work of teaching. As Fullan (2011b) declares:

All this means that the individual, isolated autonomy of the teacher becomes passé. The cultural transformation then involves the de-privatisation of teaching. The new norm is interactive professionalism, which incidentally is the way of all advanced professions (p. 4).

IR has been adapted from a well-established model used by another profession - medical rounds. Just as groups of physicians and medical students work together in a specific way to observe and gather evidence from which they can diagnose illnesses and then discuss possible treatments, educators work together to systematically move through a cycle of inquiring into a problem of practice, observing lessons to collect data about teaching and learning and then debriefing as a group; analysing this data to determine the best strategies to employ to move forward.

In the quest for increased student learning, City et al. (2009) argue that the focus must be on the instructional core; the interaction between the teacher, the student and the task. Schools can easily be distracted by new programs, technologies and innovations and if the focus is not on the instructional core, the positive effect on learning is likely to be minimal. To improve student learning, there needs to be improvement in teacher instruction, student engagement or the level of content and because of their interdependence, a change in any aspect of this core, will necessarily affect the others. At the heart of the instructional core is the task that the students are required to perform. It is this task that predicts what the students will actually learn.

Consequently, an important part of the debriefing process after lesson observations is predicting what the students actually have learned, from doing everything they were expected to do, not what the teacher might think or hope that they learned. Ultimately, the process grounds members of the community in the day to day work of the classroom and leads colleagues to see the connections between practice and learning.

These connections are articulated in theories of action; causal *if-then* statements that relate the goal or vision to the instructional core (City et al., 2009). For instance, if educators participate in IR, they will develop a shared understanding of what constitutes effective instruction in mathematics. Linking the general to the specific, these theories need to be testable. They are to be constantly revised and changed and built upon. In devising theories of action, the group develops accountability amongst its members, as well as a common language.

In comparing medicine to education, Elmore (2007) discovered that the medical profession routinely used protocols in their practice which allowed them to communicate about their work in predictable and productive ways; protocols that were absent in interactions between educators. In particular, medical practitioners employed protocols which enabled them to “separate the person from the practice” (Elmore, 2007, p. 22). They were able to discuss “problems of practice in a relatively impersonal way, as if their practice were an objective thing, apart from who they are” (Elmore, 2007, p. 22). In contrast, as a result of working in privatised situations, teachers believe their teaching is an inherent part of who they are. When teachers enter into discourse about their practice they account for differences in practice by paying respect to an individual’s right to their own distinct style. City et al. (2009) argue that these practices are unprofessional and dysfunctional, saying that professionals do not perceive their practice as something personal but instead they share common practices. Furthermore, professionals work to strengthen their expertise, in a changing world in which new problems arise and knowledge emerges. An inability to separate self from practice, means improvements in practice will be unlikely (City et al., 2009; Elmore, 2007). Such views are entrenched in our culture that often advocates that teachers are born. Underlying IR is the principle that practices are learned in the process of being professional with other colleagues (City et al., 2009).

Another characteristic of the Australian and the United States educational culture is that teachers have a natural inclination to make judgments about what they see in classrooms, immediately determining in their mind what is good or bad. In contrast to their Japanese counterparts, U.S. educators were found to make “impressionistic” observations focusing on the teacher rather than student learning when they participated in lesson study (Lewis et al., 2006, p.4). Moreover, all educators interviewed prior to teaching a lesson to be observed in the IR process “expressed concerns about being judged by their colleagues” (Chew, 2013, p. 47).

Consequently, IR requires practitioners to develop their descriptive voice and de-personalise discussions about teaching and learning. This is a skill that requires practice and is particularly challenging when first engaging in the rounds process. When debriefing after observing teaching and learning, the protocols require people to “share the evidence before they draw evaluative or diagnostic conclusions” (Elmore, 2007, p. 22). This involves articulating specific examples of what they have seen or heard in relation to the problem of practice. The idea is to build up a body of evidence about instruction that can be analysed, devoid of jargon or euphemisms that could be interpreted as judgmental.

The aim is to set up an environment in which participants feel safe to speak candidly about teaching and learning and solve problems. A common criticism of PLCs has been that collegial niceties have often detracted from critical analysis of practice (Bowe, Gore & Elsworth, 2010; City et al., 2009; Elmore, 2007). Patterns of language have developed such that colleagues “never say anything directly to each other that could be interpreted, implicitly or explicitly, as a criticism” (City et al., 2009, p.164). The establishment of stable norms, processes and protocols is a critical part of IR as they help to build up relational trust within the community. Once educators feel safe to engage in open and honest professional dialogue, real professional learning

can take place, as beliefs and practices can be challenged. Then shared responsibility for improved teaching and learning can be developed amongst the group (Brodie & Shalem, 2011; Timperley et al., 2007). Such learning enhances collective efficacy; a belief that together the group can have a positive impact on student learning, which has been found to be a characteristic of successful organisations (City et al., 2009, p. 165).

2.3.3.2 The effects of Instructional Rounds

Whilst IR has been taken up by many districts throughout the United States and even by some regions and systems in Australia, there is little research at this stage to show that the employment of this process has improved system performance or teacher or student learning (Fowler-Finn, 2013). Districts whose leaders have engaged in IR for some time such as the Cambridge Network which began in 2006 (Elmore, 2007), have reported improved performance, however there is no specific evidence to show a direct correlation to IR. The results of a study of the experiences of superintendents in Connecticut who engaged in IR were extremely positive and led to the wide spreading of this approach (Chew, 2013, p. 24). Chew (2013) reports that of the limited studies that have involved IR in education to date, most have focused “primarily on the participation of administrators as identified members of the community of practice” (p. 24). The programs that have been successful have been characterised by schools with positive and supportive PLCs.

City et al. (2009) acknowledge that IR on its own will not result in large scale improvement and furthermore, that gains in student performance do not occur quickly. They do assert that IR can accelerate improvement when combined with PLCs and leadership that values and builds up its practitioners. Whilst IR does initially involve adhering to strict protocols and establishing shared norms driven by leaders or facilitators, over time the process can and will evolve to suit the

specific context. Compliance to authority will diminish as the culture takes over. According to City et al. (2009):

Instructional Rounds is a means of moving education from a collection of more or less independent practitioners nested in a bureaucratic structure to a profession, with a shared set of practices, a body of collective knowledge, and a set of mutual commitments that define professional accountability (p. 185).

2.3.3.3 Instructional Rounds for teachers instead of administrators

Recently, researchers have begun to see the possible benefits of IR for teachers within schools, rather than primarily for school administrators (Bowe et al., 2010; Chew, 2013; Dufour & Marzano, 2011; Marzano, 2011). In his qualitative study in which head teachers in a secondary school observed one another's teaching, Chew (2013) found that the IR process supported collaboration and helped to build commonalities across content areas. It provided rich opportunities for professional dialogue and critical reflection; necessary components of effective professional learning. Marzano (2011) suggests that ideally "master teachers" (p. 80) can model effective practice and teachers can observe teaching strategies that are relevant to them.

It seems that when IR involves groups of teachers within the school environment, it shares more similarities than differences with lesson study. As Stephens (2011) explains both involve educators working together to improve student learning by investigating their own teaching practices. Furthermore, teacher inquiry is informed by evidence collected through observation of the instructional core. Dufour and Marzano (2011) explore how the strengths of both approaches can be melded together. They suggest that when "the collective development of highly crafted lessons" (p. 142) is combined with IR, the impact of pedagogy on student learning can be

critically examined to strengthen professional practice. It seems that within the western teaching culture, the protocols of IR have the potential to allow lesson study to occur more effectively and lead to a breakdown in the culture of privatisation, building up teacher collaboration.

In comparing different forms of de-privatisation to lesson study, Stephens (2011) reports that when IR is run by teachers, it is often referred to as a 'learning walk'. He explains that such experiences can be a good springboard into the more intense, cyclic and long term practice of lesson study, because they foster a culture of collaboration and develop the important teacher observation skills required to understand how students think mathematically. However, he suggests a weakness of learning walks is that teaching and learning may only be examined at a surface level because it is more episodic in nature. Problems of practice are often identified quickly and "their possible solutions may miss deeper aspects of pedagogical content knowledge" (p.128). However, when he describes learning walks, whilst acknowledging the importance of establishing agreed behavioural norms, it is not possible to ascertain if teachers have adhered to City et al.'s (2009) IR process.

Just as Hiebert et al. (2002) advocate that lesson study with the support of external expertise has the potential to transform practitioner knowledge to professional knowledge, IR could also contribute by providing a structure and language culturally acceptable for an Australian context. By working in communities of practice in which there is a commitment to continuous improvement, craft knowledge can become public. Once analysed and turned into theory, it can become shareable, storable and verifiable, as theories are tested and adjusted.

2.3.4 Summary

De-privatising the classroom is at the heart of facilitating cultural change and improving the quality of teaching and learning in mathematics on either a small or large scale. Moreover, this process necessarily demands collaborative practices in schools. Mathematics coaching, lesson study and IR all can make very useful contributions and the approaches are not actually exclusive. In fact, it seems that systems that choose to devise and implement programs that combine the essential elements of the three could be highly successful. Catholic Education in Sydney has adopted this approach through the Reading and Mathematics Project (RAMP).

2.4 The Reading and Mathematics Project (RAMP)

2.4.1 What is RAMP?

The Reading and Mathematics Project (RAMP) is a professional learning initiative that has been developed for Catholic schools in the Archdiocese of Sydney to strengthen teacher capacity in the middle years of schooling in reading comprehension and mathematics pedagogy and content in Stage 3 and Stage 4 (Years 5-8), with the ultimate goal of improved student learning (Sydney Catholic Education Office, 2012). It has been developed in response to the trend of plateauing student results in reading comprehension and mathematics, particularly evidenced in the National Assessment Program for Literacy and Numeracy (NAPLAN) in Years 5 and Years 7 and is a project embedded in the system's strategic plan *Building on Strength: Future Directions for Sydney Catholic Schools 2011-2015*.

In line with current educational research, it is designed to foster system-wide student improvement by taking a sustained, focused and coordinated approach to building the collective

capacity of teachers. It seeks to situate professional development within schools by facilitating teacher learning in PLCs. RAMP has adopted Hord's definition of a PLC: "a group of educators who continuously seek and share learning, and act on their learning" (cited in Sydney Catholic Education Office, 2012, p. 3). The system provides schools with curriculum advisers (literacy or numeracy coaches) to work with school principals and their PLCs to drive change and improve teacher practice. As part of this, teachers deepen their understanding of subject matter and pedagogy with specialist support. As is stated in the foundational RAMP paper (Sydney Catholic Education Office, 2012):

The quality of teachers' practice has the greatest effect on student learning: schools can only be as good as the people within them. One of the most important variables in student learning is the quality of the instruction students receive each day. Therefore, schools must utilise strategies that result in more good teaching in more classrooms more of the time. This project addresses this principle through in-class support (p. 3).

In the endeavour for improvement, the PLC devises SMART goals which they work together to achieve. SMART is an acronym for goals that are specific and strategically aligned to school and regional goals, measurable, attainable, results-oriented and time-bound (Sydney Catholic Education Office, 2012, p. 4). In collaboration, the members of the PLC monitor their progress and inform their practice by regularly collecting and analysing evidence of student learning.

RAMP consists of a series of essential elements (Sydney Catholic Education Office, 2012). In addition to the elements already mentioned; namely, explicitly addressing reading comprehension strategies and mathematics pedagogy and content, in line with the Australian Curriculum, and PLCs, it also includes the IR framework, an inquiry model (Timperley et al.,

2007), a feedback model (Hattie & Timperley, 2007) and principles of coaching (GROWTH) to drive change. A model to align leadership structures across the system, between the central office, regions, principals and advisers underpins everything.

Whilst RAMP is based first and foremost within schools, it is a systemic approach that also aims to build cohesion between system, region and school goals and foster sustainable change.

Principals are supported by the system with resources and expertise to build collaborative communities focused on the foundations of learning; literacy and numeracy and in turn, the expectation is that school leaders will provide evidence of change which will eventually lead to improved student outcomes.

RAMP is currently in its fourth year of operation. In the primary school sector, advisers in each of the three regions of the Sydney Catholic Office of Education, on average have taken on 5 schools each year, although this has varied from region to region depending on the size of schools and specific school needs. Schools come on board with only reading comprehension or mathematics content and pedagogy at one time and are provided appropriately with either a literacy or numeracy adviser. At the conclusion of a year, the school leadership is left to sustain the collaborative practices established with fairly minimal adviser support.

2.4.2 RAMP – the context for research on the effects of de-privatisation on the mathematics teacher

The mathematics dimension of this project presents itself as an ideal context for research about the effects of de-privatisation on the teacher of mathematics in the primary school. RAMP (Mathematics) not only insists on teachers de-privatising their classrooms, by combining mathematics coaching (numeracy advisers) and IR (with teachers rather than administrators), but

with its emphasis on mathematics content and pedagogy thus drawing on elements of lesson study.

These de-privatisation approaches are required to be utilised by the PLC and are to sit within a continuous process of inquiry. The ‘Teacher inquiry and knowledge-building cycle to promote valued student outcomes’ (Timperley et al., 2007) is the model that has been adopted by the system, to guide the work of the PLC. It is depicted in Figure 1. Combining a breadth of research about how people learn, the model is “a co- and self- regulatory cycle” meaning that “teachers collectively and individually identify important issues, become the drivers for acquiring the knowledge they need to solve the them, monitor the impact of their actions, and adjust their practice accordingly” (Timperley et al., 2007, p. xii).

This process begins with the identification of where the students are at in their learning and the knowledge and skills that they need to move forward and meet the curriculum requirements. At each point in the cycle, the PLC is challenged to draw on evidence (assessment data) to inform their actions. In the second section of the cycle, teachers reflect on their own learning needs to effectively address the requirements of their students. This leads them to explore theory that can be linked to practice. Based on this data, the team collaborates to design tasks and with the support of their colleagues and the adviser, these are implemented and teachers are encouraged to experiment with and hone their practice. Finally, multiple sources of data are gathered and analysed to determine the effectiveness of practice on student learning (Timperley et al., 2007). This model, being cyclic and involving teachers collaboratively planning learning experiences and implementing them to improve student outcomes, when combined with an IR framework requiring classroom observations, seems to draw on elements of lesson study.

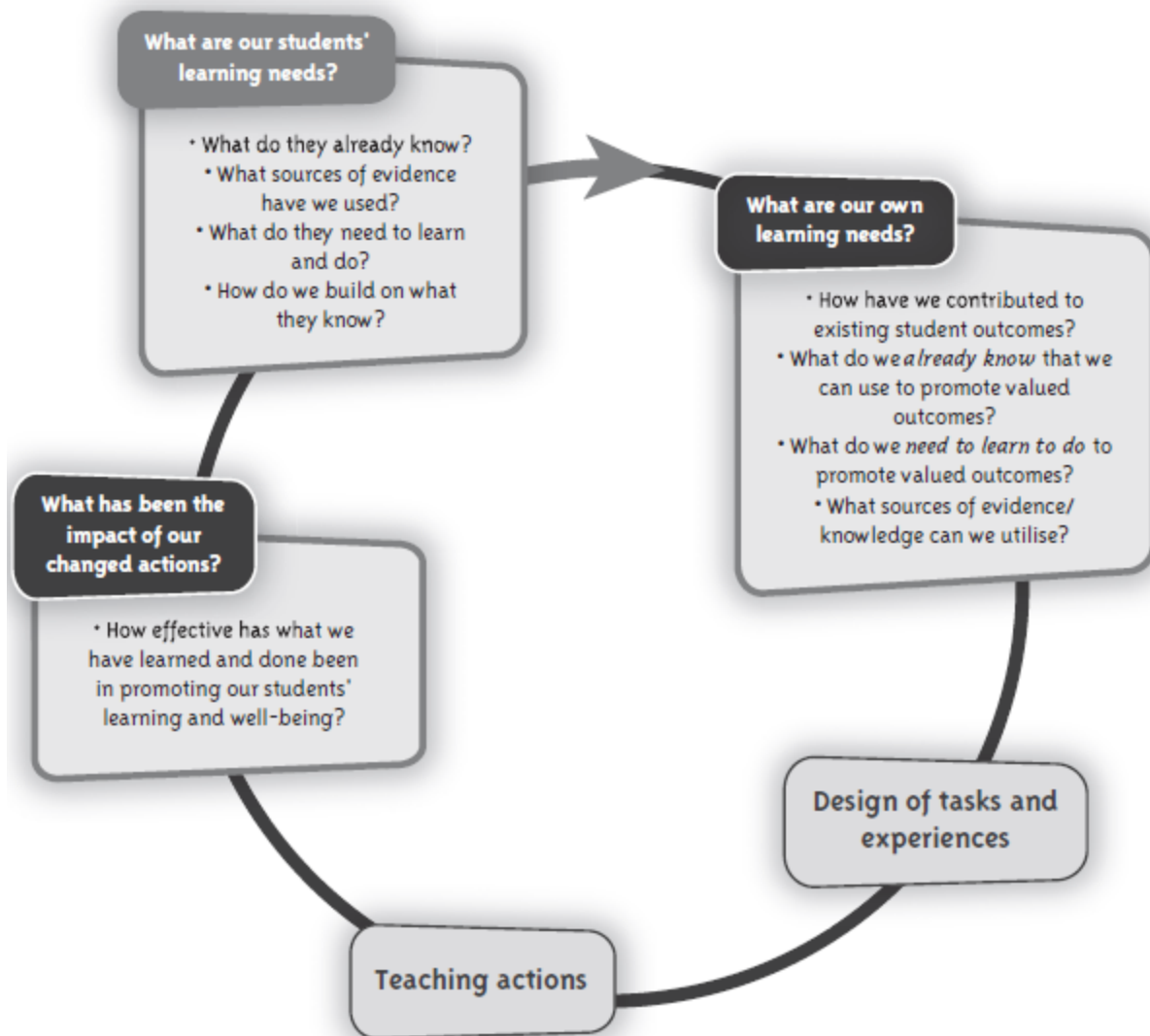


Figure 1. “Teacher inquiry and knowledge-building cycle to promote valued student outcomes” (Timperley, Wilson, Barrar & Fung, 2007)

Within RAMP, Hattie and Timperley’s model of feedback (2007) is another framework to be employed and is an important consideration when exploring de-privatisation because teachers, leaders and advisers are involved in dispensing and receiving this in relation to observations of teaching and learning. According to Hattie & Timperley (2007), the purpose of feedback “is to reduce the discrepancy between current understandings/performance and a desired goal” (p.87). It is effective when it addresses the questions: Where am I going? How am I going? and Where

to next?, is related to evidence and is complemented with effective instruction to enhance learning.

Research within the context of RAMP could investigate which elements or combination of elements in this hybrid method have more impact on improving teacher instruction and under what conditions these are most supportive. The degree to which practitioner knowledge can be transformed to a form that is useful and valuable to the wider professional community could also be explored.

Some are advocating that there is a need for educational research to go beyond surface features of new initiatives and “explicate the mechanisms” (Lewis et al.; 2006, p.5) of local innovations that lead to instructional improvement (Brown & Coles, 2010). Then, locally initiated innovations can be adapted, studied and lead to the accumulation and spread of educational knowledge. In turning the focus towards generating knowledge from the grassroots, rather than trying to impose it from outside, it is possible that in addition to facilitating improved teaching and learning, the separation between teachers and researchers could be narrowed, provoking a breakdown of the traditions that have endured in educational research. Lewis et al. (2006) propose that the field of education would be better placed to study the effects of innovations by:

rethinking the routes from educational research to educational improvement and recognizing a local proof route; building research and methods and norms that will better enable us to learn from innovation practitioners; and increasing our capacity to learn across cultural boundaries (p. 3).

2.5 Research Questions and Objectives

De-privatisation practices are an integral part of the Reading and Mathematics Project (RAMP) and increasingly, are being adopted to support professional learning for teachers. This research seeks to examine the effects of de-privatisation on teachers within the primary mathematics component of RAMP and find out the conditions under which teachers perceive de-privatisation is most supportive to improving their teaching of mathematics. It is hoped that this research will be able to inform the future development of professional learning models for teachers in Catholic Schools in the Archdiocese of Sydney and beyond.

Specifically, it aims to address the following questions from the perspective of the teacher:

1. What are the effects of de-privatising the mathematics classroom on the teacher?
2. How do teachers' gender, years of experience, school region and role in the school influence their perceptions of the usefulness of de-privatising the classroom (both 'Observing' and 'Being Observed') in their own practice and across the school?
3. How do participation in various types and frequencies of de-privatisation influence perceptions of the usefulness of de-privatising the classroom (both 'Observing' and 'Being Observed') in teachers' own practice and across the school?
4. Under what conditions do teachers perceive that de-privatising the classroom facilitates professional learning and improvements in the teaching of mathematics across the school?

Chapter 3: Methodology

This study adopted a single-case case design as the intention was to gather detailed data from educators' sites as to how de-privatising practices had been enacted in the teaching of primary mathematics across the regions of Catholic Education in the Archdiocese of Sydney. The study combined quantitative and qualitative research techniques in order to elicit a broad range of information about de-privatising perceptions and practices.

An interpretivist paradigm was applied to this research study because it was primarily concerned with teachers' interpretations of their specific context. Hearing the teacher's voice was central to this research to understand their perceptions on de-privatising the mathematics classroom.

According to Cohen, Manion and Morrison (2007), "The central endeavour of the interpretive paradigm is to understand the subjective world of human experience... Actions are meaningful to us only in so far as we are able to ascertain the actors who share their experience" (p.21).

Hence both quantitative and qualitative data were analysed to explore participants' understandings through a questionnaire and an interview study.

3.1 Situating the Research Methods

The methodology of case study was considered most suitable for this research because it was concerned about capturing 'thick' descriptive data of the participants' experiences, thoughts and feelings (Cohen et al., 2007, p. 254) about de-privatisation. As Yin (2003) explains, case study is preferred when "the focus is on a contemporary phenomenon within some real life context" (p.1). In this research, the phenomenon of de-privatisation as a professional learning strategy was explored across a range of Catholic schools that had all participated in RAMP (Mathematics), a

project that required some forms of de-privatisation to be used. Details, about the participants, and of the context within which they were ‘living’ de-privatisation, were both very important for helping the researcher to understand how these experiences were affecting them. According to Cohen et al. (2007), “One of the strengths of case study is that they observe effects in real contexts, recognizing that context is a powerful determinant of both causes and effects” (p.253).

One of the aims of the research was to collect data that could contribute to current theory about effective professional learning models for teachers and to consider how the developing phenomenon of de-privatisation in education can or should be embedded within these. The range of participants in this study provided the opportunity for the researcher to identify common themes across the sites as well as some points of difference specific to the individual contexts (Baxter & Jack, 2008). The research was exploratory and open to what emerged, predominantly analytical and working towards developing a theory about the key factors and underlying mechanisms that affect teacher learning in situations where classrooms are de-privatised.

Whilst the use of case study, can rigorously generate a wealth of fine-grain data, it can also present “dangers” for the researcher who needs to manage the volume of information and carefully select what is significant (Baxter & Jack, 2008; Cohen et al, 2007; Eisenhardt, 1989, Miles & Huberman, 1994). In this study, both quantitative and qualitative data was collected, analysed and triangulated in order to “facilitate reaching a holistic understanding of the phenomenon” (Baxter & Jack, 2008, p. 554) and keep the researcher focused. Quantitative evidence was used to establish a clear picture of the demographics in this study and also to make prominent, relationships between the multitude of variables across the various contexts, that otherwise would not have been obvious through qualitative methods alone. The qualitative evidence was able to confirm and build on the quantitative, providing reasons for the

relationships identified. In this way, it was possible to prevent the researcher “from being carried away from vivid, but false, impressions in qualitative data ...” (Eisenhardt, 1989, p. 538). The use of both types of data can be “highly synergistic....For while systematic data create the foundation of our theories, it is the anecdotal data that enables us to do the building ...” (Eisenhardt, 1989, p. 538).

Survey (teacher questionnaire) and interviews were the main methods of data collection. Quantitative and qualitative data was generated from the survey. Quantitatively, frequency data was able to illustrate the characteristics of the sample and the nature of the de-privatisation practices across the schools. Statistically significant relationships between the characteristics of the participants, the frequency of de-privatisation practices in schools, and teacher perceptions of the usefulness of different types of de-privatisation were identified. Furthermore, qualitative data was obtained from the survey in the form of short anecdotes, allowing the researcher to identify the main effects of de-privatisation from the perspective of teachers across the range of contexts and note any trends. The survey also enabled the researcher to access a sample of teachers to interview to gain further explanation of responses in the survey; to “go deeper into the motivations of respondents and their reasons for responding as they do” (Cohen et al., 2007, p. 351).

3.2 Participants

The participants in the survey were all teachers who had participated in RAMP (Mathematics) in Catholic primary schools in Sydney in 2012 and 2013. This sample included 83 teachers from 15 schools. The schools involved were situated across the three regions of the Archdiocese of Sydney, with 7 in the Eastern Region, 4 in the Southern Region and 4 in the Inner West Region.

The schools represented a broad demographic and varied in size from one to three streams. They had been serviced by one of five Numeracy Advisers employed to facilitate RAMP (Mathematics) in primary schools.

The purposive sample included a wide range of teachers, in age (22–60+ years old) and teaching experience (1st year teachers–30 years+). It also included both male and female teachers. Whilst the participants were all teachers, almost half were also leaders in their schools. These leaders included assistant principals, religious education coordinators, mathematics or other coordinators. Principals did not contribute because they did not meet the requirement that all participants were responsible for teaching mathematics to a class of students regularly and had a classroom to de-privatise.

Teachers who had been involved in RAMP (Mathematics) were considered most suitable participants because forms of de-privatisation, namely, in-class support from a numeracy adviser and Instructional Rounds (IR) were essential elements of the project (Sydney Catholic Education Office, 2012). It was reasonable to expect that the teachers involved would have de-privatised their classrooms for at least these purposes on one or more occasions. The researcher was also interested to investigate whether other forms of de-privatisation were prevalent in these schools and if so, how effective teachers perceived them to be for their professional learning.

Teachers involved in this study could have been teaching any class from Kindergarten to Year 6. Whilst RAMP is an initiative that was designed to particularly target teachers and students in Stage 3 (Year 5 and Year 6), it ultimately intended to promote whole school improvement. The individual teachers participating in the RAMP project, and consequently in this study, was a result of a negotiation by each region with each principal on a school basis. Furthermore, it is

possible that teachers could have changed classes and be teaching a different grade level since being involved in RAMP and the time when the data was being collected in this study (2014). Involvement of teachers and leaders across the school was desirable in this study as de-privatisation was being explored as a strategy for professional learning of mathematics teachers across whole school communities and possibly systems of schools.

Following the survey, three teacher-leaders participated in follow-up interviews. These teachers varied in age, gender and teaching experience but all had a role on the school leadership team and were all teaching in schools within the Southern Region. They had indicated within the survey that they would like to further discuss their ideas about de-privatisation.

3.3 Procedure

The principals of all schools that had participated in RAMP (Mathematics) in primary schools in 2012 and 2013 across the three regions of the Archdiocese of Sydney were invited, via an emailed letter, to permit the teachers who had been involved in the project to contribute to the research by completing a survey. This was a requirement of the Catholic Education Office. The targeted population included approximately 120 teachers from 25 schools, spread across the regions. From this, 15 schools agreed to be part of the research and an online questionnaire was emailed to each teacher who had taken part in RAMP (Mathematics) in these schools. Whilst principals were asked to encourage teachers to join in especially, by providing time for them to complete the questionnaire, participation by each individual was voluntary. As a result, 83 questionnaires were sent to teachers and in return, 43 were submitted.

Within the survey, teachers were invited to volunteer to participate in a follow up interview to further discuss their ideas about de-privatisation. In response, three participants volunteered. Each of these three was interviewed individually.

3.4 Data Collection Methods

Data addressing the research questions was collected via survey and interview methods.

3.4.1 Survey

Teachers were surveyed via an online questionnaire distributed electronically to teachers' email addresses through surveymonkey.com. The questionnaire consisted of a mixture of multiple-choice, Likert scale and open ended questions (Please see appendix A). Consequently, the prospective questions gathered a mixture of quantitative and qualitative self-reported data about teacher's attitudes towards de-privatisation and the effects it had had on their own teaching of mathematics and the teaching of mathematics across the school. Attitudinal items were provided in Likert scales. To measure the frequency of de-privatisation practices across the schools and to ascertain whether more frequent experiences of de-privatisation correlated with positive perceptions and to changes in the teaching of mathematics, semantics items were provided in multiple choice formats. The qualitative data gained through the open-ended questions of the questionnaire added further detail and substance to the quantitative data.

3.4.2 Questionnaire Design

A survey instrument (Appendix A) was designed to characterise how teacher gender, years of teaching experience, role in the school, the type and frequency of de-privatisation experiences effect teachers' attitudes to opening classrooms as a form of professional learning, specifically

for the key learning area of mathematics in primary schools. This instrument was constructed taking into consideration the research questions and especially current research about the forms of de-privatisation being employed by schools across the world (Lewis et al., 2004; Elmore, 2004; Stigler & Hiebert, 2009; Teitel, 2009; Hunter & Back, 2011; Dufour & Marzano, 2011; Shimizu, 2013) as case study investigations intending to build on theory “should formulate a research problem and possibly specify some potentially important variables, with some reference to extant literature” (Eisenhardt, 1989, p. 536).

The questionnaire sought to investigate how teachers perceived their professional learning when engaged in the two distinctive aspects of de-privatisation: ‘Being observed’ by their colleagues in their own classrooms and ‘Observing’ in the classrooms of other teachers (Elmore, 2004). Linking to the approaches discussed in the literature review, it also intended to explore how different de-privatisation influenced teachers. In particular it examined the effects of involvement by a numeracy adviser (mathematics coach), colleagues within the school, school leaders and educators external to the school. In addition, it endeavoured to discover the impact of both the structured IR process and other unstructured or informal experiences of de-privatisation. Questionnaire items were also designed in consultation and trialed with educators and academics in the field of mathematics education to endure content validity.

The questionnaire items were divided into independent and dependent variables as displayed in Table 2.

Table 2
Independent and dependent variables within the questionnaire

Independent Variables	Demographics: Gender Years of teaching experience Role in the school School region.
	Types and frequency of ‘Being Observed’: Visits from the numeracy adviser Observations by other teachers in your school (not including IR) Observations for IR Observations from a member/s of the school leadership team Visits from educators from other schools
	Types and frequency of ‘Observing’: When the numeracy adviser was teaching in your classroom In another teacher’s classroom (not during IR) During Instructional Rounds In another teacher’s classroom at another school
	Perceptions of helpfulness of ‘Being Observed’ Visits from a numeracy adviser Observations by other teachers in your school (not including IR) Observations for Instructional Rounds Observations from a member/s of the school leadership team Visits from educators from other schools
Dependent Variables	Perceptions of helpfulness of ‘Observing’ When the numeracy adviser was teaching in your classroom In another teacher’s classroom (not during IR) During instructional rounds In another teacher’s classroom at another school
	Perceptions of how ‘Being Observed’ led to improvement in own mathematics teaching
	Perceptions of how ‘Observing’ led to improvement in own mathematics teaching
	Perceptions of how ‘Being Observed’ and ‘Observing’ led to improvement in mathematics teaching across the school.

The two items related to perceptions of the helpfulness of ‘Being Observed’ and ‘Observing’, as outlined above, included 6 response categories: *Strongly Agree*, *Agree*, *Not sure*, *Disagree*, *Strongly Disagree* and *Not applicable*, the latter accounting for non-participants in the various

types of de-privatisation. In turn, the three items related to perceptions of ‘Being Observed’ and ‘Observing’ on leading to improvement in own mathematics teaching and across the school were ranged as *Strongly Agree, Agree, Not sure, Disagree and Strongly Disagree*, as these three items were relevant to all participants in RAMP.

In addition, the questionnaire provided open-ended boxes where respondents could provide short comments about their feelings and give explanations for their ratings about the helpfulness and impact of de-privatising classrooms, when they were both ‘Being Observed’ and ‘Observing’. It also allowed respondents to record the conditions under which they believed that de-privatisation would be most helpful to their professional learning in the future.

3.4.3 Interviews

Interviews were conducted with three teachers, who volunteered to further discuss their ideas about de-privatisation. Each interview took approximately 30 minutes and the confidentiality of the participants was assured in the consent form. Interviewees were also provided with an information sheet prior to being interviewed clarifying the purpose and outlining the questions that could be asked.

The interviews were semi-structured as the researcher was primarily concerned with hearing and understanding the teacher’s perspective. The researcher prompted and probed, aiming to draw out rich, deep and honest responses and therefore taking an informal and conversational approach, allowing flexibility in the wording and sequencing of questions (Cohen et al., 2007).

The interviews were audio-recorded and transcribed.

The following questions formed the basis of the interviews.

- 1) What elements of de-privatisation have had the most impact on your teaching? Why?
 - a. How has the presence of the Numeracy adviser affected you?
 - b. How have Instructional Rounds affected you?
- 2) What changes have you made to the way you teach mathematics, as a result of your de-privatisation experiences?
- 3) Have these changes led to improvements in student learning? How do you know?
- 4) What changes have been made to the way mathematics is taught across the school?
- 5) Do you have any concerns about de-privatisation?

These questions focused on acquiring a deep understanding of how de-privatisation had transpired in each interviewee's school both during RAMP and subsequently. The questions also sought to extract teacher perceptions of the impact of opening classrooms on professional learning, the teaching of mathematics and student learning, both in the individual's classroom and across the school. Finally, the questions hoped to acquire an understanding of the conditions under which the teachers believed de-privatisation would be helpful to primary school educators who would be teaching mathematics in the future.

3.5 Methods of Data Analysis

The three forms of data collected were each analysed. These included quantitative data from the survey, written responses from the survey and transcriptions from the interviews.

Quantitative data collected from the survey was analysed using descriptive and inferential statistics. SPSS software was used, with the chi-square (Fisher's Exact) and MANOVA tests being applied to identify statistically significant interactions between the dependent and independent variables and their effect sizes.

For the qualitative data analysis, a thematic approach was taken. Beginning with "a wide angle lens" and gradually narrowing, by reading and re-reading the data as a whole, and then "sifting, sorting, reviewing and reflecting", themes emerged (Cohen et al., 2007, p. 462). A systematic process was used to reduce the data to a manageable form, with every effort made to ensure the integrity of the whole was maintained (Cohen et al., 2007; Miles & Huberman, 1994).

Specifically, with the responses to the open-ended questions in the survey, the answers to each of these were examined separately, so ultimately, issues could be identified in relation to the teachers' perceived effects of 'Being observed', 'Observing', de-privatisation across the school and the conditions required for successful de-privatisation. Comments were coded and categorised according to the meaning expressed in each phrase or sentence. Whilst every effort was made to establish discrete themes, some comments communicated a number of thoughts and consequently, were included under more than one theme. After a process iteration and re-iteration, themes were teased out and refined. All responses were included in the analysis, with the small number of comments that could not be categorised, included in the data displays to

ensure all data was considered. From this analysis, the themes were ordered according to their frequency so patterns could be described.

A similar data reduction took place with the interviews except that the responses were initially organised within the framework of the five questions. After interviews were transcribed, the themes and issues that were raised by each participant were summarised. Subsequently, responses of each participant were compared with issues of agreement and discrepancies identified. Finally, these were summarised in relation to the interview questions. There was a lot of overlap in the responses to the first two questions, so these ideas were combined together. The final analysis presented the teachers' perceptions about de-privatisation under four headings: (a) Impact on the interviewees and their teaching, (b) Impact on student learning, (c) Impact across the school, and (d) Concerns about de-privatisation.

The analysis of both quantitative and qualitative data led to drawing the conclusions and implications in relation to the research questions, theory, current research and policy in Chapter 6.

3.6 Ethical considerations

A low risk ethics approval was obtained from the Human Ethics Research Committee of the University of Notre Dame Australia. Participation in this study was voluntary. Participants who chose to participate were assured of their anonymity and that of their school and adviser (appendices F-G).

The researcher, as a mathematics adviser in the Eastern Region of the Sydney Catholic Education was aware of her possible perceived position of power in relation to the teachers who

chose to participate in this research from her region. With this in mind, the following steps were taken to minimise the effects of this. Firstly, the questionnaire was entirely anonymous, with the researcher not being able to identify the respondent and secondly, teachers from the Eastern Region were not provided with the opportunity to volunteer to participate in the interview in the questionnaire. Therefore, only teachers from the Inner West and Southern Regions were offered the option of being interviewed.

Chapter 4: Quantitative Data

This chapter addresses the quantitative data analysis of the study. The examination of quantitative data from this research has been divided into three main parts. The first part identifies the dependent and independent variables within this study and clarifies the analysis process used. The second part is an analysis of data using descriptive statistics, exploring the nature of the sample in this study and the third part investigates the effects of de-privatisation on teachers by analysing the statistically significant relationships and their effect sizes, using inferential statistics.

In general, the analysis found that the participants felt that they benefited from both the two forms of de-privatisation, that is, 'Being observed' and 'Observing' although the latter was more influential in leading to changes in their own teaching of mathematics. The study also found that the number of years of teaching experience and the frequency of 'Being observed' and 'Observing' experiences had significant effects on teacher attitudes.

4.1 Dependent and Independent Variables

As stated in the methodological chapter the research questions sought to characterize the nature and dimension of the dependent and independent variables as well as the interaction among them.

Tables 3 and 4 show the independent and dependent variables for this study, respectively, and how they relate to the questions as they were presented to participants in the online survey.

Table 3

Relationship between questions in the online survey and the independent variables

Independent Variables		
Item	Question in survey	Variable heading “Text as it appeared in the survey”
1	Q1	Gender “Gender”
2	Q2	Years of teaching experience “Years of teaching experience”
3	Q3	Role in the school “What is your role in the school?”
4	Q14	Region “In which region do you work?”
5	Q4	Frequency of different types of ‘Being observed’ experiences “During the last two years, how many times have the following occurred in your mathematics classroom?”
	Q4_1	“Visits from the numeracy adviser”
	Q4_2	“Observations by other teachers in your school (not including IR)”
	Q4_3	“Observations for IR”
	Q4_4	“Observations from a member/s of the school leadership team”
	Q4_5	“Visits from educators from other schools”
6	Q8	Frequency of different types of ‘Observing’ experiences “During the last two years, how many times have you observed mathematics teaching and learning:”
	Q8_1	“when the numeracy adviser was teaching in your classroom?”
	Q8_2	“in another teacher’s classroom (not during IR)?”
	Q8_3	“in another teacher’s classroom at another school?”
	Q8_4	“when the numeracy adviser was teaching in your classroom?”

Table 4

Relationship between questions in the online survey and the dependent variables

Dependent variables		
Item	Question in survey	Variable heading “Text as it appeared in the survey”
1	Q5	Helpfulness of different types of ‘Being observed’ experiences “During the last two years, to what extent do you agree that the following have been helpful to your professional learning?”
	Q5_1	“Visits from the numeracy adviser”
	Q5_2	“Observations by other teachers in your school (not including IR)”
	Q5_3	“Observations for IR”
	Q5_4	“Observations from a member/s of the school leadership team”
	Q5_5	“Visits from educators from other schools”
2	Q7	Degree to which opening your classroom has led to changes in the teaching of mathematics “To what extent do you agree that opening your classroom has led to changes in the way you teach mathematics?”
3	Q9	Helpfulness of different types of ‘Observing’ experiences “During the last two years, to what extent do you agree that observing has been helpful to your professional learning:”
	Q9_1	“when the numeracy adviser was teaching in your classroom?”
	Q9_2	“in another teacher’s classroom (not during IR)?”
	Q9_3	“in another teacher’s classroom at another school?”
	Q9_4	“when the numeracy adviser was teaching in your classroom?”
4	Q11	Degree to which observing has led to changes in the teaching of mathematics “To what extent do you agree that observing teaching and learning has led to changes in the way you teach mathematics?”
5	Q12	Degree to which de-privatisation has led to improvements in the teaching of mathematics across the school “To what extent do you agree that opening mathematics classrooms has led to improvements in the teaching of mathematics across the school?”

Section 2 of this chapter deals with the descriptive statistics and describes how the participants responded to each of the questions, under each of the variable headings, as represented in the tables above. An analysis of the independent variables shows that the sample represents the views of a broad range of teachers and leaders across the Archdiocese of Sydney who participated in RAMP (Primary Mathematics) from 2012-2013. Teachers indicated that predominantly they have opened their classrooms for visits from the numeracy adviser and for

IR, processes integral to RAMP, and that they have exposed their own teaching more often than observing that of others. Teachers were overwhelmingly positive about de-privatisation although asserting that ‘Observing’ is more influential than ‘Being observed’ in changing the way they teach mathematics.

In section 3 the statistically significant interactions and their effect sizes are explored and interrogated. Consequent to the research questions, the inferential analysis in this section sought to explore whether the independent variables, namely, (a) gender, (b) years of teaching experience, (c) role in the school, (d) region, (e) the frequency of different types of ‘Being observed’ and (f) the different types of ‘Observing’ experiences have an effect on the dependent variables. As stated above, the dependent variables were, namely, teachers’ perceptions of the helpfulness of different types of (a) ‘Being observed’ and (b) ‘Observing’ experiences and the degree to which (c) ‘Being observed’ and (d) ‘Observing’ have led to changes in their teaching of mathematics and finally, (e) the effects of de-privatisation on the teaching of mathematics across their schools.

4.2 Descriptive Statistics

Eighty three questionnaires were emailed to teachers in 15 schools who were part of RAMP (Mathematics) in primary catholic schools in the Archdiocese of Sydney in 2012 and 2013. A total of 25 schools had participated in RAMP (Mathematics) during this time and all were invited to participate in this research, however not all principals were receptive. Forty three teachers responded to the survey, although seven surveys were incomplete, with only the first three questions being answered. Therefore, the return rate was 43% (36/83).

It seems that the seven participants who did not complete the survey disengaged for two main reasons; they either did not have their own class or their classroom had not been de-privatised during their involvement in RAMP. This seems to be a reasonable assumption as it was after the first 3 questions that asked for information about gender, years of teaching and role in the school, and prior to Question 4 that asked participants to indicate the number of times their classroom had been de-privatised (for various reasons), that *all* the non-completers ceased their participation. Two of the non-completers indicated in Question 3 that they were not classroom teachers. That is, one was the Reading Recovery & Gifted and Talented Teacher, whilst the other was the Assistant Principal. The other five non-completers did not respond to a question after Question 3.

The two sections that follow, deal separately with a descriptive statistical analysis of the aforementioned independent and dependent variables. The analysis focuses on the patterns emerging from frequencies and percentages calculated from the data set.

4.2.1 The independent variables

The following sections illustrate the nature of the sample for this research by exploring the participants' responses to the questions related to the independent variables.

4.2.1.1 Gender

Of the 43 online surveys submitted, the gender response rate was 86% (37) female compared to 14% (6) male. Table 5 illustrates the gender of invitees and respondents compared to the teaching workforce. Table 5 shows that a slightly smaller proportion of males responded to the invitation to complete the survey, than females. Whilst there is a clear difference in the

percentage of male and female participants in this research, it can be seen that this is a reflection of the population of primary school teachers in New South Wales. According to the NSW Department of Education and Communities (2014), females make up 85% of teachers in NSW public primary schools in comparison to 15% who are male.

Table 5
Gender of invitees and respondents compared to gender of the teaching workforce in NSW

% of total	Surveys sent to ...	Surveys submitted by ...	Teachers in public schools in NSW
Males	19%	14%	15%
Females	81%	86%	85%

4.2.1.2 Years of Teaching Experience

In the questionnaire, teachers were provided with options in five year increments “Years of teaching experience”; namely, 0-5, 6-10, 11-15, 16-20, 21-25, 25-30 and 30+ years. However, for ease of analysis and communicating results, year groups were combined into 10 year ranges. The years of teaching experience of respondents to the survey are illustrated in Table 6. As can be seen, the sample has representatives across all categories from 0-10 years (beginning teachers) through to teachers who have had over 30 years of teaching experience, allowing for the views of teachers across all stages of a teaching career to be explored through this research.

Table 6
Years of teaching experience

	Frequency	Percent
0-10	10	23
11-20	10	23
21-30	15	35
30+	8	19
Total	43	100

4.2.1.3 Role in the school

The survey respondents fall into two main categories in regard to their role in the school; “classroom teacher” or “member of the leadership team and classroom teacher”. Whilst participants were provided with four options for the question: “What is your role in the school?”; namely, “classroom teacher”, “classroom teacher and member of the leadership team”, “principal” and “other”. No principals participated in the survey and only 2 “others” responded. It was hoped that principals would not complete the survey because this study is primarily focused on understanding the perceived effects of de-privatisation on teachers who are responsible for a class and have actually de-privatised their classroom through the RAMP process. Whilst it is acknowledged that principals are first and foremost teachers and that many principals have been actively involved in RAMP and its various processes, the nature of their role means that they are not necessarily responsible for teaching mathematics to particular classes of students. For this reason, the survey would have been difficult for them to complete and the researcher intended to exclude them from this study. Similarly, the 2 “others”, whilst involved in RAMP, were not responsible for their own class and consequently, could not answer the majority of the questions posed in the survey.

Consequently, the number of classroom teachers compared to classroom teachers who are also leaders can be seen in Table 7. Almost half of the respondents to the survey were not only classroom teachers but also members of the school leadership team.

Table 7

What is your role in your school?

	Frequency	Percent
Classroom teacher	21	49
Member of leadership team & classroom teacher	20	47
Other	2	5
Total	43	100

4.2.1.4 Region

Table 8 represents the number of respondents from each of the three regions across the Archdiocese of Sydney. Almost two-thirds of the respondents belonged to the Eastern Region and over a quarter were from the Southern Region, with only three surveys being completed by teachers in the Inner West Region.

Table 8

In which region do you work?

	Frequency	Percent
Eastern Region	23	53
Inner West Region	3	7
Southern Region	10	23
Missing	7	16
Total	43	100

Table 9 displays the relationship between the number of surveys sent to each region and the percentage submitted. More questionnaires were completed in the Eastern Region as the researcher was also the numeracy adviser facilitating RAMP in this region and consequently, she had established relationships with school principals and teachers in these schools. In contrast, most principals and teachers in the other regions were unfamiliar with the researcher and

consequently, their participation in the questionnaire was simply in response to the emailed invitation. The emails of teachers in the other two regions were accessed from the Archdiocesan Catholic Education Office after being forwarded by the numeracy advisers in the other regions. Finally, it is also important to consider the relative size of each region. The Southern Region is significantly larger than the other two regions and had been serviced by three different advisers. Consequently, more teachers were involved in the Southern Region, compared to the Inner West.

Table 9
Number of surveys sent and submitted to the regions

Region	Surveys sent (%)	Surveys submitted (%)
Eastern Region	43 (36)	64 (24)
Inner West Region	17 (14)	8 (6)
Southern Region	40 (33)	28 (13)
Total	100 (83)	100 (43)

Note: Frequencies are in parentheses

4.2.1.5 Frequency of different types of ‘Being observed’ experiences

Table 10 displays how often teachers opened their mathematics classrooms over a two year period for the five different purposes outlined in Question 4; “During the last two years, how many times have the following occurred in your mathematics classroom?” It shows that the most frequent reason teachers de-privatised their classrooms was for visits from the numeracy adviser (Q4_1) and that observations for IR (Q4_3) were also prevalent. Over 90% of teachers had had an experience of these two forms of de-privatisation. These results were to be expected as “in-class support” (Q4_1) and the “IR (Instructional Rounds) framework” (Q4_3) are essential aspects of RAMP (Catholic Education, 2012, p.5), meaning that participation in these forms of de-privatisation was an organised and integral component of being involved in the project. In contrast, the other forms of de-privatisation addressed in Q4_2, Q4_4 & Q4_5 were less

prevalent and participation in RAMP did not require the use of these forms. In each of these latter cases, at least one third of the participants had not had a ‘Being observed’ experience.

Table 10
Percentage of participants who have opened their mathematics classroom for ... (‘Being observed’)

	Q4_1	Q4_2	Q4_3	Q4_4	Q4_5
	Visits from a numeracy adviser (%)	Observations by other teachers in your school (not including IR) (%)	Observations for IR (%)	Observation from member/s of the school leadership team (%)	Visits from educators from other schools (%)
0	6	36	8	33	53
1-2	14	31	31	39	33
3-4	22	8	17	6	3
5+	58	25	44	22	11
Total	100	100	100	100	100

4.2.1.6 Frequency of different types of ‘Observing’ experiences

Table 11 illustrates the number of times that teachers participated in different types of ‘Observing’ experiences as outlined in Question 8, “During the last two years, how many times have the following occurred in your mathematics classroom?” In these cases, those surveyed were asked to consider the number of times that they had observed teaching and learning when they were not the teacher. The options available in the questionnaire in relation to ‘Observing’ experiences mirrored those posed in Q4, related to ‘Being observed’, although in this question (Q8), the teachers were not asked about ‘Observing’ a member of the leadership team. Whilst most members of leadership teams have the responsibility of monitoring and supporting colleagues and consequently may observe the practice of others in their school, not all members of the leadership team have their own classes.

In Table 11 it can be seen that the most common ‘Observing’ experience was during IR, with over 90% of participants experiencing this at least once and almost half observing during this process on 5 or more occasions (Q8_3). Seventy five percent of teachers observed the numeracy adviser teach in their classroom at least once, with almost one third being able to witness the adviser’s practice on five or more occasions (Q8_1). In comparison, teachers had had less experiences of observing colleagues in their school (not during IR) with 58% (Q8_2), and only a small portion, that is, 23%, had visited a classroom of an educator at another school to view a mathematics lesson (Q8_4).

Table 11
Percentage of participants who have observed mathematics teaching and learning ...
(‘Observing’)

	Q8_1 when the numeracy adviser was teaching in your classroom (%)	Q8_2 in another teacher’s classroom (not during IR) (%)	Q8_3 during IR (%)	Q8_4 in another teacher’s classroom at another school (%)
0	25	42	9	77
1-2	22	33	26	17
3-4	25	11	20	0
5+	28	14	46	6
Total	100	100	100	100

Interestingly, comparing Tables 8 & 9, there are similarities and discrepancies between the number of times the participants have been observed versus been observers. For example, comparing Q4_3 (‘Being observed’) and Q8_3 responses (‘Observing’) it appears that teachers have been able to frequently expose their own practice and observe that of their peers though IR. In these cases, the non-participation percentages were only 8% and 9% indicating that participants had had experiences of both ‘Being observed’ and ‘Observing’, respectively.

In contrast, there are more apparent differences between the percentages of times teachers had not been observed versus not observing, in the other questions. For visits from the numeracy adviser (Q4_1 and Q8_01), the difference is 6% and 25%, respectively. The non-participation percentages for the relationships with other teachers in your schools not during IR (Q4_2 and Q8_2) were 36% and 42%, and for educators from other schools (Q4_5 and Q8_5), 53% and 77%, for 'Being observed' and 'Observing', respectively. These discrepancies indicate that, on the whole, more teachers were being observed than being observers.

4.2.1.7 Summary of analysis of independent variables

In summary, it can be seen that the sample of respondents in this study is predominantly female. Teachers with a broad range of teaching experience are represented, including about one quarter of beginning teachers. About half of the teachers involved are also members of the leadership team in their school and finally, teachers from the Eastern Region, more rigorously responded to this study than those in other regions in the Archdiocese of Sydney.

On being questioned about the number of times they have been observed in various situations, the sample indicated that they had most frequently been observed by the numeracy adviser or during IR; de-privatisation processes fundamental to RAMP. In contrast, there were substantial non-participation amounts for the other less structured forms of de-privatisation; namely, being observed by a colleague (not during IR), a member of the leadership team or an educator from another school. A similar pattern emerged for the frequency of 'Observing' experiences.

Participants indicated that they had mostly observed others during IR, followed by observing the numeracy adviser. Observing during the less structured situations; a colleague (not during IR)

and an educator at another school; were less prevalent. Importantly, the data highlighted that apart from IR, more teachers were ‘Being observed’ than ‘Observing’.

4.2.2 The dependent variables

In the following sections the teachers’ attitudes in relation to the different types of de-privatisation experiences are analysed in regards to the dependent variables. As previously stated, the dependent variables were related to teachers’ perceptions of the helpfulness of different types of (a) ‘Being observed’ and (b) ‘Observing’ experiences and the degree to which (c) ‘Being observed’ and (d) ‘Observing’ have led to changes in their teaching of mathematics and finally, (e) the effects of de-privatisation on the teaching of mathematics across their schools.

4.2.2.1 Helpfulness of different types of ‘Being observed’ experiences

Table 12 displays teachers’ attitudes to the different types of de-privatisation experiences in regards to ‘Being observed’. It shows that the vast majority of respondents believe that opening classrooms, whatever the form, is helpful to their professional learning, with visits from the numeracy adviser (Q5_1) being the most helpful, followed by IR (Q5_3). Overwhelmingly, 89% teachers indicated that opening their classroom for a numeracy adviser was beneficial to them, suggesting that increasing the provision of such personnel in schools could lead to pleasing gains in teacher learning. Furthermore, whilst IR had been frequently used, they have also been appreciated by 75% of participants. Table 12 also shows that for Q5_2, Q5_4 and Q5_5, a substantial number of teachers indicated “Not applicable”, 22%, 25% and 46% respectively. This indicates that in each of these cases, which are not necessarily part of RAMP, many teachers had not experienced ‘Being observed’.

Table 12

Percentage of participants who agree that the following have been helpful to their professional learning: ('Being observed')

	Q5_1	Q5_2	Q5_3	Q5_4	Q5_5
	Visits from a numeracy adviser (%)	Observations by other teachers in your school (not including IR) (%)	Observations for IR (%)	Observation from member/s of the school leadership team (%)	Visits from educators from other schools (%)
Not applicable	0	22	6	25	46
Disagree	3	17	14	14	14
Not sure	8	17	6	14	6
Agree	89	44	75	47	34
Total	100	100	100	100	100

4.2.2.2 Helpfulness of different types of 'Observing' experiences

Table 13 represents teacher attitudes to the various 'Observing' experiences. It shows that teachers value observing experiences, whatever the form. The observing experiences which were most prevalent in classrooms; namely, observing the numeracy adviser (Q9_1) and observing during IR (Q9_3), also proved to be the experiences which teachers believed impacted most positively on their learning with 75% and 78% agreeing respectively. Considering that large percentages of teachers had not observed colleagues outside of IR (Q9_2); 35%; and educators in other schools (Q9_4); 64%; the levels of agreement for these forms of de-privatisation were also important; 53% and 31%, respectively.

Table 13

Percentage of participants who agree that observing experiences have been helpful to their professional learning: ('Observing')

	Q9_1 when the numeracy adviser was teaching in your classroom (%)	Q9_2 in another teacher's classroom (not during IR) (%)	Q9_3 during IR (%)	Q9_4 in another teacher's classroom at another school (%)
Not applicable	17	35	8	64
Disagree	3	0	6	0
Not sure	6	14	8	6
Agree	75	53	78	31
Total	100	100	100	100

Comparing the 'Agree' columns in Tables 12 ('Being observed') and Table 13 ('Observing'), teachers were positive about the impact of both de-privatisation forms. Interestingly, teachers were even more positive about being observed by the numeracy adviser (Q5_1) than observing (Q9_1), 89% compared to 75%, respectively. This suggests that whilst teachers can learn much from having a good model, they value feedback from an expert about their own practice even more. The differences between 'being observed' (Q5_3) and 'observing' (Q9_3) during IR, 75% and 78%, respectively; and having visiting educators in the school (Q5_5) and visiting at other schools (Q9_5), 31% and 34%, respectively, were minor in favour of 'observing'. However, observing other practitioners in the school, not during IR (Q9-2) was clearly considered more beneficial than being observed (Q5_2); 53% and 44% respectively.

4.2.2.3 Degree to which opening your classroom has led to changes in the teaching of mathematics

Teachers were asked to rate the degree to which they agreed that opening their classrooms had led to changes in the way they teach mathematics. Figure 2 shows that almost 80% of the respondents believed it had.

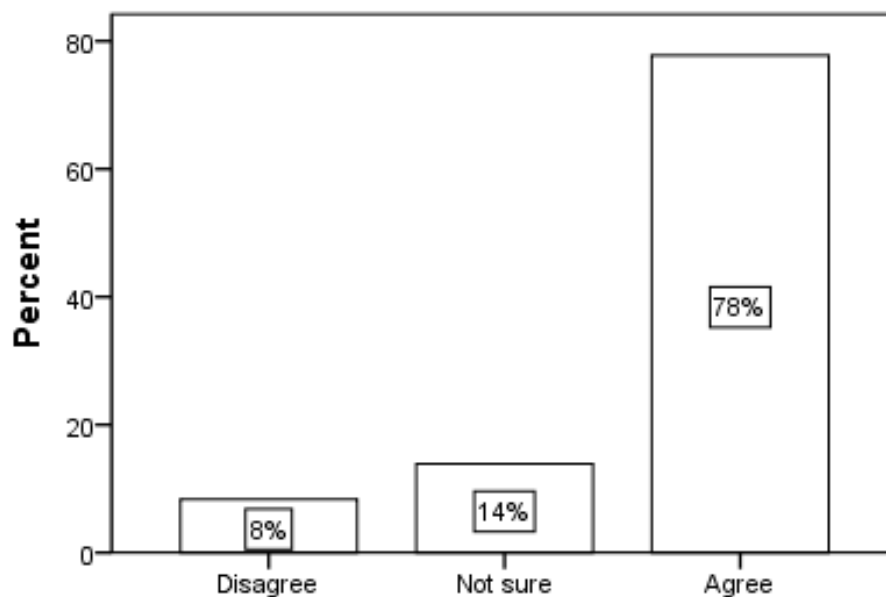


Figure 2. Degree to which opening your classroom has led to changes in your teaching of mathematics

4.2.2.4 Degree to which observing has led to changes in the teaching of mathematics

Figure 3 clearly shows the degree to which teachers agree that observing has led to changes in the way they teach mathematics. It shows that the teachers involved in this study feel that

viewing the instruction of other educators has led them to make modifications to their own practice.

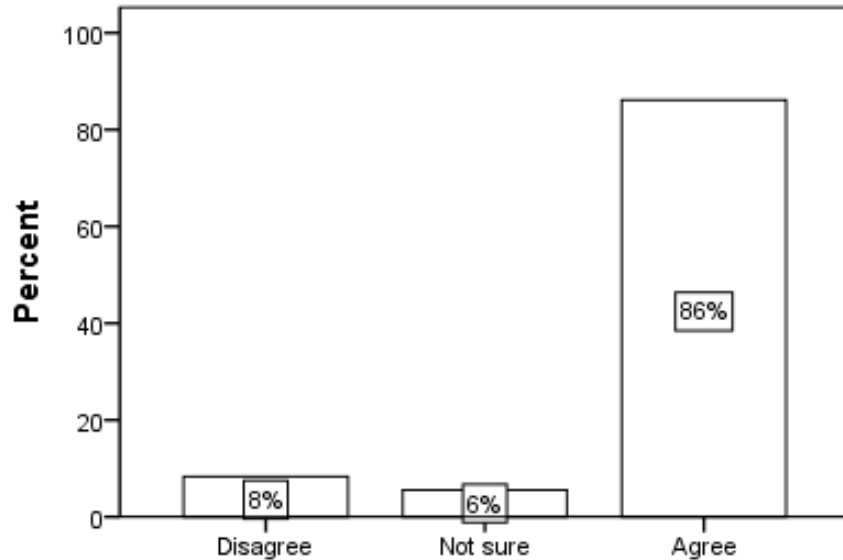


Figure 3. Degree to which observing has led to changes in your teaching of mathematics

Comparing the ‘Agree’ columns from Figures 1 and Figure 2 it can be stated that ‘Observing’ (86%) is more influential than ‘Being observed’ (78%) in leading to changes in the way a teacher teaches mathematics. Whilst clearly both ‘Being observed’ and ‘Observing’ have led to pedagogical change, it seems learning from seeing a model has slightly more impact than receiving feedback about one’s teaching.

4.2.2.5 Degree to which de-privatisation has led to improvements in the teaching of mathematics across the school

Finally, teachers were asked to indicate the degree to which they agree that de-privatisation has led to improvements in the teaching of mathematics across the school. Figure 4 shows that

almost 80% of teachers agreed that opening classrooms had led to school improvement. Whilst just over one fifth of those surveyed were unsure about this broader impact, not one participant disagreed that de-privatisation had not had a positive effect across the school.

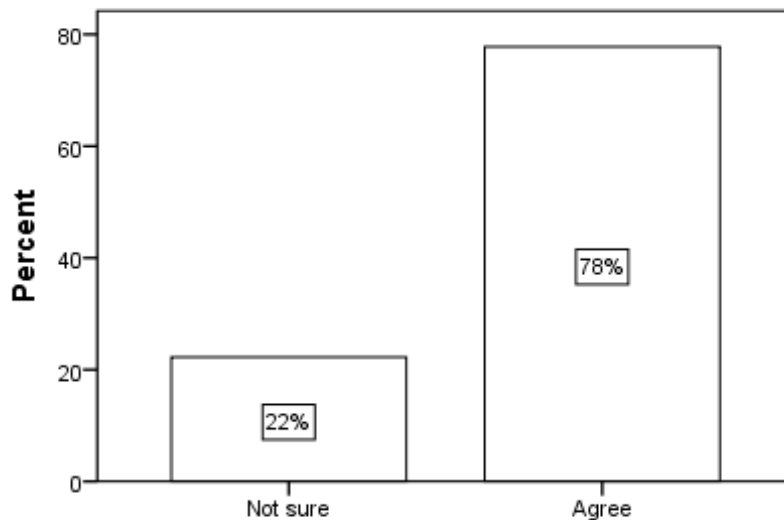


Figure 4. Degree to which de-privatisation has led to improvements across the school

4.2.2.6 Summary of analysis of dependent variables

It is safe to say that the teachers that have been involved in RAMP concur that opening classrooms and allowing practitioners to share their practice is most conducive to professional learning and indeed both individual and collective improvement of mathematics pedagogy across a school. In this study, there has been strong support for numeracy advisers to be in the classrooms and teachers have, on the whole, indicated that the formalised process of IR has facilitated professional learning. Teachers were also positive about their ability to learn from visits from colleagues, members of the leadership team or visits from other schools, although the occurrence of these forms of de-privatisation was less prevalent. In most cases, teachers

indicated that being an observer was more helpful than being observed. The only exception was when the numeracy adviser was in the classroom and in this instance teachers indicated that they preferred to acquire feedback. Also, ‘Observing’ was considered to be more influential than ‘Being observed’ in leading to changes in the way a teacher teaches mathematics.

4.2.3 Conclusion of descriptive statistics

In conclusion, whilst most teachers within this sample have had experiences of ‘Being observed’ and ‘Observing’ when the numeracy adviser was in their classroom and during IR, important numbers of teachers have not participated in the less structured forms of de-privatisation; with other teachers from their school (not during IR), members of the leadership team or educators from other schools. Furthermore, more teachers are ‘Being observed’ than ‘Observing’.

Teachers have clearly indicated that they believe that all forms of de-privatisation are helpful to their professional learning. Moreover, whether they are ‘Being observed’ or ‘Observing’, such experiences are influencing their teaching of mathematics and indeed, mathematics instruction across the school.

4.3 Inferential Statistics

Section 3 details the statistically significant relationships between the independent and dependent variables and considers the reasons why certain independent variables are perceived by teachers to have an effect on their professional learning, their pedagogy and furthermore, the teaching of mathematics across the school (dependent variables).

This analysis shows that the years of teaching experience and the frequency of de-privatisation experiences, whether teachers are ‘Being observed’ or are ‘Observing’, do have effects on

teacher's attitudes to de-privatisation. Furthermore it shows that the prevalent 'Being observed' and 'Observing' experiences that have been provided through RAMP, namely, in-class support from a numeracy adviser or participation in IR, have been perceived by teachers to be very helpful.

Throughout this analysis, cross-tabulations have been used to exhibit the relationships between the independent and dependent variables. To facilitate the analysis of these statistics, certain options from the survey have been grouped together. For Likert scale questions, the "Strongly agree" and "Agree" responses have been combined to form the "Agree" category. Similarly, the "Strongly disagree" and "Disagree" responses have been categorized together as "Disagree".

MANOVA and the chi-square (Fisher's Exact) tests have been used to compare the effects of these relationships. MANOVA, a multivariate analysis of variance, compares the mean scores of a dependent scale variable between groups. It has been used for interactions with Questions 7, 11 & 12 as these are scale variables and allow for MANOVA processing. In contrast, the chi-square (Fisher's exact) test has been used for the cross-tabulations involving Questions 5 & 9, as the inclusion of the "Not applicable" (NA) option in the survey classifies the data from these as ordinal variables. Fisher's exact test is the most appropriate for this analysis, due to the sample size that many of the cells have.

The analysis of statistically significant interactions, that follows, focuses on those relationships in which the probability value p is less than 0.01. On application of MANOVA, using this error level, there were no statistically significant interactions and therefore none are reported here.

This section only reports the nine Chi-square significant interactions.

4.3.1 Chi-square (Fisher's exact) analysis

Using chi-square (Fisher's exact), nine relationships proved to be statistically significant ($p < 0.01$): Years of teaching experience, the frequency of different types of 'Being observed' experiences and the frequency of different types of 'Observing' experiences were found to have an effect on teacher's professional learning. Tables 14-16 depict these interactions and the corresponding effect sizes.

Table 14

Statistically significant interactions with the independent variable: Years of teaching experience Q2

Item	Dependent variable	<i>p</i>	Effect size
1.1	Q5_5 Visits from educators from other schools have been helpful	0.003 Chi squared	0.798 (Phi) Strong

Table 15

Statistically significant interactions with the independent variable: Frequency of different types of 'Being observed' experiences Q4

Item	Independent variable	Dependent variable	<i>p</i>	Effect size
2.1	Q4_2 Frequency of observations by other teachers in your school (not including IR)	Q5_2 Observations by other teachers in your school (not including IR) have been helpful	0.001 Chi squared	0.841 (Phi)
2.2	Q4_3 Frequency of observations for IR in your classroom	Q5_3 Observations for IR have been helpful	0.002 Chi squared	0.956 (Phi)
2.3	Q4_4 Frequency of visits from a member of the leadership team to your classroom	Q5_4 Observations from a member of the leadership team have been helpful	0.003 Chi squared	0.864 (Phi)
2.4	Q4_5 Frequency of visits from educators from other schools to your classroom	Q5_5 Visits from educators from other schools have been helpful	0.000 Chi squared	0.854 (Phi)

Table 16

Statistically significant interactions with the independent variable: Frequency of different types of 'Observing' experiences Q8

Item	Independent variable	Dependent variable	<i>p</i>	Effect size
3.1	Q8_1 Frequency of you observing when the numeracy adviser was teaching in your classroom	Q9_1 Observing when the numeracy adviser was teaching in your classroom has been helpful	0.000 Chi squared	0.911 (Phi) Moderate - Strong
3.2	Q8_2 Frequency of you observing in another teacher's classroom (not during IR)	Q9_2 Observing in another teacher's classroom (not during IR) has been helpful	0.000 Chi squared	0.823 (Phi) Moderate
3.3	Q8_3 Frequency of you observing during Instructional Rounds	Q5_3 Observations for IR have been helpful	0.004 Chi squared	0.900 (Phi) Moderate - Strong
3.4	Q8_4 Frequency of you observing in another teacher's classroom at another school	Q9_4 Observations in another teacher's classroom at another school have been helpful	0.001 Chi squared	0.715 (Phi) Moderate

A detailed interpretation of the above nine statistically significant interactions is presented in the next section.

4.3.1.1 Years of Teaching Experience

4.3.1.1.1 Visits from educators from other schools have been helpful to your professional learning

There is a statistically significant interaction between years of teaching experience and the extent to which teachers agree that visits from educators from other schools have been helpful to their professional learning ($p = 0.003$). The effect size is moderate ($Phi = 0.798$). This relationship is depicted in Table 17.

Table 17

*Cross-tabulation of Years of Teaching Experience * Visits from educators from other schools have been helpful*

Years of Experience (Q2)	Visits from educators from other schools have been helpful (Q5_05)				
	Not applicable (%)	Disagree (%)	Not sure (%)	Agree (%)	Total (%)
0-10	25 (2)	13 (1)	25 (2)	38 (3)	100 (8)
11-20		38 (3)		63 (5)	100 (8)
21-30	75 (9)			25 (3)	100 (12)
30+	71 (5)	14 (1)		14 (1)	100 (7)
Total	46 (16)	14 (5)	6 (2)	34 (12)	100 (35)

Note: Frequencies are in parentheses

The results show that the “Not applicable” and the “Agree” categories ranked highest with 46% and 34% of the total responses (N = 35) compared to the “Disagree” and “Not sure” categories representing 14% and 6% of the sample. The large number of “Not applicable” responses indicates the number of respondents who had not had visits from educators from other schools. Within “Not applicable” the frequencies in the 21-30 and 30+ years of teaching experience categories were highest, with 9 and 5 respectively from a total of 16 responses, showing that teachers with over 20 years of teaching experience have been observed less by educators from other schools. Within the “Agree” category, the 0-10, 11-20 and 21-30 years of experience ranges had the highest frequencies; 3, 5 and 3 respectively, from a total of 12 responses; showing that these 3 groups are more assertive to the statement that “Visits from educators from other schools have been helpful” in comparison to more experienced teachers, that is, the group with 30 or more years of experience. In general, nearly half of the respondents did not participate in visits from educators from other schools. A further one-third agreed that those visits were helpful particularly for teachers with less than 30 years of experience.

4.3.1.2 Frequency of different types of ‘Being observed’ experiences

The researcher is interested in whether the number of times a teacher makes his or her classroom practice public, impacts on his or her attitude to professional learning in various de-privatisation situations. In this study, four significances ($p < 0.01$) emerged, with moderate to strong effect sizes ($\Phi > 0.51$).

4.3.1.2.1 Frequency of observations by other teachers in your school (not including IR) in your classroom

The number of times teachers open their classrooms to colleagues in their school (outside of IR) has a significant effect on the extent to which they perceive these experiences to be helpful to their professional learning ($p = 0.001$). This relationship is displayed in Table 18.

Table 18 shows that 44% of participants agree that observations by other teachers in their school, outside of IR, were helpful compared to 22% who had not had the experience and hence could not make a judgment and 17% who disagreed or were not sure. This indicates that most teachers who have been observed by their colleagues, outside of IR, concur that the experience has facilitated their professional learning. Within the “Agree” category, it appears that the frequencies are higher when teachers have been observed on 1-2 occasions or 5+ times, with 6 and 7 counts respectively. This suggests that a low or high, and not a medium number of visits, is perceived as most helpful.

Table 18

*Cross-tabulation of Frequency of observations by other teachers in your school (not including IR) * Observations by other educators in your school (not including IR) have been helpful*

Frequency of observations by other teachers in your school (not including IR) (Q4_2)	Observations by other teachers in your school (not including IR) have been helpful (Q5_02)				
	Not applicable (%)	Disagree (%)	Not sure (%)	Agree (%)	Total (%)
0	62 (8)	15 (2)	8 (1)	15 (2)	100 (13)
1-2		9 (1)	36 (4)	55 (6)	100 (11)
3-4		33 (1)	33 (1)	33 (1)	100 (3)
5+		22 (2)		78 (7)	100 (9)
Total	22 (8)	17 (6)	17 (6)	44 (16)	100 (36)

Note: Frequencies are in parentheses

4.3.1.2.2 Frequency of observations for IR in your classroom

The relationship between the number of times teachers open their classrooms for IR and the extent to which they find IR helpful to their professional learning was found to be statistically significant ($p = 0.002$) with a strong effect size ($Phi = 0.965$). This relationship is shown in Table 19.

Table 19

*Cross-tabulation of Frequency of observations for IR * Observations for IR have been helpful*

Frequency of observations for IR (Q4_3)	Observations for IR have been helpful (Q5_3)				
	Not applicable (%)	Disagree (%)	Not sure (%)	Agree (%)	Total (%)
0	67 (2)	33 (1)			100 (3)
1-2		9 (1)	18 (2)	73 (8)	100 (11)
3-4		33 (2)		67 (4)	100 (6)
5+		6 (1)		94 (15)	100 (16)
Total	6 (2)	14 (5)	6 (2)	75 (27)	100 (36)

Note: Frequencies are in parentheses

These results show that 75% of respondents (N=36) agreed that being observed during IR has been helpful to their professional learning. An examination of the “Agree” responses reveals that the frequencies are highest when teachers have been observed more than five times, with 15 opting for this category, compared to 8 and 4 for 1-2 and 3-4 occurrences, respectively. This suggests that the more teachers expose their teaching during IR, the more convinced they are that it is helpful to their professional learning, particularly when they have experienced it five or more times.

4.3.1.2.3 Frequency of visits from a member of the leadership team to your classroom

The interaction between the frequency of visits from a member/s of the leadership team to classrooms and the extent to which these observations have been perceived to be helpful to teacher’s professional learning has been found to be statistically significant ($p = 0.003$), equating to a moderate effect size ($Phi = 0.854$). This data is depicted in Table 20.

Table 20
*Cross-tabulation of Frequency of visits from a member of the leadership team * Observations from a member/s of the leadership team have been helpful*

Frequency of visits from a member/s of the leadership team (Q4_4)	Observations from a member of the leadership team have been helpful (Q5_4)				Total (%)
	Not applicable (%)	Disagree (%)	Not sure (%)	Agree (%)	
0	58 (7)	17 (2)	8 (1)	17 (2)	100 (12)
1-2	14 (2)	7 (1)	7 (1)	71 (10)	100 (14)
3-4			100 (2)		100 (2)
5+		25 (2)	13 (1)	63 (5)	100 (8)
Total	25 (9)	14 (5)	14 (5)	47 (17)	100 (36)

Note: Frequencies are in parentheses

The high “Agree” responses (47%) stand out in comparison to the other categories (N=36). In particular, the frequency for 1-2 visits is much larger than the other ranges with 10 participants

out of 17 agreeing that visits from the leadership team have been useful, compared to 0 and 5 for the ranges of 3-4 and 5+ respectively. This suggests that 1-2 visits from members of the leadership could be sufficient to support professional learning. More than 2 visits from leaders are not necessarily perceived as being more helpful.

4.3.1.2.4 Frequency of visits from educators from other schools

The number of times teachers open their classrooms to educators from other schools has a significant effect on the extent to which teachers believe this form of de-privatisation is helpful to their professional learning ($p=0.000$). According to *Phi* the effect size is moderate (0.854). This interaction is represented in Table 21.

Table 21
*Cross-tabulation of Frequency of visits from educators from other schools * Visits from educators from other schools have been helpful*

Frequency of visits from educators from other schools (Q4_5)	Visits from educators from other schools have been helpful (Q5_5)				
	Not applicable (%)	Disagree (%)	Not sure (%)	Agree (%)	Total (%)
0	83 (15)	11 (2)		6 (1)	100 (18)
1-2	8 (1)	17 (2)	8 (1)	67 (8)	100 (12)
3-4				100 (1)	100 (1)
5+		25 (1)	25 (1)	50 (2)	100 (4)
Total	46 (16)	14 (5)	6 (2)	34 (12)	100 (35)

Note: Frequencies are in parentheses

Table 21 reinforces that a large number of teachers have not opened their classrooms to practitioners from other schools, as is indicated with the “Not applicable” category scoring 46% of the total responses (N=35). Thirty-four percent of the teachers agreed that such visits have been helpful. Within this “Agree” category, the highest frequency was in the 1-2 visit range.

This result was markedly higher than the other ranges which all had frequencies of 2 or less. This

indicates that opening one's classroom to visitors from outside the school once or twice is generally perceived as beneficial, but more visits are not necessarily considered to be more helpful to one's professional learning.

4.3.1.2.5 Summary of frequency of different types of 'Being observed' experiences

For the frequency of different types of 'Being observed' experiences there is a pattern that can be sustained. For the structured process of IR, it seems that the more teachers engage in it, the more they like it. In contrast, for the less orchestrated processes; 'Being observed' by peers (not during IR), by members of the leadership team or visitors from other schools; a medium number of visits are perceived as least helpful and in these cases, it seems that one to two visits are sufficient to promote professional learning.

4.3.1.3 Frequency of different types of 'Observing' experiences

In this section, the relationship between the number of observing experiences in various situations and the attitude teachers have to professional learning in different settings is examined. In relation to this, four statistically interactions emerged from the analysis.

4.3.1.3.1 Frequency of observing when the numeracy adviser was teaching in your classroom

There was a moderate to strong effect ($\Phi = 0.911$) for the interaction between the number of observing experiences when the numeracy adviser was teaching and the impact observing the numeracy adviser had on a teacher's professional learning ($p = 0.000$). Table 22 displays the statistically significant interaction.

Table 22

Cross-tabulation of Frequency of observing when the numeracy adviser was in your classroom
** Observing when the numeracy adviser was teaching in your classroom has been helpful*

Frequency of observing when the numeracy adviser was teaching in your classroom (Q8_1)	Observing when the numeracy adviser was teaching in your classroom has been helpful (Q9_1)				
	Not applicable (%)	Disagree (%)	Not sure (%)	Agree (%)	Total (%)
0	67 (6)	11 (1)	11 (1)	11 (1)	100 (9)
1-2			13 (1)	88 (7)	100 (8)
3-4				100 (9)	100 (9)
5+				100 (10)	100 (10)
Total	17 (6)	3 (1)	6 (2)	75 (27)	100 (36)

Note: Frequencies are in parentheses

The results in Table 22 show that 75% of participants (N=36) agreed that observing the numeracy adviser teach in their classrooms was helpful. Scrutinising the “Agree” responses, it can be seen that the frequencies and percentages increase as the number of opportunities to observe the numeracy adviser model teaching also increases. All of the teachers who observed the numeracy adviser 3-4 or 5+ times agreed that these experiences enhanced their learning. It seems fair to conclude that the more teachers observe the numeracy adviser teaching in their own context, the more they learn.

4.3.1.3.2 Frequency of observing in another teacher’s classroom (not during IR)

The next significance concerns the interaction between the frequency of observing experiences in other teacher’s classrooms in the school (not during IR) and the influence this has on a teacher’s professional learning ($p = 0.000$). This is illustrated in Table 23. A moderate effect was found between these two variables ($\Phi = 0.823$).

Table 23

*Cross-tabulation of Frequency of observing in another teacher’s classroom (not during IR) * Observing in another teacher’s classroom (not during IR) has been helpful*

Frequency of observing in another teacher’s classroom (not during IR) (Q8_2)	Observing in another teacher’s classroom (not during IR) has been helpful (Q9_2)				
	Not applicable (%)	Disagree (%)	Not sure (%)	Agree (%)	Total (%)
0	73 (11)		20 (3)	7 (1)	100 (15)
1-2	8 (1)		8 (1)	83 (10)	100 (12)
3-4				100 (4)	100 (4)
5+			20 (1)	80 (4)	100 (5)
Total	33 (12)		14 (5)	53 (19)	100 (36)

Note: Frequencies are in parentheses

The results displayed in Table 23 reveal that the “Agree” category ranked the highest, with 53% of the total (N=36). The next highest category was “Not applicable” with 33%, indicating that one third of the participants had not observed a colleague from their school teach mathematics, outside of IR. Whilst 14% were unsure, interestingly, no teachers disagreed. Within the “Agree” category, the highest frequency was 10 from teachers who had observed their colleagues once or twice. However, even teachers who had observed a peer 3-4 or 5+ times were positive about these experiences with high percentages within these ranges; 100% and 80% respectively; concurring that observing in another teacher’s classroom (not during IR) facilitated their professional learning. These results show that on the whole, the participants who had had the experience of observing their colleagues, not within IR, valued it irrespective of the number of occasions and that even 1-2 observing opportunities supported professional learning. These results suggest that more opportunities should be made available for teachers to work together with their colleagues in schools, even in less orchestrated situations like IR.

4.3.1.3.3 Frequency of observing during IR

A moderate to strong effect size ($\Phi = 0.900$) was found for the interaction between the number of observing experiences during IR and the perceived helpfulness of opening one's own classroom for IR ($p = 0.004$). This relationship is depicted in Table 24.

Table 24

Frequency of observing during IR (Q8_3)	Observations for IR have been helpful (Q5_3)				Total (%)
	Not applicable (%)	Disagree (%)	Not sure (%)	Agree (%)	
0	67 (2)	33 (1)			100 (3)
1-2		11 (1)	11 (1)	78 (7)	100 (9)
3-4		14 (1)	14 (1)	71 (5)	100 (7)
5+		6 (1)		94 (15)	100 (16)
Total	6 (2)	11 (4)	6 (2)	77 (27)	100 (35)

Note: Frequencies are in parentheses

The statistically significant interaction represented in Table 24 shows that most teachers agreed that opening their own classroom for observation for IR was helpful to their professional learning as 77% supported this statement ($N = 35$). High percentages of over 70% are evident within the "Agree" category for 1-2, 3-4 and 5+ visits, showing that observing during IR any number of times is generally perceived as being helpful. The particularly high score of 94% for 5+ visits compared to 78% and 71% for 1-2 and 3-4 visits, respectively, indicates that teachers who have been observers during IR more than 5 times are most likely to agree that exposing their own practice during IR is conducive to their learning. It seems that the more experience teachers have observing IR, the more they believe that opening their own classroom for IR is helpful. This suggests that teachers who are reluctant to expose their own practice in IR may be encouraged if they have the opportunity to observe first.

4.3.1.3.4 Frequency of observing in another teacher’s classroom at another school

Finally, the last significance refers to the relationship between the number of observing experiences in another teacher’s classroom at another school and the impact such experiences have on teacher’s professional learning ($p = 0.001$). The effect size is 0.715, indicating a moderate effect.

Data shows that the vast majority of teachers have not had the opportunity to observe in classrooms in other schools. This is reinforced through the results in Table 25 which show that the “Not applicable” category is the highest with 66% of the total responses ($N = 35$). Of the 35% of teachers who have had the experience of observing practitioners at other schools, the majority (29%) agreed that it was helpful. An examination of the frequencies within the “Agree” category shows that 5 agreed for 1-2 observations compared to 2 for 5+. It seems that whilst most teachers who have been able to observe outside of their own school have found it useful, more than 1-2 experiences of this are not necessarily more conducive to a teacher’s professional learning.

Table 25

*Cross-tabulation of Frequency of observing in another teacher’s classroom at another school * Observations in another teacher’s classroom have been helpful*

Frequency of observing in another teacher’s classroom at another school (Q8_4)	Observations in another teacher’s classroom at another school have been helpful (Q9_4)			
	Not applicable (%)	Not sure (%)	Agree (%)	Total (%)
0	81 (22)	7 (2)	11 (3)	100 (27)
1-2	17 (1)		83 (5)	100 (6)
3-4				100 (0)
5+			100 (2)	100 (2)
Total	66 (23)	6 (2)	29 (10)	100 (35)

Note: Frequencies are in parentheses

4.3.1.3.5 Summary of frequency of different types of ‘Observing’ experiences.

For the frequency of different types of ‘Observing’ experiences, teachers are most enthusiastic about the helpfulness of observing the numeracy adviser and observing during IR. The more teachers observe the numeracy adviser teach in their classroom, the more they perceive they are learning. The more teachers observed others during IR, the more they believed that exposing their own practice through IR was beneficial to their own learning. However, whilst teachers were positive about the less formalised processes; observing practitioners within (not during IR) and external to their school; irrespective of the number of visits, it seems that 1-2 visits is sufficient to enhance learning.

4.3.2 Summary of chi-square (Fisher’s Exact) analysis

In summary, the analysis using chi-square (Fisher’s exact) test, has revealed that years of teaching experience, the frequency of different types of being observed experiences and the frequency of different types of observing experiences have an effect on teacher’s professional learning ($p < 0.01$).

In particular, teachers with more than 30 years of teaching experience were least positive about the helpfulness of visits from educators from other schools to their classroom, although these teachers, along with those in the 21-30 range, had experienced this form of de-privatisation least.

With the frequency of ‘Being observed’ and ‘Observing’ experiences, some patterns seem to have emerged. Firstly, teachers believe they learn from being involved in the structured process of IR, whether they are ‘Being observed’ or ‘Observing’. The more teachers were observed during IR, the more they felt they learned. Furthermore, it seems that the more teachers

observed during IR, the more they were encouraged to publicise their own practice through IR. In contrast, for the less structured processes involving teachers within the school and educators from other schools, whilst also perceived as beneficial, one to two experiences, whether ‘Being observed’ or ‘Observing’ were considered to be enough to promote learning. More experiences were not necessarily more helpful. Similarly, one or two experiences of ‘Being observed’ by a member of the leadership team were considered sufficient. Finally, teachers were strongly of the view that frequently ‘Observing’ the external expert; the numeracy adviser; was most helpful to their learning.

4.4 Conclusion

This study has drawn on the views of a broad range of teachers and leaders across the Archdiocese of Sydney. In particular, an analysis of the independent variables shows that whilst the sample is predominantly female and has been more rigorously supported by educators in the Eastern Region, teachers and leaders covering the whole range of years of teaching experience, including beginning teachers, have participated. The de-privatisation processes integral to RAMP, namely, in-class support from the numeracy adviser and IR have been most prevalent. In contrast, there have been significant numbers of non-participants in the other forms explored in this study involving other teachers from one’s school (not during IR), members of the leadership team and teachers from other schools. On the whole, teachers indicated that they are ‘Being observed’ more than they are ‘Observing’.

An analysis of the dependent variables shows that teachers overwhelmingly agree that the de-privatisation of mathematics classrooms, whether they are ‘Being observed’ or ‘Observing’ is conducive to professional learning, influences their pedagogy and leads to improvements in

mathematics instruction across the school. This signifies the importance of including de-privatisation experiences within a teacher's professional learning. In particular, in-class support from the numeracy adviser and IR, have been highly supported, suggesting that the system would benefit from an increased provision of advisers and that the use of IR should continue to be encouraged. Teachers were also positive about the other less formalised de-privatisation forms explored, despite the fact that these were less prevalent. Teachers indicated that being an observer was more helpful and influential to changing their teaching practice than 'Being observed' except for when the numeracy adviser was in the classroom, in which case they welcomed feedback about their instruction from the expert.

Using inferential statistics, three independent variables were found to significantly affect professional learning; years of teaching experience, the frequency of 'Being observed' experiences and the frequency of 'Observing' experiences. When teachers had more than 30 years teaching experience, they were less inclined to agree that visits from educators from outside the school to their classroom were helpful to their learning. With the frequency of 'Being observed', teachers benefited from multiple experiences of IR. In fact, the teachers who had had the most experiences of IR were the most likely to agree that this process helped them learn. Whilst high frequencies of the less structured forms that involved 'Being observed' by other teachers in the school (not during IR) and members of the leadership team were also generally perceived to be helpful, 1-2 visits were considered adequate to support professional learning. Likewise, 1-2 visits from teachers from other schools were enough. Finally, with the frequency of 'Observing' experiences a similar pattern emerged. Teachers believed that the more they engaged in the prevalent and more structured forms of de-privatisation, observing the numeracy adviser and IR, the more they learned. Indeed, with observing during IR, teachers indicated that

the more they observed, the more they learned from 'Being observed', suggesting that observing often during IR encourages teachers to share their own practice with others through this process. Correspondingly, to the frequency of 'Being observed', for the less structured forms involving observing other teachers in the school (not during IR) and teachers at other schools, 1-2 visits were considered most helpful and sufficient to promote professional learning. In summary, it seems that teachers believe they learn most from frequent experiences with a numeracy adviser and within the more structured and school community experience of IR. The other less formalised processes, whilst also very helpful, do not need to occur as often.

Chapter 5: Qualitative Data

This chapter explores the qualitative data of the study. It has been divided into two main parts. Part 1 examines the teachers' responses to the open-ended questions within the online survey, whilst part 2 focuses on the thoughts and opinions shared by the participants during the follow-up interviews.

This analysis shows that on the whole, teachers have found that de-privatisation has impacted well on their teaching practice and the teaching of mathematics across the school. It highlights a number of conditions under which teachers believe that de-privatisation can support their professional learning and also raises some genuine concerns that need to be addressed if de-privatising mathematics classrooms is going to lead to improvement across a school.

5.1 Open-ended questions in the online survey

The research questions for this study endeavour to determine the effects of de-privatising mathematics classrooms on teachers and to ascertain the conditions under which teachers perceive de-privatisation facilitates their learning. As detailed in the methodology chapter, the open-ended questions allow the researcher to hear the voice of the teacher and to gather rich, personal data (Cohen, Manion & Morrison, 2007, p. 321) that will highlight important themes and add substance to the quantitative analysis.

Table 26 shows the open-ended questions as they were presented in the online survey. Questions 6 and 7 focus on the feelings and impact of opening one's classroom so teaching and learning can 'Be observed', whereas Questions 10 and 11 focus on the feelings and impact of 'Observing' the teaching of others. Question 12 examines the degree to which teachers believe de-

privatisation has improved teaching across the school overall. Finally, Question 13 asks respondents to describe the conditions under which de-privatisation would be most conducive to their professional learning.

Table 26
Open-ended questions in the online survey

Item	Question in survey	Heading “Text as it appeared in the survey”
1.1	Q6	Feelings about ‘Being observed’ “How have you felt about opening your classroom so teaching and learning can be observed?”
1.2	Q7	Degree to which opening classrooms has led to changes in the teaching of mathematics “To what extent do you agree that opening your classroom has led to changes in the way you teach mathematics? (Enter rating on Likert scale) Please explain:”
2.1	Q10	Feelings about ‘Observing’ “How have you felt about being an observer?”
2.2	Q11	Degree to which ‘Observing’ has led to changes in the teaching of mathematics “To what extent do you agree that observing teaching and learning has led to changes in the way you teach mathematics? (Enter rating on Likert scale) Please explain:”
3	Q12	Degree to which de-privatisation has led to improvements in the teaching of mathematics across the school “To what extent do you agree that opening mathematics classrooms has led to improvements across your school? (Enter rating on Likert scale) Please explain:”
4	Q13	Conditions under which de-privatisation would be most helpful to professional learning “In the future, under what conditions do you think that opening classrooms would be most helpful to your professional learning?”

A thematic analysis was applied to the responses of each of the questions. Comments were sorted according to the theme expressed, with responses with similar key words or phrases grouped together. Some comments communicated a number of sentiments and consequently, were included under more than one theme. From this analysis, the themes that emerged were ordered

according to their frequency. These are displayed in the tables that follow, along with a descriptive analysis.

5.1.1 The effects of ‘Being observed’

5.1.1.1 Feelings about ‘Being observed’

Table 27 displays the examination of the responses to the question: “How have you felt about opening your classroom so teaching and learning can be observed?” (Q6) Thirty five out of the 36 participants recorded a response to this question.

The results show that the most prevalent response was that teachers felt confident about opening their classrooms, with 15 teachers indicating this. However, almost as many respondents (12) said that they were nervous about exposing the teaching and learning in their classroom.

Interestingly, 7 out of the 12 teachers who indicated they were nervous about exposing their practice also said that over time opening their classroom became easier or the experience improved. These respondents typically shared the sentiments of a particular teacher who commented, “Initially [I was] a little anxious but became much more comfortable as it became common practice.” A number of respondents also indicated that they were fearful of being judged by others (5) but a couple of these also explained that these feelings dissipated over time.

For example, one teacher said, “Initially I was nervous and feared being judged negatively however, I realised it was an opportunity to gain valuable feedback and ultimately, I enjoyed the experience.” Seven teachers commented that being observed was an opportunity to learn from feedback from colleagues. Overall, the feelings about opening classrooms were more positive than negative and often negative comments were tempered with an understanding that de-

privatising the classroom, whilst challenging or nerve-racking, was helpful or even “necessary” to promote learning.

Table 27
Feelings about teaching and learning ‘Being observed’

Theme	Key words or phrases used in open-ended question responses	No. of responses
Confident	“confident”, “excellent”, “fine”, “great”, “no concerns”, “no problem”	15
Nervous	“nervous”, “hesitant”, “anxious”, “sick”, “apprehensive”	12
Became easier or better over time	“Initiallybut ...”, “after one session...”, “becomes easier and worthwhile”, “realised ...supportive”, “became more comfortable as it became common practice”, “ultimately, I enjoyed...”	10
Opportunity to learn from feedback	“feedback”, “constructive comments”, “opportunity to learn welcomed”	7
Fear of judgment	“fear of being judged”, “exposed”, “daunted”, “critiqued”	5
Pressured	“pressured”, “overwhelmed”	3
Opportunity to share	“opportunity to share”, “show off practice”	2
Challenged	“challenged”	1
Necessary	“necessary”	1

N=35

5.1.1.2 Degree to which opening classrooms has led to changes in the teaching of mathematics

After indicating on the Likert scale the degree (“Strongly agree” to “Strongly disagree”) to which opening one’s classroom had led to changes in one’s teaching of mathematics (Q7), participants were invited to explain their choice. Thirty two participants responded to this question. The analysis of these responses is depicted in Table 28.

Table 28

Comments about the degree to which opening classrooms has led to changes in the teaching of mathematics

Theme	Sample words or phrases used in open-ended question responses	No. of responses
Critical reflection of own practice has led to change	“reflect on own practice”, “think even more deeply”, “evaluating naturally leads to better practice”, “it has made more aware of how ... I teach”	11
Learned from collaboration / professional dialogue	“collaboration”, “conversations”, “discussions”, “working with other teachers”, “professional dialogue”	9
Led to best practice	“best practice”, “improve the quality and effectiveness of my teaching”	6
Acquired new ideas / tasks / activities	“Interesting activities”, “richer tasks”, “gain ideas”	6
Learned from the adviser	“adviser”, “my time with the numeracy adviser changed my teaching”	5
No change	“haven’t changed”, “was teaching this way for years”, “not applicable”	4
Led to trying new teaching strategies	“implement many new strategies”, “try different approaches”, “attempt to use strategies”	3
Feedback from colleagues	“feedback”	3
Other responses	“more organised”, “more thorough planning”, “keeps you focused”, “more aware of how to differentiate”	

N=32

From Table 28 it can be seen that the most common theme (11) was that opening classrooms had led teachers to critically reflect on their instruction and that this had in turn led them to change the way they taught mathematics. These comments typically indicated that de-privatising the classroom had “made” or “forced” them to think about their teaching. For instance, one such response was: “Opening my classroom has made me reflect greatly on my own teaching prior to

the lesson, during the lesson and after. This reflective practice has enabled me to improve the quality and effectiveness of my teaching.” A number of teachers indicated that opening their classroom was “putting on a show” but explained that this process made them think deeply about what they were doing as a teacher. One participant explained: “you want your lesson to be excellent and the learning of the students to be strong so 'putting on the show' reflecting and evaluating naturally leads to better practices.”

The other significant theme was that teachers learned from the collaboration or professional dialogue that came about as a result of the classroom being opened, with 9 teachers explicitly highlighting this in their comments. Some examples of such comments were: “it allows collaboration of ideas and critique (not teaching style) of methods” and it “leads to discussions about how to teach numeracy in a better way”. Whilst many teachers highlighted the helpfulness of discussions and observations for acquiring new ideas or activities (6) to use in their teaching or encouraging them to try new strategies (3), and a few teachers specifically mentioned that the “feedback” that they received about their teaching impacted on their practice. Five respondents explicitly mentioned that it was the numeracy adviser that had impacted a change in their teaching. As one explained, “... team teaching with her allowed me to implement many new strategies. It also really improved my knowledge and skills in the area of mathematics.”

Whilst 4 respondents said that opening their classrooms had not led to changes in their teaching of mathematics, all other comments were positive, with 6 indicating that it had led to best practice or improvements in their effectiveness.

5.1.1.3 Summary of the effects of ‘Being observed’

In summary, more respondents had positive feelings about opening their classroom than negative feelings. Whilst a majority indicated that they felt confident, a significant number of teachers indicated that they felt nervous or fearful about exposing their practice. However, many of these teachers explained that over time, with multiple experiences, their feelings became more positive. Teachers appreciated receiving feedback about their practice.

The vast majority of respondents believed that opening their classrooms had led them to make positive changes to their teaching as a result of critically reflecting on their pedagogy before, during or after the experience. Many stressed the beneficial effects of professional dialogue that resulted, with some specifically emphasising the helpfulness of the numeracy adviser.

5.1.2 The effects of ‘Observing’

5.1.2.1 Feelings of ‘Observing’

Table 29 shows how participants responded to Question 10: “How have you felt about being an observer?” As can be seen, the responses to this were very positive, with the most common theme being that observing others was a “comfortable” or “enjoyable” experience (10). Almost as many respondents (8) explained that ‘Observing’ was a positive learning experience. These responses typically echoed the thoughts of this particular teacher who commented, “I liked it as I learnt from the other teacher.” Some teachers (5) were more specific in their response explaining that they could “benefit from observing methods and ideas of others in action.” These teachers emphasised the advantage of actually “seeing” an idea or strategy in a teaching and learning context. As one observer explained, “I enjoy observing lessons to see how other teachers go about teaching different concepts.” These positive comments were reinforced by a few teachers

stating that they were “thankful” for the opportunity to see others in action in the classroom. In addition, five respondents used the word “interested” to describe how they felt as an observer.

Whilst many respondents, emphasised the usefulness of seeing the teacher in action, a few highlighted the advantages of being able to view the students. For instance, one commented, “It is a real gift to be able to view another teacher giving a lesson and seeing how the students respond using the lens of an observer.”

Interestingly, three teachers highlighted their feeling that they needed to be “respectful” whilst in the role of observer and remain “focused” so that they could provide useful feedback to the teacher. For example, “I feel as an observer I need to be respectful and thankful to the teacher and offer observations and challenges specific to what they are asking for with specific data/observations.” These teachers seem to be concerned about remaining true to the protocols that are clearly articulated through IR, where teachers need to be disciplined observers, conforming to the group’s pre-determined decisions about “*what to observe, how to observe, and, most importantly, how to talk about what is seen*” (City et al., 2009, p. 85-86). One of these respondents, aware of their responsibility as an observer to provide feedback said that he/she felt “not very confident as I feel that I will not be very constructive and say the right thing to my colleagues.” The respondents who indicated that they felt uncomfortable as observers (3), indicated that they empathised with the teacher who was pressured or uncomfortable in exposing his or her practice. For instance, it was noted, “At times the teacher has been uncomfortable with the process so it doesn't allow for an authentic experience anyway. When the teacher is happy then it's easier.” Such responses show that observing is easier and perhaps more beneficial when practitioners are confident and effective instruction is on display.

Table 29

Feelings about teaching and learning 'Being observed'

Theme	Key words or phrases used in open-ended question responses	No. of responses
Comfortable	“comfortable”, “fine”, “I have enjoyed it”, “No stress on me”	10
A positive learning experience	“positive learning experience”, “great learning experience”, “I learnt from the other teacher”	8
Benefited from seeing ideas /strategies in action	“benefit from observing methods and ideas of others in action”, “see a new idea for a particular topic”, “a great opportunity to see what I can do better”	5
Interested	“interested”	5
Needed to be focused / respectful / to provide feedback	“I need to be respectful ... and offer observations and challenges specific to what they are asking for”, “I ... felt it was important to be respectful and to look for specific things”	3
Uncomfortable	“too much pressure”, “uncomfortable for colleague being observed”	3
Grateful	“grateful”, “thankful”	3
Could see students through a different lens	“I could stand back from my class and see them through a different lense.”, “seeing how the students respond using the lens of an observer”	3
Not just observing	“not just observed but walked around the classroom giving student guidance and assistance”, “I get involved in lessons and not just sit there and watch”	2
Other response	“Could see different stages of student learning”	1

N=35

5.1.2.2 Degree to which 'Observing' has led to changes in the teaching of mathematics

The teachers were invited to elaborate on their ratings about the degree to which 'Observing' teaching and learning had led to changes in the way they teach mathematics (Q11). Twenty

seven participants chose to make a comment. The analysis of these responses is represented in Table 30.

Table 30
Degree to which observing has led to changes in the teaching of mathematics

Theme	Key words or phrases used in open-ended question responses	No. of responses
Pick up new ideas, strategies, methods	“pick up new ideas, teaching strategies strategies”, “opens you up to ideas”, “good example”, “given me ideas”	18
Led to implementing better teaching practices	“I now ensure that I have a variety of engaging activities”, “I have implemented ...”, “Use and adapt”, “led to best practice”	7
Challenged to reflect on and refine practice	“challenges you”, “helped me refine my own teaching”, “reflect”	5
Good to watch experts or confident practitioners	“the advisor”, “good to watch teachers who feel confident”, “watching an expert”	4
More sharing of resources	“sharing of resources”	3
No change	“I have not really changed...”, “not really changes to my teaching practice”	2

N=27

Overwhelmingly, one theme stood out. Predominantly, teachers (18) indicated that observing had allowed them to pick up new ideas, strategies or teaching methods. One respondent seems to sum up the ideas of many, “Seeing [the] ways others teach (even in the way they interact during class work) just opens you up to ideas, methods and activities that you can use and adapt to fit your own class. Any sharing of resources and/or strategies leads to changes!!” Whilst many respondents simply indicated that they were able to gain “new ideas”, 7 specifically mentioned that they had applied what they had seen to their own teaching practice. Furthermore, 5

emphasised that in observing they were challenged to reflect on their own teaching. It was commented that “observing others allows you to reflect”

Extending on the theme introduced in Question 10, 4 teachers explained that they preferred observing experts or confident practitioners. Three out of these 4, mentioned the adviser. For instance, one stated that “Observing others especially the Advisor really has helped [me] to see different strategies, techniques, examples, styles and ways of teaching maths to students.”

Interestingly, there were only two responses that indicated that observing others had not led to much change in teaching practice. Whilst one of these acknowledged that they had picked up new ideas, he/she did not believe it had led to a change in practice. For instance, “I think it's been helpful because you may see a new idea for a particular topic [but it's] not really about changes to my teaching practice.”

5.1.2.3 Summary of the effects of ‘Observing’

For the vast majority of respondents, ‘Observing’ was a comfortable, enjoyable or positive learning experience. They felt that they were able to learn from seeing teaching and learning in action and were appreciative of the opportunity. The respondents overwhelmingly indicated that observing had allowed them to pick up new ideas, strategies or teaching methods which they could apply to their own practice. However, some were concerned about their responsibility to provide feedback to their teaching colleague. Teachers were more comfortable observing confident teachers or the adviser.

5.1.3 Degree to which de-privatisation has led to improvements in the teaching of mathematics across the school

Towards the end of the online survey, participants were asked to rate the degree to which they believed that de-privatisation had led to improvements in the teaching of mathematics across the school (Q12). Of the 36 participants, 25 chose to record a comment following their rating on the Likert scale. A summary of these responses is depicted in Table 31.

Two main themes were identified. In each case, 8 teachers highlighted these in their responses. The first was that de-privatisation had led the teachers within the school to develop a shared vision with agreed practices for the teaching of mathematics and that the teachers were more accountable to each other. For example, one explained, “Opening our classrooms has led to a shared Maths vision. . . . It has also enabled us to form a discourse around the contemporary and effective teaching of Maths.” Another commented, “It has helped us to move towards agreed whole school practices.” Finally, another stated that “Teachers are accountable to teach using the structure that has been agreed upon by the staff.”

The other major theme for Question 12 was that de-privatisation had led to increased sharing and learning from one another. Similarly to the first theme, it emphasised the notions of collaboration and professional dialogue. Not only did these respondents mention increased “sharing of ideas” but they also highlighted that “Teachers talk about Maths more frequently.” Interestingly, one mentioned, “No one can hide, there's a lot more sharing of ideas and resources, etc.” Four teachers specifically noted that “people have made an effort to try new approaches” and reflect on their practice.

Table 31

Degree to which de-privatisation has led to improvements in the teaching of mathematics across the school

Theme	Key words or phrases used in open-ended question responses	No. of responses
Shared vision, agreed practices and accountability	“accountability”, “agreed whole school practices”, “shared Maths vision”, “common shared purpose”, “consistent”, “standardized”	8
More sharing and learning from each other	“share and take ideas off each other”, “teachers talk about Maths more”, “a lot more sharing”, “people are learning from each other”	8
Trying new approaches and critically reflecting on practice	“everyone is trying”, “critical reflection”, “try new approaches”, “included many of the strategies we learned”	4
Teachers reluctant to open classrooms	“classrooms are not open”, “obstacle”, “feel nervous”, “others might judge”	3
Processes not sustained	“just revert to old ways”, “a one off process”, “has not continued”	3
More focused teaching	“more focused teaching”, “focuses on the needs of students”	3
No change	“no change”, “has not yet changed”	2
Inequitable opportunities	“some people have not had the opportunity”	1
Unsure about improvements	“unsure”	1

N=25

Whilst the majority of comments focused on the positive effects of de-privatisation across the school, there were also a number that suggested that there had not been change or that it had not spread across the whole school. It was commented by 3 teachers that classrooms are not open and teachers keep their classrooms closed because they are nervous or scared about how they will be judged. Another 3 explained that processes had not been sustained with “some just

revert[ing] back to their old ways”. One said that it been “a one off process and has not continued after the RAMP project”, presumably when the adviser was no longer in the school. Another respondent explained that not all teachers within the school had had the opportunity to de-privatise their classrooms.

In summary, whilst respondents were overwhelmingly positive about the impact of de-privatisation on the teaching of mathematics across the school, comments indicate that there was also a significant level of uncertainty about the impact and there is still room for much growth. Concerns about de-privatisation not being embraced across the school and sustainability of practices (especially once the adviser left the school) were also expressed.

5.1.4 Conditions under which de-privatisation would be most helpful to professional learning

Finally, participants were asked the following question: “In the future, under what conditions do you think that opening classrooms would be most helpful to your professional learning?” (Q13) Interestingly, 35 teachers (all but 1) responded to this question. The results are summarised in Table 32. Ideas that stood alone and were only mentioned by one respondent are recorded in “Other responses”.

As can be seen from Table 32, participants shared a broad range of conditions under which they believed de-privatisation would support their professional learning. However, two main themes emerged. Firstly, 8 respondents emphasised that teachers needed to enter into de-privatisation with the right mindset, namely; that it was a collaborative learning experience. For instance, one explained that it would be most helpful “If people enter it in [the] correct frame of mind and see it as an opportunity.” Another said it was most useful “... When it's not judgmental, when you

know that all who is [*sic*] involved is [*sic*] AUTHENTIC and really interested in improving teaching and learning of Mathematics”, highlighting the tension between being assessed by others as opposed to being supported by colleagues to learn.

Secondly, the other major theme, also highlighted by 8 respondents, was that de-privatisation works best when it is placed within a structured process. These comments emphasised the importance of what happens before and after classrooms were opened and the need for the whole learning experience to be supported and resourced by the school leadership especially through the provision of time. For instance, “support needs to be given to implement this and time must also be given in order to properly execute and analyse lessons”, “ I believe that whether it is colleagues from your school or from other schools, it is important to come together before and after the observation so that [the] context and feedback can be given.” Another explained, “It depends on the cohort and leadership support as to the benefits.” Others said that it needed to be “controlled”, involve “focused feedback”, “under the guidance of an experienced adviser”. In summary, these responses stressed the importance of structure and a level of formality.

Table 32

Conditions under which de-privatisation would be most helpful to professional learning

Theme	Key words or phrases used in open-ended question responses	No. of responses
Viewed as a collaborative learning experience	“like-minded teachers”, “collaboration”, “all... interested in improving teaching and learning”, “all teachers are open to”	8
Structured process – planning, feedback, supported by leadership (resourced)	“support to be given “, “come together before and after ...”, “focused feedback”, “planning”, “controlled”, “leadership support”	8
Team teaching or observing across a stage is better	“stage teachers”, “across the grade, in a less confronting way”, “team teaching”	6
Needs to be purposeful and focused on school/teacher goals	“particular focus”, “teachers set their own goal”, “focusing on the goal”, “maintain the focus ... within the school”	5
Visit other schools	“visit other schools”, “in our own schools and in cluster school groups”, “within region”	5
Observing good/best/confident practice	“access to really good examples of mathematics teachers”, “identify specific strengths in our teachers”, “confident and highly competent teachers”, “seeing the maths adviser”	4
Advisers needed	“adviser”, “guidance of an experienced adviser”	3
Choice about being observed/observing	“given options”, “I don’t think teachers should feel pressured into being observed”	2
Processes are disruptive	“disruption”, “I do not want to be out of my class”	2
Other responses	“A more open process, not something that is so prescribed like Instructional rounds” “a couple of times a year” “place ... resources on line” “If i was to teach a stage i haven't taught before, this would be beneficial ...” “both formal and informal observations” “Not sure”	

N=35

Interestingly, 6 responses suggested that opening classrooms would be more conducive to professional learning if it occurred amongst teachers who taught the same grade or stage in a school or in the context of team teaching. These responses seemed to be concerned about making the process less threatening for teachers. One teacher commented, “Maybe across the grade, in a less confronting way. Instructional rounds made me ill.” Whilst another suggested that, “maybe teachers could team teach to help them feel more at ease.” It seems that contrary to some of the other prevalent comments, these teachers are encouraging a less structured or less formalised approach. Such an idea is also supported by the comment that “a more open process, not something that is so prescribed like Instructional rounds” would be beneficial. Whilst another respondent emphasised the importance of “both formal and informal observations.”

The importance of classrooms being opened for a purpose was highlighted by 5 respondents. These stressed the need for de-privatisation practices to be aligned to school goals or at least the individual goals of the teacher. For instance, one explains that it would be helpful “If there was a particular purpose for the visit and constructive feedback was provided.” Whilst another explains that, “Open classrooms would be good when focusing on the goal for the year. For example this year our school goal is improving student outcomes in reading.” This theme seems to align with the previously discussed notion of a structured approach, suggesting that de-privatisation works best when it is strategically placed within a whole school plan.

The idea that opening classrooms should be extended beyond one’s school was also advocated by 5 respondents. For instance, “It would be great to visit other schools and see how learning takes place in a different culture and environment.” Some suggested that it could take place between a “region” or within a “cluster” of schools.

In addition, themes that have already been identified in previous questions were reinforced, namely; that teachers benefit from observing good or confident teaching (4), and that advisers are needed (3).

Two respondents indicated that they would not like classrooms to be opened in the future, highlighting the “disruption” it causes to teaching and learning.

5.1.5 Summary of the analysis of the open-ended questions

On the whole, teachers felt positive about both ‘Being observed’ and ‘Observing’. Whilst a significant number of respondents mentioned that they were initially nervous or fearful about being observed, they also admitted that it became easier over time and overall was beneficial for them, as they received constructive feedback. These experiences had led them to critically reflect on their pedagogy and had led to more frequent and richer professional dialogue with their colleagues. Opportunities to observe were also enjoyed and appreciated as teachers were able to pick up ideas and strategies from their observations and apply them to their own teaching. Respondents indicated that they preferred to observe the adviser or confident and competent practitioners.

The majority of respondents seem to believe that de-privatisation has led to improvements in the teaching of mathematics across the school. A major theme was that it had led teachers within schools to develop a shared vision with agreed practices for the teaching of mathematics and higher levels of accountability. In addition, teachers felt that it had fostered collaboration with increased discussion about teaching and the generous sharing of ideas and resources. However, the responses also suggested that the impact of de-privatisation could be more significant, especially if more teachers were receptive to it and if processes were more sustainable. Teachers

shared a variety of conditions under which they believed de-privatisation would be conducive to professional learning. They indicated it was most helpful when the majority of teachers involved entered into the experience with the intention of learning and supporting others, rather than judging. Furthermore, a significant theme was that de-privatisation is beneficial when it sits within a structured process that is purposeful, aligns to school goals and is well led. Respondents stressed that these processes needed to be resourced with time to plan prior and share feedback afterwards. In contrast, aware that many teachers feel apprehensive about opening their classrooms, some teachers encouraged gentler and more open approaches to de-privatisation, suggesting that classrooms just be opened across the stage or grade in a school or that teachers engage in team teaching. A number of teachers explained that they would like the opportunity to observe teaching and learning in other schools.

5.2 Interviews

At the conclusion of the survey, participants were invited to volunteer to participate in a follow-up interview to further discuss their views about opening the mathematics classroom so that teaching and learning can be observed. The purpose of these interviews was to gather more detailed information from a small number of specific cases to more accurately address the research questions.

Three participants volunteered to be interviewed. It is important to note that teachers from the Eastern Region of the Archdiocese were not presented with this opportunity as they had an established relationship with the researcher/interviewer. Table 33 shows the characteristics of the interviewees.

Table 33
Characteristics of interviewees at time of interview

Interviewee	Gender	Years of Teaching experience	Role in the school	Region
A	Female	16-20 years	Classroom teacher & member of leadership team	Southern Region
B	Male	21-25 years	Classroom teacher & member of leadership team	Southern Region
C	Female	6-10 years	Classroom teacher & member of leadership team	Southern Region

As can be seen in Table 33, whilst all three volunteers were classroom teachers who were also members of their school leadership teams and all were teaching in schools within the Southern Region of the Archdiocese of Sydney, there were variations in gender and in the number of years they had each been teaching. There were also significant differences in the demographics of the schools with Interviewees A & B working in three stream schools in southern Sydney, whereas Interviewee C was teaching (and not a leader) in south-west Sydney in a smaller two stream school whilst involved in RAMP (during 2012-2013), but at the time of the interview (2014) was working in a different four stream school in south-west Sydney, as a first time leader.

Interestingly, these teachers had been serviced by at least two different numeracy advisers.

The researcher met with each interviewee in their school for approximately 30 minutes to conduct an informal, semi-structured interview addressing the following five questions:

1. What elements of de-privatisation have had the most impact on your teaching (classroom visits from numeracy adviser/colleagues, instructional rounds...)? Why?
2. What changes have you made to the way you teach mathematics, as a result of your de-privatisation experiences?

3. Have these changes led to improvements in student learning? What evidence do you have for this?
4. What changes have been made to the way mathematics is taught across the school?
5. Do you have any concerns about de-privatisation? If so, what are they?

The following analysis presents a summary of the interviewees' responses in relation to the above questions about de-privatisation within RAMP, under four main headings: (1) Impact on the interviewees and their teaching, (2) Impact on student learning, (3) Impact across the school, (4) Concerns about de-privatisation.

5.2.1 Impact on the interviewees and their teaching

5.2.1.1 Feelings

The feelings of the interviewees about de-privatising their classrooms, whilst each different, aligned with those that were identified in the analysis of the survey responses; either confident or initially nervous or fearful but happier and appreciative over time. Interviewees A and B were most enthusiastic about the experiences that they had had as a result of de-privatising their classrooms, especially for visits from the numeracy adviser. Interviewee B explains,

She came in, I think last year, she was in my room for, on and off, for the best part of three weeks, or two weeks, like probably six times ... and it was excellent. I had no problems. I don't find it very threatening. Ohh, mind you I don't find anybody coming in very threatening."

He had also had a number of "good" experiences of IR.

Interviewee A, whilst deprived of experiences of IR, was also full of praise for the numeracy adviser, "...team teaching with her was one of the best experiences of my life....in the beginning, though, I was tempted to feel like, ohh, she is so fantastic, I can't do this." She explained that whilst she was originally intimidated by the high level of expertise of the adviser, the experience of working with her over time "was very empowering". In particular, she emphasised the nature of the relationship that she developed with the adviser because they were teaching together rather than one strictly observing the other and providing formalised feedback. As she described,

Yeah I felt that that was a really great experience having her team teach, so it was my classroom where I felt comfortable and she came in, but not to supervise me and watch and suggest where I could go better but to team teach with me so I could see her in action, she could see me in action and I think when you get someone older and experienced perhaps we don't have the same experience and perhaps one of us is expert and one of us is learner but it seemed to be that it was an equal partnership and I think that sort of opened um, like anyone would have to ...accept that sort of help ...

Interviewee C had a different experience of de-privatisation. Whilst she was observed by the numeracy adviser and other colleagues, especially through IR, and she also observed the adviser teach in the classrooms of some of her colleagues on occasion, she did not have the opportunity to observe the adviser teach the students in her class. She admitted, "...you know if the adviser came and worked within my classroom that would have been a lot more personable for me ...", however she explains that de-privatising her classroom was "helpful" especially because of the feedback she received that could help her to improve the learning of her students.

You know, at first, ... you don't really want to open up your classrooms but, you know, it is great when they come in and share and show different ways of doing things and different ideas and even just when they are just watching and you know that they're observing. It's a great experience ... to be open, um, and know that something good is going to come of it.

Clearly, these teachers felt that de-privatisation was a positive learning experience.

5.2.1.2 Impact of de-privatisation on teaching

All three interviewees believed that de-privatisation had led to changes to their teaching of mathematics. They all stressed that their knowledge of both mathematical content and pedagogy had improved and that this had affected what they do with their students. Interviewee A described how she had learned about number sequences, the Cartesian plane and a different approach to differentiate and especially emphasised that her increased knowledge of numeration, as a result of working with the adviser had impacted her.

... I know 100% without a doubt ... if the kids can do numeration well, they won't need to be taught addition and subtraction. Once they know their base 10 number system, they're good to go. They will be able to work out a strategy that will work with them given the numbers that they have got. So I, like, what I said. My philosophy around teaching maths has changed.

Interviewee B explained that "I think I'm better at doing it [teaching mathematics]" especially as a result of his increased knowledge of the language of mathematics and his improved planning.

I'm better at planning with ... the success criteria, with what I am aiming for the kids to achieve and what I expect to see if I'm going to see that achievement. Um, yeah, and ...

just that idea of actually using the syllabus to teach [laugh] You know what I mean? And not just planning off the top of your head, so I'd say they've been the biggest improvements in my classroom teaching.

Interviewee C, who was working in a school that had a whole school focus on the language of mathematics highlighted the learnings she had gained from applying ESL strategies like barrier games to her teaching;

So, yes, it did make me a better teacher, especially, you know on that topic because I questioned the activities that I was doing and I realised that's a whole lot of me talking and not them. Or that's a whole lot of, you know um, you know they might be reading the words but they're not using them and, and then, if they're not hearing them, they're not going to use them themselves.

As can be seen, as a result of feedback, as well as critical reflection on their practice, these teachers have acquired and applied mathematical pedagogical content knowledge (Anthony & Walshaw, 2009; National Numeracy Review, 2008). That is, they have not only increased their knowledge of the mathematical content but they have also attained knowledge about how to go about teaching it effectively.

5.2.2 Impact on student learning

Whilst all three teachers believed that their improved teaching had impacted learning, only one of the interviewees could provide substantial evidence to prove it. Interviewee C explained that at her school the teachers had jointly constructed a pre-test targeting their focus area which was the language of mathematics. This was re-administered at the end of year to show growth; "...

so we did a pre-test ...and so we collected that data and then at the end of the year, um, we did the same test and there was improvement.”

In contrast, whilst the other interviewees believed that the student learning had improved, “...it definitely did when [the numeracy adviser] was in the room with me” (Interviewee A) and “...I’ve certainly seen it transfer in student engagement. Definitely. Um, I guess, their learning. I think I have, but whether or not [the numeracy adviser] agrees with me ...” (Interviewee B), they were less convinced. As Interviewee A stated, “I don’t think our NAPLAN results are going to be anything to write home about ...”. Neither teacher believed that the improvements in their practice would show immediate increases in student outcomes, however they were confident that continued professional learning, including de-privatisation, would have impact over time. As Interviewee B said, “I’d like to say there’s been a big improvement in student learning but I also think it is one of those things that doesn’t change straight away. It takes three to four years to see...”. Both teachers believed that an increase in teacher knowledge would ultimately lead to evidence of student learning. As Interviewee A summed up, “So I think the student outcome is really, like, so closely aligned with the teacher’s knowledge, as much as their practice.”

5.2.3 Impact across the school

A similar trend was identified for the impact of de-privatisation across the school. Again, Interviewee C believed that the de-privatisation that had been facilitated through RAMP had led to change across the school because it was embedded within a whole school focus on the language of mathematics. As she described,

...we’ve got clear school goals as a focus and one of them was, trying to improve the language of maths ... we did that by um, having parent workshops and we did lots and

lots of things to do with the language of maths. So when it became time to trying to introduce Instructional Rounds ... everybody knew what the focus was ... everybody was clear.

She explains that “it worked” because everything was “aligned” within the school. RAMP was clearly part of the greater school plan. “Um, I’m not sure how much of it was RAMP and how much of it was the school, you know, driving all these things but it was a huge difference.”

In contrast, Interviewees A and B were less certain about the whole school impact. Both teachers believed that their colleagues were trying to include new ideas and improving their mathematics lessons, “So teachers have tried really hard to embrace the counting, the warm up activity, the bulk of their lesson , their plenary.” (Interviewee A) and “...our numeracy sessions are a lot more structured...” (Interviewee B). Interviewee B added, “...people are more confident to be able to sit down and talk about what they’re doing in maths and how they’re doing it.” However, they were also quite concerned about the quality of teaching in the school and felt they had a lot more to address. As Interviewee A said, “What’s happened is, we’ve gotten to a place where we have very poor practice.”

Interviewee A and B attributed the limited impact across the school to teacher knowledge and personal confidence in relation to mathematics. In each of their cases, they explained how teachers in their schools had done everything in their power to avoid opening their classrooms and exposing their practice. Interviewee A describes her school’s situation,

So when you’ve got a high female staff who don’t see themselves as great at mathematics, and then they have to actually teach ... there’s a myriad of problems....So with people who didn’t feel 100% comfortable in teaching mathematics, they didn’t want

the [numeracy adviser] anywhere near them.... So what happened was, we got a timetable and you were to put on when she would come in and she just ended up with me constantly because people for whatever reason, as soon as there was a timetabling issue that they could get out, they would.

Interviewee B explained that teachers in his school had similar aversions not just to the numeracy adviser but to “somebody else” being in their room. “...it tends to be the people that don’t really need it that put their hand up and yeah, say I’ll have a crack at that.”

Both Interviewees A & B agreed that they benefited from opening their classrooms and the feedback that followed but they also had quite a high level of confidence teaching mathematics especially due to their extensive teaching experience. Furthermore, they were open to learning. Interviewee B admitted that he used to be threatened by visitors to his classroom however, “... now that I’m older,... To be honest I probably think I’m better at the job ... and the other side of it is that I’m happy to learn,..., I’m yet to meet the teacher that’s fantastic at everything.”

Interestingly, Interviewee C, who felt that there had been significant improvements in the teaching of mathematics across the school, highlighted that she and her colleagues had no choice about de-privatising their classrooms. She explains,

...at the start I think a lot of people, you know, were, they didn’t really want other people coming in because they thought that they were going to be judging them. Um, but we, because we all got to go to different classrooms and we did it a few times, it was kind of, just like, well, this is what we’ve got to do and we had to just do it.

In summary, it seems that giving teachers an option about whether to de-privatise their classroom may not be conducive to getting such professional learning approaches up and going.

Furthermore, for whole school change there needs to be a whole school focus and plan that the vast majority of teachers are committed to addressing for the greater good of the students. As Interviewee A emphasised,

...you've got to be that community of learn, of like, professionals, that ah, you know, want to improve um, and not have that closed door idea. Like you know, um, "this is my classroom. I do what I want. It's my way or the highway. It's worked for me for twenty years and I'm gonna continue to do," and unfortunately, I mean I know the critical mass is about 80% and you're always going to have that 20% that won't come along but I think anyone new to the school, we should indoctrinate into that whole idea, um, straight off.

Interviewee C supported this sentiment, stressing that de-privatising "...pushes people to do the best they can for the children and that's what we should be doing all the time."

5.2.4 Concerns about de-privatisation

The interviewees highlighted three other issues in relation to de-privatisation in their discussions with the researcher. These will be explored below under the headings of (1) Professional standards, (2) Resourcing of time and (3) Sustainability.

5.2.4.1 Professional standards

In the discussions about de-privatisation, each of the interviewees made mention of their important role as leaders to work with beginning teachers as they endeavour to become accredited against the Australian Professional Teaching Standards as required by the Board of Studies, Teaching and Educational Standards (BOSTES) in NSW. They each shared the challenges they were facing as they tried different strategies in an effort to build positive

relationships with these younger teachers and work with them in their classrooms so they feel supported and can grow professionally.

For Interviewee A, when asked to discuss her experiences of de-privatisation, she immediately brought up this challenge. “Well for starters the majority of the work that I have done, as in, if you call it de-privatisation,...[is] aligning those,..., the standards.... I find that that’s pretty difficult ...” She discussed extensively the challenge of supporting new graduates who have had little time to explore and develop their teaching skills before expert teachers enter their classrooms or are dragging them out of their classrooms to view other practitioners. Whilst she acknowledged that “it’s brilliant” that new scheme teachers are “so much more supported” and have mentors, she believed it could actually be “quite deflating to their self-esteem” when an experienced teacher, let alone a numeracy adviser intervenes. She explained

...instead of achieving the goal which is to empower teachers and to, to improve their practice, you can actually deflate them, if you get a match that is not um, that’s not conducive to the teacher feeling good about themselves and feeling that they can achieve what they’ve seen.

She emphasised the importance of carefully matching the graduate to the mentor and providing space for the new teacher to learn and gradually work up to a team teaching arrangement.

I think try and find the mentor that they feel comfortable with, that they can build [a] relationship with. Give them six months, on their own. Stop hassling them. Let them try their practice ... Just time and then once they’ve built [a] relationship with the mentor, and get your mentors trained. Make sure they know what they’re doing. Don’t let them overstep the mark. Don’t have them in and out every five seconds. Build that trust, build

that relationship and then once you've got that, um, have that as the person that the beginning teacher can come in and actually watch or they can go in ...

Interviewee B emphasised the importance of less confident practitioners being observers, rather than being observed and suggested that IR was a good opportunity to learn with colleagues.

“Well, I think it's good for people, for those people to be on the walking side of it; Instructional Rounds. Like going and seeing other classrooms....”

Both he and Interviewee C shared the difficulty they have had of getting teachers to visit their classrooms or getting into the classrooms of their colleagues, especially the classrooms of the young teachers they are required to mentor. As Interviewee B said, “It's part of my role to invite people into my room for maths ... [and] going into people's rooms. I've offered people to go to my room ... As yet nobody has taken it up ...” Interviewee C shares similarly,

I was pestering, like ‘What time can I come in?’ or I'd email them and no one would get back to me and so if I didn't do anything they would have just let it go.... so I did kind of have to force myself in there ...

It seems that whilst these leaders are required and also willing to support and mentor their less experienced colleagues and this certainly involves de-privatisation, this is not something that they are finding easy, suggesting that they require more help to do this.

5.2.4.2 Resourcing of time

Each of the interviewees explained how their school had fine-tuned de-privatisation practices over time. A common theme was the importance of time being provided so that all participants could give and receive feedback. It seems that at least initially, an inadequate amount of time was built into de-privatisation processes, in each of the interviewees' schools. Consequently, not

all participants were involved in the powerful conversations that emerged after classroom observations. It seems that sometimes those who had been observed were excluded or otherwise conversations occurred in smaller groups, meaning everyone did not hear exactly the same message. This was especially highlighted in relation to IR, but it was also mentioned that even with team teaching experiences, teachers needed to have de-briefing time, ideally, immediately after the experience. Interviewee B stressed that de-privatisation is only going to work, “If everybody is in the conversation. I think that when we did it here, people who were being visited were a bit in the dark and so were, just like anything, what you don’t know you get more fear of...” He explained that initially only the people that observed, de-briefed about what they had seen, “...not the people who taught it and to me that’s [pause] Well, you’re still where you were, aren’t you?” Similarly, Interviewee C described how resourcing constraints initially hindered the success of IR at her school,

So for those people that weren’t involved in the discussion. Because it was only, it’s hard to release all of the people at the one time so it was kind of, I think there was about six people in a group and then another six so that all of those six knew what each other was talking about but then they didn’t get to share with the other groups.

She elaborated that,

...the feedback wasn’t kind of immediate (clicking fingers), so then we did it again and made sure that we had time to get together to all talk about it because otherwise it would have been lost and yeah, we learned from that. To just make sure that we scheduled in enough time...

Interviewee C was keen to emphasise the improvement that had been made in her school.

... a huge problem timetable wise was to get people out together. Like that's one major, huge advantage now. Our principal and our AP have managed to get every grade out. At the moment, all of my grade is out for two hours.

Clearly, all interviewees highlighted the importance of professional dialogue that includes all stakeholders particularly after de-privatisation experiences if they are going to facilitate professional learning and change across the school. A necessary part of this is the provision of time.

5.2.4.3 Sustainability

Finally, the interviewees were all concerned about the sustainability of the de-privatisation practices that had been encouraged through RAMP. One major concern was coping without the expertise of a numeracy adviser. Interviewee A explained,

...if you come into a school and give like great examples for six months and then walk away, I don't think you're going to get anywhere. You've got to then put us on some sort of maintenance program. Like weight loss [giggle] ...

Interviewee B stated that for de-privatisation to work, it was important to have strong facilitators and effective mathematics teachers in the school. If numeracy advisers are not accessible, then people with these skills within the school need to be willing and able to take on these roles. He said, "... you hope that people are then confident enough to say, "Yeah, well you know what, I do this bit pretty good, I should be able to show..." Otherwise he recommended that the leadership looked beyond the school.

...and money comes into everything, but if it's a matter of going to another school even to go and have a look at how, I don't know, Year 2 for example, will do it at some other

school that's doing it well....That's the way to learn, is to go and watch somebody else doing it.

Interviewee C also reinforced that for consistency in teaching between classes across the school, at least the leaders in the school needed to see what was happening. However, she stated that one of her challenges was finding time to get into classrooms. In a week, she usually only has time to get into one or two classrooms and in her large school she needs to get into more. She questioned, "Is it sustainable and if you don't have the leader driving it, reminding everyone of what they need to do, is it going to get done?"

5.2.4.4 Summary of concerns.

The leaders interviewed saw promoting de-privatisation processes integral to RAMP, as synonymous with mentoring and accrediting teachers against the Australian Professional Teaching Standards. The latter has become a significant part of their leadership role. However, they all emphasised that getting into classrooms whilst also maintaining positive relationships with their colleagues was difficult. In addition, these teachers believed that for de-privatisation to be a beneficial and sustainable strategy for improving the teaching of mathematics, highly skilled teachers and facilitators need to be accessible either within or outside of the school. Furthermore, the leaders in the school need to be committed to driving participation in the processes and essentially this involves providing time to ensure all teachers are included in professional dialogue, including feedback about how mathematics is best taught.

5.2.5 Summary of the analysis of the interviews

Three volunteers were interviewed following the completion of the online survey. They were all teaching leaders from different sized catholic schools within the Southern Region of the Archdiocese of Sydney, with varying amounts of teaching experience.

The interviewees felt that their involvements in de-privatisation had been positive learning experiences in which their pedagogical content knowledge in mathematics had improved as a consequence of critical reflection on their practice and feedback from the numeracy adviser and their colleagues.

Whilst they could provide limited evidence of improved student learning outcomes as a result of de-privatisation, they felt that at least student engagement had improved and that with more time, proof of student learning would be forthcoming, as increases in teacher knowledge and confidence would ultimately lead to this.

The interviewees had seen varying degrees of impact across their schools. However, contrary to the other two, the leader that reported the most significant school improvement highlighted that the de-privatisation processes had been embedded within a whole school plan with goals that all teachers were committed to achieving for the benefit of the students. Moreover, within this school, opening classrooms was an expectation, rather than a choice, for all teachers.

Finally, the interviewees acknowledged that de-privatisation, whilst important for facilitating professional learning, was difficult to make happen, especially for teachers who were inexperienced or who lacked confidence in teaching mathematics. Despite this, with the introduction of professional teaching standards, getting into classrooms had become an integral part of their job. They stressed the need for schools to have highly effective practitioners and

facilitators or otherwise numeracy advisers, as well as strong leaders, who provide time for collaboration and dialogue, to ensure that de-privatisation leads to professional learning for teachers across the schools.

5.3 Conclusion

Qualitative data was drawn from the responses to 6 open-ended questions in the online survey and from 3 follow-up interviews with teaching leaders who volunteered to discuss opening mathematics classrooms so teaching and learning could be observed.

The open-ended responses confirmed that most teachers believed that de-privatising classrooms to 'Be observed' or 'Observing' was a positive learning experience. Whilst almost half of the respondents said they felt confident exposing their practice, most others indicated that they were initially nervous or scared of being judged but over time the experiences became easier. Opening their classrooms led them to critically reflect on their teaching and student learning and also led to more frequent and rich professional discussion with their colleagues. 'Observing' opportunities were on the whole welcomed and appreciated, as seeing instruction allowed teachers to pick up ideas and strategies which were applied to their own practice. As observers, some teachers were aware of their responsibility to provide feedback and support their teaching colleagues, and they preferred to observe numeracy advisers or confident and competent mathematics practitioners.

The vast majority of respondents indicated that opening classrooms had not only led to improvements in their own teaching but also to teaching across the school. De-privatisation processes had helped communities to develop shared visions, agreed practices and higher levels of accountability for the teaching of mathematics. Although some stressed that for a more

significant impact teachers across the school needed to be more receptive to opening their classrooms and put their personal concerns aside for the benefit of the students. Others were concerned that practices were not sustainable, especially when the numeracy adviser left the school.

Teachers advised that de-privatisation would be most successful if all teachers entered into the processes in the spirit of learning and supporting each other, rather than judging. The processes need to be aligned to whole school goals and be carefully structured, with protocols, allowing people to collaborate before, during and especially after classrooms have been opened. In contrast, some suggested that softer, more informal approaches like team teaching could encourage apprehensive participants to expose their practice, whilst others were keen to see effective instruction in other schools.

The interviewees were also very positive about de-privatisation and the significant impact it had had on their own teaching. They reinforced the themes that had been identified through the analysis of the questionnaire responses. Whilst they believed that opening classrooms had led to some improvement in student learning, especially student engagement, they felt that it would take time for improved teaching practice to impact on student outcomes. On the whole, they were concerned about the quality of mathematics teaching in their schools and highlighted the teachers' limited knowledge of mathematics and confidence to teach it, as roadblocks to both improved student learning and participation in open classrooms.

To improve the teaching of mathematics on a larger scale, the interviewees suggested that participation in de-privatisation processes should be an expectation, rather than an option for all teachers, as less confident and competent teachers, who require the support the most, will always

try to avoid joining in. Leaders indicated that getting into teachers' classrooms had become an important but challenging part of their role, with the requirement for them to especially support beginning teachers and accredit them against the national teaching standards. There were mixed suggestions about how to best support new graduates. It was noted that they need both support and also space to explore, in their teaching. Allowing them to be 'observers' first, before exposing their pedagogy, was particularly encouraged. Overall, it seems that leaders require more support as they endeavour to help their less experienced and less confident colleagues.

The interviewees emphasised the need for strong mathematics practitioners and facilitators to be involved in de-privatisation processes if the teaching and learning of mathematics was to improve. Whilst numeracy advisers have provided this through RAMP, there were questions about the sustainability once these advisers left for other schools, especially if competent personnel were not available within the school. For this reason, the leaders could see the benefit of visiting other schools to see effective practice. Finally, the importance of strong leadership to drive and resource change was emphasised.

Chapter 6: Summary, Discussion, Implications and Limitations

As de-privatising classrooms is increasingly being adopted as a strategy to support the professional learning of teachers, the present study intended to examine its effects on primary school teachers in Catholic schools in Sydney and determine the conditions under which it is perceived by teachers to be most supportive to improving their instruction of mathematics. This was investigated within the context of the mathematics component of the Reading and Mathematics Project (RAMP). Specifically, the study intended to answer the following research questions:

1. What are the effects of de-privatising the mathematics classroom on the teacher?
2. How do teachers' gender, years of experience, school region and role in the school influence their perceptions of the usefulness of de-privatising the classroom (both 'Observing' and 'Being Observed') in their own practice and across the school?
3. How do participation in various types and frequencies of de-privatisation influence perceptions of the usefulness of de-privatising the classroom (both 'Observing' and 'Being Observed') in teachers' own practice and across the school?
4. Under what conditions do teachers perceive that de-privatising the classroom facilitates professional learning and improvements in the teaching of mathematics across the school?

In the following subsections, the research questions have been answered based on both the quantitative and qualitative analysis of the data. Then they have been discussed in relation to Lave and Wenger's theory (1991), endorsing that learning involves participating in 'communities of practice', as discussed in the literature review.

6.1 Summary and Discussion

6.1.1 The effects of de-privatising the mathematics classroom on the teacher

The vast majority of teachers surveyed in this study were very positive about the effects of de-privatising the classroom. The quantitative data indicated that they believed that de-privatisation has been helpful to their professional learning. Furthermore, it showed that whether they were 'Being observed' or 'Observing', they believed that these experiences had led to changes in their teaching of mathematics and indeed, the teaching of mathematics across the school.

The qualitative data reinforced these findings. Furthermore it showed that 'Being observed' presented as a more confronting and challenging experience than 'Observing'. Whilst about half of the participants indicated that they were confident about exposing their practice, the others admitted that they were nervous or fearful of being judged negatively. Although, the more they engaged in de-privatisation, the easier it became and the more they learned. Opening their classrooms was a positive learning experience because it (a) forced them to critically reflect on their practice and its impact on their students, (b) led to richer and more frequent professional dialogue with colleagues and (c) allowed feedback to be provided by observers. The majority of teachers were appreciative and comfortable about 'observing' other teachers teach. Primarily, 'seeing' others in action allowed them to accumulate new ideas and strategies, building up their own repertoire of pedagogical resources. The small number of negative feelings expressed, stemmed from teacher concerns about fulfilling their responsibility to provide effective feedback to colleagues, particularly if they deemed the practice viewed to be flawed or requiring

challenge. Consequently, teachers indicated that they would prefer to observe strong and confident mathematics teachers.

Qualitatively, the data also indicated that there was significant resistance to de-privatisation in schools. It was believed that this stemmed primarily from teachers who lacked confidence and competence in their ability to teach mathematics. The brunt of this resistance was felt by school leaders who as part of their role are now required to observe and mentor teachers as they accredit them against the national teaching standards.

6.1.2 The effect of gender, years of experience, region and role in school on teacher perceptions

On the whole, teachers believed that de-privatisation was beneficial to their professional learning and impacted positively on their teaching practice and the teaching of mathematics across the school, irrespective of their gender, region of Sydney that they worked in or their role in the school.

Quantitatively, one statistically significant relationship was found for years of experience and teachers' perceptions of different forms of de-privatisation. In this case, the most experienced participants (30+ years of teaching) were least positive about the usefulness of de-privatising their classrooms for educators from other schools. Interestingly, these teachers, along with the teachers in the 21-30 years of teaching range, had had significantly less experiences of this form of de-privatisation, compared to their less experienced counterparts.

Qualitatively, the responses from interviewees also indicated that years of teaching experience had had an effect on teacher's feelings about participating in de-privatisation, with less

experienced teachers being more resistant to exposing their practice. However, despite these negative feelings, there was no evidence to show that they perceived de-privatisation to be less helpful to their learning, their teaching or the teaching of mathematics across the school.

6.1.3 The effect of various types and frequencies of de-privatisation on teacher perceptions

It was found that the type of de-privatisation, that is, who was involved, whether it was a ‘Being observed’ or ‘Observing’ experience and the degree of formality or structure, all impacted on teachers’ perceptions of the usefulness of open classrooms to their teaching and the teaching of mathematics across the school. Furthermore, the frequency of these different types of experiences also had different effects. Table 34 provides an overview of these relationships, showing the percentage of participants who had no experiences and 3 or more experiences of each type of de-privatisation, as well as the percentage that indicated that this type of de-privatisation enhanced their professional learning. The discussion which follows expands on this data accounting for both the quantitative and qualitative results in this study.

Table 34
Frequency of different types of de-privatisation experiences and the percentage of participants who agree that the type had been helpful to their professional learning:

Type	Being observed			Observing		
	Frequency		De-privatisation has been helpful	Frequency		De-privatisation has been helpful
	0 (%)	3+ (%)	Agree (%)	0 (%)	3+ (%)	Agree (%)
Numeracy Adviser	6	78	89	25	53	75
Other colleagues (not during IR)	36	33	44	42	25	53
IR	8	61	75	9	66	78
Members of the leadership team	33	28	25			
Educators from other schools	53	14	46	77	6	64

Teachers were very positive about their ability to learn from the numeracy adviser. The analysis emphasised that teachers especially valued ‘Being observed’ by the numeracy adviser because they received valuable feedback. They also appreciated ‘Observing’ the adviser, indicating that the more they observed the adviser, the more convinced they were that such experiences facilitated their professional learning. Receiving feedback, as well as seeing the numeracy adviser in action within their school context was beneficial because the advisers had special expertise in the teaching of mathematics and strong facilitation and mentoring skills. These results highlighted the value of having numeracy advisers working intensively in schools.

In addition to de-privatising classrooms for the numeracy adviser, the other most prevalent form was Instructional Rounds (IR). This process provided teachers with the most opportunities to observe other educators. The more teachers had opened their classroom to be observed during IR, the more they believed it facilitated their learning. In addition, the more they observed others during IR, the more they believed they learned from exposing their own practice. These quantitative results suggest that observing during IR encourages teachers to share their practice through IR. Interviewed leaders further endorsed that beginning teachers and less confident practitioners would benefit from observing their colleagues before being required to expose their teaching to others. In this study, teachers believe that IR, with its facilitated, structured process which includes establishing protocols to ensure professional dialogue about classroom observations is devoid of personal judgments, has been effective in fostering their learning.

Participation rates in the other forms of de-privatisation examined in this study, namely, ‘Being observed’ or ‘Observing’ colleagues not during IR, ‘Being observed’ by member/s of the leadership team and ‘Being observed’ or ‘Observing’ educators from other schools, were markedly less. Despite this, teachers who had engaged in these forms were generally positive

about the impact they had had on their learning. However, in these situations, teachers indicated that ‘Observing’ rather than ‘Being observed’ had had more impact on their practice, suggesting that whilst the opportunity to pick up ideas and strategies was welcomed, the level of critical reflection required or the quality of professional dialogue or feedback was less. Significantly, more than one or two experiences of these forms of de-privatisation (‘Being observed’ and ‘Observing’) were not perceived to be more favourable to facilitating professional learning. These forms lacked the formal structure and protocols of IR and the presence of the specialised expertise of the numeracy adviser.

The qualitative analysis also highlighted that many teachers valued de-privatisation processes that were structured, especially with adequate time to share feedback afterwards. Some asserted that less formal approaches like team teaching, or observing across a grade or stage would be better as they are less threatening and more supportive to less experienced or less confident teachers of mathematics. Some were also keen to see more de-privatisation between schools, particularly if there were not adequate examples of quality mathematics teaching within their own context.

6.1.4 Conditions for facilitating professional learning and improvements in mathematics teaching across the school

This study found that on the whole, teachers believe that the following conditions are required to facilitate professional learning and improvement in the teaching of mathematics across schools through de-privatisation: (a) A shared commitment to learning collaboratively for the benefit of students, (b) A clear purpose and (c) A carefully resourced plan. Firstly, for it to be successful, ideally all, or otherwise at least a critical mass of, teachers need to enter into it with the intention

of learning together, as opposed to judging others, so that ultimately teaching will improve and students will learn more effectively. People needed to be united in trying to improve student learning. Secondly, de-privatisation experiences need to have clear purposes which ideally align to school goals. Finally, these experiences need to be carefully embedded in the school plan. This plan needs to ensure that leaders are driving the processes and expecting teachers to participate, all participants have time to work together before and to de-brief afterwards, and that effective feedback is provided. It was found that when these conditions were met, the school developed a shared vision with agreed practices for quality teaching and learning in mathematics and higher levels of collaboration and accountability. Teachers believed that there was also some evidence of student learning.

6.1.5 Communities of practice

In line with Lave and Wenger's social learning theory (1991), teachers strongly acknowledged that they learned through the collaborative experiences of de-privatisation. Through critical reflection on these experiences with others, knowledge was acquired and spread and effective feedback shared (Wenger, 1998a; 1998b). It makes sense, given that traditionally the classroom has been the realm of the individual teacher (Elmore, 2004), that de-privatisation would cause some discomfort to practitioners who are suddenly required to publicise their actions, uncertain of the responses of their peers (City et al., 2009). Furthermore, within this culture of closed classrooms, it is understandable that teachers, and indeed leaders, have not developed the skills of delivering feedback to their colleagues about their teaching and are apprehensive about doing so. However, given also, that this individualised nature of school education has been unsuccessful in bringing about sustained improvement in teaching and learning (Elmore, 2004; Fullan, 2011b; Hattie, 2015a; Masters, 2014), especially in mathematics (Stigler & Hiebert,

2009), it seems that a cultural change is possible if de-privatisation for professional learning is systematically employed.

Wenger (2006) defined 'communities of practice' as "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (p. 1). It is over time, as members build up relationships through working together that 'shared ways of doing' develop (Wenger, 1998a; 1998b; 2006). It follows that teachers declared that they benefitted most from the most prevalent forms of de-privatisation. The more teachers opened classrooms for the numeracy adviser and participated in IR, the more they believed they learned. It is possible that if more teachers had had the opportunity to engage in the other forms of de-privatisation, more often, then they could have found them more helpful. Teachers with 30+ years of experience were the least positive about the benefits of opening their classrooms to educators from other schools. However, they had also had minimal opportunities to experience this.

Looking through the 'communities of practice' lens, it seems plausible that forms of de-privatisation like team teaching could indeed foster learning if they were used more, through the social process of "legitimate peripheral participation" (Lave & Wenger, 1991). Though this is assuming that the participants genuinely wish to learn and believe they can acquire knowledgeable skills from the others in the community (Lave & Wenger, 1991). This study highlighted the resistance of teachers from learning through de-privatisation for fear of being judged especially if they were less experienced or lacked confidence in teaching mathematics. If they knew they were genuinely being supported by knowledgeable and respected others in their schools, it seems that team teaching scenarios could certainly be conducive to professional learning.

This study has found that professional learning takes place through de-privatisation when a group of participants is committed to improving student learning together and they are supported by a purposeful and well-resourced plan. These conditions align with Wenger's assertions for how communities of practice can be "cultivated" (Wenger 1998a). According to this theory, communities of practice can be sustained and learning enhanced when organisations, like schools legitimize participation by supporting them with resources like time to work together, external expertise, recognised leaders and eliminating barriers to participation (Borg, 2012; Wenger 1998b).

In this study, time, expertise and leadership have been highlighted as essential. This research has strongly emphasised the importance of the numeracy adviser. It seems that many teachers valued their feedback, even more than that of the leaders or their colleagues within their own schools because of the advisers' strong knowledge of mathematics and how to teach it. Furthermore, they had the skills to facilitate the collaborative process of IR and were trained and experienced in coaching and mentoring. Significantly, unlike the leaders, it was not the role of advisers to observe teachers for the purposes of accreditation against the national teaching standards. Within this study, the provision of external experts as a condition for cultivating communities of practice was essential. This is especially the case because it seems that many teachers and possibly some leaders have yet to develop the skills in mathematics instruction or coaching and mentoring needed to nourish the community of practitioners within their schools. Whilst numeracy advisers seem the logical resource for schools to employ, expertise in other local schools has been identified as an under-utilised resource that could be accessed, especially if advisers are unavailable.

The most significant barrier to participation in the community of practice to be eliminated within this study has been the choice of whether one wishes to participate or not. The qualitative analysis indicated that a culture needs to be established in schools such that all teachers work/learn together for the greater good of students by sharing their practice and in essence making it an object of study. This primarily requires leaders to create this learning culture and set up organisational structures that ensure all in the community can participate. These results are consistent with current research about school improvement which emphasises the important role school leaders need to play in establishing collaborative practices and in ensuring that the focus of PLCs is on evaluating the impact teaching is having on student progress (Fullan & Langworthy, 2014; Hargreaves & Fullan, 2013; Hattie, 2015a; Masters, 2014; Robinson, 2011; Timperley et al., 2007).

6.2 Conclusions

Teachers perceived de-privatisation, as investigated in this study through RAMP, to be a most useful strategy to be employed by schools to foster professional learning and promote improved teaching of mathematics across schools. This was because it:

- Forced teachers to critically reflect on their practice and its effect on students,
- Led to richer and more frequent professional dialogue amongst teachers,
- Allowed teachers to receive feedback about their teaching, and
- Provided opportunities to ‘see’ practice in action and consequently acquire new ideas and strategies for their teaching of mathematics.

In-line with Lave & Wenger’s theory of ‘communities of practice’ (1991), it seems teacher learning was an inherent part of the collaborative experiences availed by de-privatisation.

Understandably, in light of the cultural shifts away from teaching in isolation, de-privatisation was, at least initially, met with some resistance as teachers feared being judged negatively. Some teachers were concerned about their limited capacity to give feedback to their colleagues and/or their ability to teach mathematics well (inadequate pedagogical content knowledge). Leaders, keen to visit classrooms, as they are charged with the responsibility of accrediting their colleagues against national teaching standards, were particularly confronted with this resistance.

However, it seems that the more teachers engaged in de-privatisation, the more comfortable they became and the more they believed that they learned from these experiences. This was certainly true for the most prevalent forms; in-classroom support from numeracy advisers and IR. The more teachers observed the numeracy adviser, the more they believed they learned. Teachers also valued being observed by the adviser as they received expert feedback. Similarly, IR was valued most by those who had participated most and the more teachers observed others during IR, the more they believed they learned from being observed *by* others.

The other types of de-privatisation investigated in this study, namely, opening classrooms for colleagues (not during IR), member/s of the leadership team or educators from other schools, were also perceived positively, however these were markedly less prevalent. In these cases, more than one or two experiences were not considered to be more beneficial and teachers felt it was more helpful to 'Observe' than 'Be observed'. It seems that whilst teachers were keen to pick up ideas, these experiences lacked the expertise of the adviser or the structure of IR, so feedback was less valued.

Ultimately, it can be concluded from this study that for de-privatisation to be conducive to fostering professional learning in mathematics for teachers across the school, the following conditions are required:

- A shared commitment by a majority of teachers to learn collaboratively through the de-privatisation experiences to improve the learning of their students,
- A clear purpose for engaging in the de-privatisation experiences and
- De-privatisation experiences need to be embedded within a carefully resourced school plan, which is driven by the school leadership. They need to include time for planning and de-briefing and allow for effective feedback to be shared. Ideally, they include the external expertise of an adviser who has a high level of mathematical content knowledge and is skilled in coaching and mentoring.

6.3 Implications

From the results in this study, a number of theoretical, training and policy development implications are discussed. In addition, implications for future research are drawn.

6.3.1 Implications for theory development

The findings from this study support a social constructivist perspective on learning. Professional learning for teachers is an inherent part of lived experiences and occurs within the social context (Hord, 2009; Stoll, 2012; Timperley et al., 2007; Timperley, 2008). The conditions under which teachers perceived de-privatisation to be most effective to their professional learning and to improvements in their practice aligned with the characteristics of effective PLCs; groups of

practitioners with a shared vision that collectively inquire into how to improve student learning and work collaboratively to action ideas and evaluate their progress based on evidence of improvement in student outcomes (Dufour & Eaker, 2009; Harris & Jones, 2012; Leiberman & Miller, 2011; Stoll, 2012; Timperley, 2008). The findings add weight to the literature that asserts that professional learning communities are effective when educators are supported to process new understandings and the implications for their teaching and also when their theories of action are challenged (Leiberman & Miller, 2011; Stoll, 2012; Timperley et al., 2007). Through this, the community of practitioners become co-regulators of their practice and develop shared visions and approaches for teaching and learning (Hattie, 2015a; Timperley et al., 2007). In this study, which focused particularly on the teaching of mathematics, the presence of external expertise (the numeracy adviser) was a critical component, aligning with Timperley et al.'s work (2007).

RAMP was identified as a most suitable context to investigate the effects of de-privatisation and particularly, how in-classroom support from a numeracy adviser and IR could support teachers. These forms of de-privatisation were required to be included in the “Teacher-inquiry and knowledge-building cycle to promote valued student outcomes” (Timperley et al., 2007), the research-based professional learning framework to guide the work of school established PLCs. The results of this study suggest that these forms of de-privatisation (and possibly others), can sit comfortably, and in fact, can be valuable components within this model. Whilst this study does not provide data about the order in which these two forms of de-privatisation were used within Timperley’s cycle during RAMP in the various schools, it does reinforce the various benefits of both in-class support from an adviser and IR, particularly when teachers have multiple opportunities to experience these forms.

Based on the findings of this study, Figure 5 shows how these forms of de-privatisation could work within the “Teacher-inquiry and knowledge-building cycle to promote valued student outcomes” (Timperley et al., 2007). To begin with, once student learning needs have been established and members of the PLC have critically reflected on their learning needs (within the first two dimensions of the cycle), teachers engage in learning with their colleagues, crafting lessons and being supported in their development of both content and pedagogical knowledge, ideally with the support of a mathematics specialist, the numeracy adviser. Initially, external to the classroom, relationships within the PLC can be built as members inquire together in an endeavour to improve student outcomes. Teachers then implement their lessons, observing or being observed by a numeracy adviser. Such an approach, whilst perhaps not as intensive, mirrors the cycle of Lesson Study (Doig & Groves, 2011; Hunter & Back, 2011; Shimizu, 2013), including the important components of goal setting and collaborative planning. However, before exposing their practice to colleagues for observation and analysis, teachers can be set up for success by first receiving feedback from a numeracy adviser.

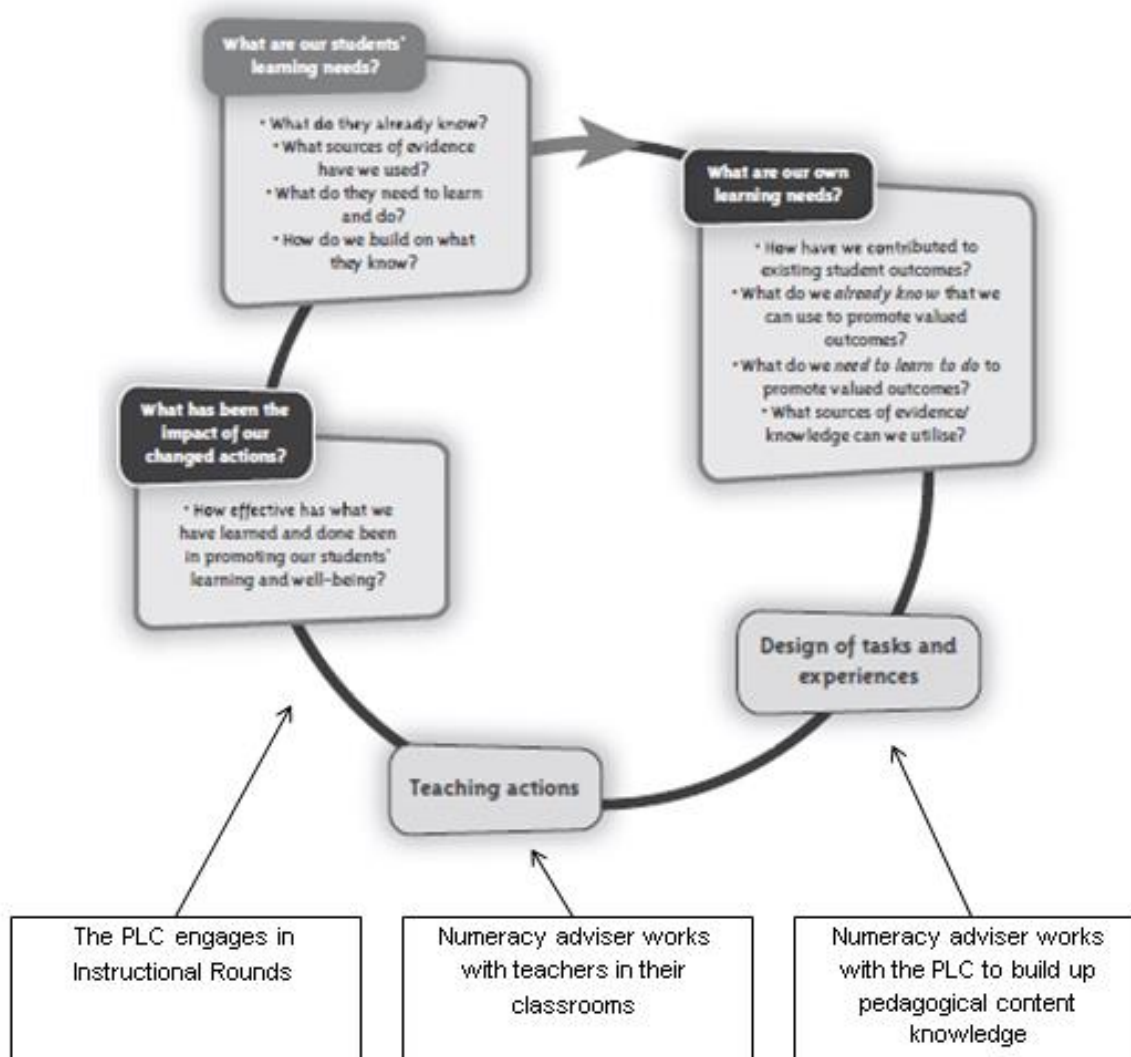


Figure 5. “Teacher inquiry and knowledge-building cycle to promote valued student outcomes” (Timperley, Wilson, Barrar & Fung, 2007)

The inclusion of IR after some teaching practice, as teachers move into the third dimension of this cycle; “What has been the effects of our changes actions?”, can provide the PLC with rich observational data from which the group can both evaluate the effects of their teaching on student learning and form shared theories of action (City et al., 2009). IR at this point, means that it is more likely that the teaching observed aligns with the group’s goals and plans, is delivered with increased confidence and some mathematical rigour and also provides a structure and set of

protocols that allows teachers to engage in rich, professional dialogue, develop the skills of feeding back to colleagues, connecting the effects of teaching to learning in a professional manner. It seems that by continuously moving through this cycle, embedding de-privatisation experiences, feelings of apprehension, fear or inadequacy that have presented as roadblocks to cultural change could be reduced. Furthermore, it is possible that practitioner knowledge can be transformed to a form that is beneficial to the PLC and possibly beyond, hopefully leading to improved student outcomes on a larger scale.

6.3.2 Implications for professional learning

The findings in this study encourage schools to use frequent and multiple de-privatisation experiences to support the professional learning of teachers, through participation in PLCs with colleagues within the school context, ideally with the support of a numeracy adviser (mathematics coach). However, to achieve these conditions schools must also address the main barrier; namely, voluntary participation in de-privatisation experiences and the important issues that seem to be underlying teacher resistance to participation; namely, insufficient pedagogical content knowledge in mathematics and inadequate skills and confidence to provide feedback.

6.3.2.1 Voluntary participation in de-privatisation experiences

In this study, it has been found that de-privatisation experiences were more likely to lead to professional learning when participation was an expectation. Given the choice, those who quite possibly need the professional learning most, will opt out. Furthermore, it has been found that once teachers have engaged in de-privatisation, they are likely to appreciate its benefits. In their synthesis of current research about professional learning in mathematics, Timperley et al., (2007) found that whether participation was mandatory or voluntary had little effect on student

outcomes. The most important thing was that teachers engaged. Moreover, they found that the presence of collegial support was more significant than whether all teachers in the school participated or not. Combined, the research challenges school communities to develop cultures whereby the ultimate vision is to see improved outcomes for students. This can be done by increasing the effectiveness of teachers through professional learning (Dufour & Marzano, 2011; Harris & Jones, 2012; Hattie, 2009; Hattie, 2015a; Timperley et al., 2007). Whether all teachers come onboard with de-privatisation immediately or not, engagement of all at some time is important.

6.3.2.2 Lack of teacher pedagogical content knowledge in mathematics

When considering the effects of de-privatisation on teachers and the conditions under which de-privatisation is most conducive to the professional learning, it has emerged from the qualitative data in this study, that a lack of teacher pedagogical content knowledge is significant. The analysis of interview responses related to the three school leaders suggest that primary teachers in their establishments are not be sufficiently equipped with pedagogical content knowledge in the area of mathematics education, or at least present a lack of confidence in this knowledge. It also seems likely that such a situation is a primary reason for teachers to resist valuable de-privatisation opportunities. This also seems plausible in light of the breadth of research emphasising the importance of deepening teacher pedagogical content knowledge in mathematics for improved teaching and learning (Anthony & Walshaw, 2009; Stacey, 2010), with the development of teachers' mathematical content knowledge being identified as most important (New South Wales Government, 2013b; Timperley et al., 2007). In the synthesis of research on professional learning in mathematics, Timperley et al. (2007) declared that "Successful programmes developed teacher's content knowledge of mathematics and their

understanding of student's mathematical thinking" rather than particular pedagogies (p.92). When teachers' conceptual understanding of mathematics improved, they were more able to develop conceptual understandings in their students, assess students and ultimately, attend to their needs. Furthermore, it was also noted that when teachers were able to see effective examples of mathematics teaching, this supported teachers in bridging the gap between theory and practice.

Whilst it has been found in this study that those lacking skills can be addressed at least to a degree through de-privatisation experiences, especially with a numeracy adviser or competent practitioner of mathematics, it may be that other forms of professional learning, especially addressing mathematical content knowledge prior to de-privatisation could lead to teachers more readily embracing learning through opening classrooms.

6.3.2.3 Inadequate skills and confidence to provide feedback

Feedback to teachers such that they can determine how they are going and where they need to go next for their students, has been found to have a very significant effect on student achievement, especially when evidence-based models have been employed (Hattie, 2009, p.181). Indeed, in this study, teachers have acknowledged that feedback after classroom observations has led to improvements in their teaching and has been one of the main reasons why they have valued de-privatisation experiences. However, some have indicated that 'observing' has also required them to provide feedback to their colleagues, a position about which they have felt inadequate or uncomfortable.

Given that the ingrained culture for teachers in western education has been characterised by individualism and isolation (Elmore, 2004; Fullan, 2011a; Fullan 2011b, Hattie, 2015a), it is not

surprising that there is a shortfall of skills and confidence in teachers and leaders for providing feedback to colleagues. A cultural shift which employs de-privatisation within schools, as a professional learning strategy, also needs to be supported with professional learning for teachers, such that they have the skills to coach or mentor each other. IR, with its process that requires participants to firstly use their descriptive voice to share fine-grained observational data before analysing, predicting and ultimately, determining the “next level of work” has been developed to do this (City et al., 2009). In this study participants have indicated that it has been successful, especially when they have had multiple experiences, suggesting that schools could benefit from employing this process frequently. These results endorse the views of City et al. (2009) that “people get better at the process over time” (p. 151).

These results may also account for why less structured approaches to de-privatisation have been less positively received as teachers and leaders have been left unsupported to relay observations and advice to their colleagues. Through RAMP, IR has been facilitated most often or at least initially, by the numeracy adviser, however, it seems clear that teachers and leaders would benefit from training in this process or at least in coaching and mentoring, especially if schools deem that less structured and less threatening processes are more suitable for their teachers.

Whilst teachers or leaders may lack the language and questioning skills to relay feedback to their colleagues, or at least the confidence, it is also likely that if their pedagogical content knowledge in mathematics is limited, that this too, may be impeding their ability to provide feedback to others. In this study teachers have been most receptive to feedback from the numeracy adviser, not only because of their expertise as a coach but also due to their high level of pedagogical content knowledge. As Timperley et al. (2007) explain, the changes required in mathematics teaching and learning “required challenge and support from those with appropriate expertise”

(p.74). Indeed, they found that leaders were reluctant to adopt expert roles in their schools when focusing on mathematics because what was challenging teachers was equally as challenging for leaders. It is very possible that the feedback offered by other teachers and leaders has not been considered to be of a useful standard.

6.3.3 Implications for policy development

Opening classrooms for the purpose of teacher observations and ultimately, improving the quality of the teaching workforce is a strategy integral to the NSW Government's *Great Teaching, Inspired Learning A blueprint for action* (New South Wales Government, 2013a), and also current Australian government policy, as teachers are required to showcase their practice in order to be accredited against the *Australian Professional Standards for Teachers* (AITSL, 2011). Beginning teachers who have been employed since October 2004 in NSW have been required by the Board of Studies, Teaching and Educational Standards (BOSTES) to expose their teaching practice to their more experienced colleagues in order to be accredited against standards (NSW DEC, n.d.), and under the new policy this will extend to all teachers. It is anticipated that in being given a set of standards, a number of goals will be achieved. This policy hopes that educators individually and collectively, will (a) acquire a better understanding of what constitutes quality teaching (AITSL, 2011), (b) be supported and developed in their roles, (c) be motivated to achieve the benchmarks and (d) be rewarded when they can provide evidence of attaining them (NSW DEC, 2013a; 2013b).

In light of the results of this study, it may seem that this new policy as outlined in *Great Teaching, Inspired Learning A blueprint for action* (NSW DEC, 2013a), provides an opportunity for schools to break the culture of teacher isolation, as it would oblige them to participate in

frequent de-privatisation experiences. However, the problem is that its multitude of purposes will leave teachers and leaders conflicted. On the one hand, it wishes to use “school-based, classroom-focused professional learning” to support and develop teachers in an ongoing way over extensive periods of time, and on the other, it aims to utilise these for “performance management” so that “underperforming teachers and school leaders will be treated in an efficient and fair way” and strong performers recognised (NSW DEC, 2013a, p. 15). Whilst this study has highlighted the advantages of the former ambition, it has also stressed the issues of the latter. As teachers need to expose their practice to be judged by their school leaders, it seems most likely that they will not associate de-privatisation as a collaborative learning experience, a condition that this study has advocated as fundamental to facilitating teacher professional learning. As Coe et al. (2014) report referring to the work of Popham (1988) and Hinchey (2010), these purposes are incompatible and counter-productive as “formative assessments, intended to improve practice” (p. 39) require teachers to be reflective, admit weaknesses and trust their observers, whilst the alternative is summative with potential dire consequences, encouraging those who perceive themselves to be at risk to conceal their deficits. Systems in the world that have led with the “drivers” of strengthening teacher standards, assessment and monitoring and accountability have been unsuccessful (Fullan, 2011a; Masters, 2014).

The effect of government policy is already showing on some leaders who are stretched both in their capacity (with limited coaching and mentoring skills and possibly inadequate pedagogical content knowledge in mathematics) and also in the time that conducting observations and relaying feedback requires. Moreover, in this study, de-privatisation for the purpose of visits from a member of the leadership team were less frequent than other forms and frequent visits (beyond 1-2 over a two year period) were not perceived as more helpful to professional learning.

Leaders expressed their frustration as they tried to get into their colleagues' classrooms. It is unsurprising that the support of numeracy advisers was considered far more valuable, as their responsibilities did not include assessing teachers for the purposes of accreditation. If the current policy is to be successful in both developing teachers as well as managing their performance and leaders are to primarily be responsible for the latter, then extensive employment of mathematics coaches may be essential to achieve the former. Government policy needs to also consider the extensive demands being placed on school leaders and ensure that professional learning is provided and that time is freed up to allow them to effectively meet their responsibilities. As Fullan and Knight (2011) state:

States, provinces, and nations need to recognise that a combination of change agents is essential for success. If teachers are the most significant factor in student success, and principals are second, then coaches are third. All three, working in coordinated teams, will be required to bring about deep change. (p. 53)

6.3.4 Implications for further research

Whilst this research investigates teacher perceptions of how de-privatising the classroom affects their own professional learning; the effects they perceive it is having on their teaching practice and on their students' learning, it does not measure what actually transpires in practice. Whilst teachers have shared some evidence of changes in their teaching practice and improvement in student learning, it is acknowledged that what is perceived is not always congruent with what actually happens. Stigler & Hiebert (2009) highlighted the ingrained and stable nature of teaching in their *Trends in International Mathematics and Science Study* (TIMSS) video study, stating that despite many teachers believing they had made significant adjustments to their

pedagogy, in their observations they noted no significant difference. Future studies may wish to explore to what extent teachers' perceptions of improved instruction are evident through observation or through improved student learning outcomes.

In particular, the results of this study seem to suggest that limited pedagogical content knowledge of teachers in mathematics, and possibly even leaders, is a significant impediment to teacher participation in de-privatisation experiences and that developing this knowledge may also need to be an integral part of professional learning experiences. Further research is required to confirm this. This could be explored using qualitative methods and a longitudinal framework, in an effort to gain evidence of improvement over time. Data collection methods could include observation of teachers within a PLC, prior to, during and post, engaging in de-privatisation experiences. Teacher interviews, journal reflections and measurements of the impact on student learning could also support this.

Also, it was difficult to determine the effect of some forms of de-privatisation on teachers in this study, as they were not heavily employed. These included opening classrooms for visits from colleagues (not during IR), from leaders and from educators from other schools. Considering that a number of teachers and leaders indicated that they believed such forms could be supportive and less threatening, it would definitely be worth exploring whether teachers perceived multiple experiences of these forms facilitated their professional learning and led to improvements in their teaching of mathematics. In particular, team teaching was a strategy strongly encouraged by some participants in this study and surprisingly, under-utilised. The impact of this form of de-privatisation in other research is also limited and requires further investigation (Hattie, 2009, p. 219).

6.4 Limitations of the Study

A limitation of the study was that some groups of teachers within the Archdiocese of Sydney, who participated in RAMP, during the timeframe being investigated, were not well represented. One major reason for this was the restrictions imposed by the ethics approval not to interview teachers in one of the three regions because the researcher herself was the RAMP adviser in that region. Another reason was that it was difficult to gain support for participation in the research, as required by the Catholic Education Office, from some principals, particularly outside the researcher's region, as they were concerned about the other numerous competing demands on their teachers. Principals who were familiar with the researcher keenly participated and encouraged their teachers to take up the survey. Finally, it was each individual teacher's choice to participate and it seems likely that teachers who had not had multiple experiences of de-privatisation through RAMP chose not to accept the invitation.

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Appendices

Appendix A: Survey

Survey: De-Privatisation of the Mathematics Classroom

You are invited to participate in a research project to explore the effects of de-privatising the mathematics classroom on teachers. For the purposes of this study, de-privatising means opening ones classroom to one or more educational professionals, so they can observe teaching and learning.

If you agree, kindly complete this short survey. It should only take you about 15 minutes.

Study findings will be reported in a way that ensures that individual or school responses will remain anonymous. All responses will be strictly confidential. There are no 'right' or 'wrong' answers. Participation in this research is voluntary. By completing this survey you are indicating your willingness to contribute to this study.

For more information about this research, please contact Jennifer Chu email: jennifer.chu@syd.catholic.edu.au

1) Gender:

Female Male

2) Years of Teaching Experience:

0-5 6-10 11-15 16-20 21-25 26-30 30+

3) What is your role in your school?

- Classroom teacher
- Member of the leadership team and classroom teacher
- Principal
- Other: _____

4) During the last two years, how many times have the following occurred in your mathematics classroom?

	0	1	2	3	4	5+
Visits from a Numeracy Adviser	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Observations by other teachers in your school (not including instructional rounds)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Observations for instructional rounds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Observations from a member/s of the school leadership team	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Visits from educators from other schools	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5) During the last two years, to what extent do you agree that the following have been helpful to your professional learning?

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Not applicable
Visits from a Numeracy Adviser	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Observations by other teachers in your school (not including instructional rounds)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Observations for instructional rounds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Observations from a member/s of the school leadership team	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Visits from educators from other schools	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6) How have you felt about opening your classroom so teaching and learning can be observed?

7) To what extent do you agree that opening your classroom has led to changes in the way you teach mathematics?

Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Not applicable
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please explain:

8) During the last two years, how many times have you observed mathematics teaching and learning?

	0	1	2	3	4	5+
When the numeracy adviser was teaching in your classroom?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In another teacher's classroom (not during instructional rounds)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
During instructional rounds?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In another teacher's classroom at another school	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9) During the last two years, to what extent do you agree that observing has been helpful to your professional learning?

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Not applicable
When the numeracy adviser was teaching in your classroom?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In another teacher's classroom (not during instructional rounds)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
During instructional rounds?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In another teacher's classroom at another school	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10) How have you felt about being and observer?

11) To what extent do you agree that observing teaching and learning has led to changes in the way you teach mathematics?

Strongly agree Agree Not sure Disagree Strongly disagree Not applicable

Please explain:

12) To what extent do you agree that opening mathematics classrooms has led to improvements in the teaching of mathematics across your school?

Strongly agree Agree Not sure Disagree Strongly disagree Not applicable

Please explain:

13) In the future, under what conditions do you think that opening classrooms would be most helpful to your professional learning?

14) What region do you work in?

Eastern Region Inner West Region Southern Region

15) Would you like to participate in a follow-up interview to discuss your ideas about opening the mathematics classroom so teaching and learning can be observed?

Yes No

16) if YES, please provide your contact details below:

Name:

Phone number:

Email address:

Appendix B: Participant Information Sheet for Survey



Dear Teacher,

You are invited to participate in a research project to explore the effects of de-privatising the mathematics classroom on teachers. For the purposes of this study, *de-privatising* means opening ones classroom to one or more educational professionals, so they can observe teaching and learning.

De-privatisation practices are an integral part of the Reading and Mathematics Project (RAMP) and increasingly, are being adopted to support professional learning for teachers. This research seeks to find out from teachers who have been involved in RAMP (Mathematics), how they feel about this approach and the conditions under which they perceive it is most supportive to improving their teaching of mathematics. It is hoped that this research will be able to inform the future development of professional learning models for teachers in Catholic Schools in the Archdiocese of Sydney and beyond.

If you choose to participate, simply complete the online questionnaire. It requires you to answer a variety of multiple choice, options on a scale and open-ended questions. It should only take you about 15 minutes. You can remain anonymous.

At the end of the questionnaire, you will be invited to participate in a follow up interview to further discuss your views on this professional learning model. If you would like to be interviewed, you will need to leave your contact details. Interviews will take about 30 minutes and will be audio taped. A mutually convenient location will be determined for the interview to take place.

If you agree, kindly complete this survey by clicking the link below.

SURVEY LINK: <https://www.surveymonkey.com/s/8PWTXX2>

Study findings will be reported in a way that ensures that responses from an individual or school CANNOT be identified. All responses will be strictly confidential. There are no pre-determined 'right' or 'wrong' answers. Participation in this research is voluntary. The submission of this survey is an indication of your willingness to participate in this study. You can withdraw your participation in this research at any time before the final analysis although it is not possible for a completed anonymous questionnaire to be removed from a set of completed questionnaires. Data will be kept secure and destroyed after five years.

This research has been approved by the Human Research Ethics Committee (HREC) of The University of Notre Dame Australia (approval number #####). If you wish to make a complaint regarding the manner in which this research project is conducted, it should be directed to the Executive Officer of the Human Ethics Committee, Research Office, The University of Notre Dame Australia, PO Box 1225 Fremantle WA 6959, phone (08) 9433 0943, research@nd.edu.au. The researcher is Jennifer Chu, a Master of Philosophy (Research) student, from the University of Notre Dame, Sydney. The chief investigator is Tim Perkins (tim.perkins@nd.edu.au).

For more information about this research, or for a summary of the research findings, please contact Jennifer Chu via email: jennifer.chu@syd.catholic.edu.au

Thank you for completing the survey. Please submit it by **, 2014.***

Appendix C: Plain English Statement for Survey



PARTICIPANT INFORMATION SHEET

PROJECT TITLE: The effects of de-privatising the mathematics classroom on the teacher

CHIEF INVESTIGATOR: Tim Perkins

STUDENT RESEARCHER: Jennifer Chu

STUDENT'S DEGREE: Master of Philosophy (Research)

Dear Participant,

You are invited to participate in the research project described below.

What is the project about?

The research project investigates the effects of de-privatising the mathematics classroom on teachers. For the purposes of this study, de-privatising means the opening of a classroom to one or more educational professionals, so they can observe teaching and learning.

De-privatisation practices are an integral part of the Reading and Mathematics Project (RAMP) and increasingly, are being adopted to support professional learning for teachers. This research seeks to ascertain from teachers, how they feel about this approach and the conditions under which they perceive it is most supportive to improving their teaching of mathematics.

Who is undertaking the project?

This project is being conducted by Jennifer Chu and will form the basis for the degree of Master of Philosophy (research) at The University of Notre Dame Australia, under the supervision of Tim Perkins.

What will I be asked to do?

If you choose to participate, simply complete the online questionnaire. It requires you to answer a variety of multiple choice, options on a scale and open-ended questions. It should only take you about 15 minutes.

At the end of the questionnaire, you will be invited to participate in a follow up interview. If you would like to discuss your views on this professional learning model, you will need to leave your contact details. Interviews will take about 30 minutes and will be audio taped. A mutually convenient location will be determined for the interview to take place.

Are there any risks associated with participating in this project?

Participation in this research is voluntary. You can remain anonymous. There are no 'right' or 'wrong' answers, as this research endeavours to gather the genuine views of teachers. Responses will not be public identifiable.

What are the benefits of the research project?

It is hoped that this research will be able to inform the future development of professional learning models for teachers in Catholic Schools in the Archdiocese of Sydney and beyond.

Can I withdraw from the study?

Participation in this study is completely voluntary. You are not under any obligation to participate. By submitting the questionnaire you are indicating your willingness to contribute to this study. Once the survey is submitted, it will not be possible to withdraw responses from the research.

Will anyone else know the results of the project?

Information gathered about you will be held in strict confidence. This confidence will only be broken in instances of legal requirements such as court subpoenas, freedom of information requests, or mandated reporting by some professionals. All reporting will be done using pseudonyms where required.

If you choose to participate in the interview, the researcher will require your contact details. However, the data used from the interview will be reported to ensure that your identity and that of your school is not disclosed.

Consent forms and data will be stored securely in the School of Education at The University of Notre Dame Australia for a period of five years.

Will I be able to find out the results of the project?

Yes. Once the project is complete, the results will be published and made available to all participants.

Who do I contact if I have questions about the project?

For more information about this research, please contact Jennifer Chu
email: jennifer.chu@syd.catholic.edu.au

What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Committee at The University of Notre Dame Australia (approval number #####). If you wish to make a complaint regarding the manner in which this research project is conducted, it should be directed to the Executive Officer of the Human Research Ethics Committee, Research Office, The University of Notre Dame Australia, PO Box 1225 Fremantle WA 6959, phone (08) 9433 0943, research@nd.edu.au

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

I want to participate! How do I sign up?

Simply complete the online questionnaire that has been emailed to you.

Yours sincerely,

Jennifer Chu

Appendix D: Principal Information Sheet for Survey



Dear Principal,

I am writing to ask you to invite your teachers to participate in an online survey. It is about the effects of de-privatising the primary mathematics classroom on teachers in the context of the Reading and Mathematics Project (RAMP).

For the purposes of this study, *de-privatising* is defined as the opening of classrooms to other educators so that teaching and learning can be observed. As you would be aware, it is an integral part of the Reading and Mathematics Project (RAMP) and increasingly, is being adopted to support the professional learning for teachers. This research seeks to find out how teachers perceive de-privatisation and how it can support their teaching of mathematics. It is hoped that this study will inform the future development of professional learning models for teachers in Catholic Schools in the Archdiocese of Sydney and beyond.

This survey is part of my Masters of Philosophy (Research) degree at The University of Notre Dame. All primary school teachers involved in RAMP (Mathematics) across the Archdiocese of Sydney during 2012 & 2013 are being invited (via email) to complete an anonymous online questionnaire. This will include the following teachers who have been involved from your school:

(Teacher names to be inserted).

The questionnaire should only take them about 15 minutes. As part of this, they will also have the opportunity to volunteer to participate in a follow-up interview. If you could provide your teachers with some time to complete the survey, it would be much appreciated. The closing date is *****, 2014.

For your information, I have attached a copy of the Participant Information Sheet which includes a link to the survey. If you would like more information about this research, please feel free to contact me on. 8344 3000 or email jennifer.chu@syd.catholic.edu.au

Thank you for your support.

Kind regards,

Jennifer Chu

*Numeracy Adviser K-6
Eastern Region Catholic Education Office
8344 3000*

Appendix E: Interview Participant Information Sheet

INTERVIEW PARTICIPANT INFORMATION SHEET



Dear Interviewee (insert TEACHER X),

Recently you submitted a survey about the effects of de-privatising the mathematics classroom on the teacher in relation to your involvement in RAMP. As part of this you indicated that you would like to participate in an interview to further discuss your views about this professional learning model.

In the coming days I will be in contact with you to organise a mutually convenient time and place to conduct this interview. Here is some information detailing what will be involved.

INTERVIEWEE INFORMATION

What is the Interview about?

The interview will be an opportunity for you to further elaborate on the information you provided in the online questionnaire about the effects of de-privatising your classroom for mathematics.

The purpose of the interview is to understand how you have felt about classrooms in your school being opened for observation to other teachers and the impact this has had on the teaching of mathematics in your school. It also aims to appreciate what you believe are the conditions under which this approach is most conducive to professional learning for teachers.

Who will the interviewer be?

The interview will be conducted by Jennifer Chu, the Numeracy Adviser K-6 for the Eastern Region of Catholic Schools in the Archdiocese of Sydney. The data will form the basis for the degree of Master of Philosophy (research) at The University of Notre Dame Australia, under the supervision of Tim Perkins.

What will I be asked to do?

The interviewer will contact you to establish a mutually convenient location for the interview to take place. It is anticipated that the Interview will take about 30 minutes. It will be audio taped. The interview will be an opportunity for you to share your views and experiences. It will be informal and conversational.

The questions could include:

1. What elements of de-privatisation have had the most impact on your teaching? Why?
2. What changes have you made to the way you teach mathematics, as a result of your de-privatisation experiences?

3. Have these changes led to improvements in student learning? What evidence do you have for this?
4. What changes have been made to the way mathematics is taught across the school?
5. Do you have any concerns about de-privatisation? If so, what are they?

What are the benefits of the research project?

It is hoped that this research will be able to inform the future development of professional learning models for teachers in Catholic Schools in the Archdiocese of Sydney and beyond.

Are there any risks associated with participating in this project?

Participation in this research is voluntary. There are no 'right' or 'wrong' answers, as this research endeavours to gather the genuine views of teachers.

Data from the interview will be reported to ensure that your identity and that of your school is not disclosed. All reporting will be done using pseudonyms where required. Information gathered about you will be held in strict confidence. This confidence will only be broken in instances of legal requirements such as court subpoenas, freedom of information requests, or mandated reporting by some professionals. Consent forms and data will be stored securely in the School of Education at The University of Notre Dame Australia for a period of five years.

Can I withdraw from the study?

Participation in this interview is completely voluntary. You are not under any obligation to participate. If you agree to participate, you can withdraw from the study at any time without adverse effects.

Will I be able to find out the results of the project?

Yes. Once the project is complete, the results will be published and made available to all participants.

Who do I contact if I have questions about the project?

For more information about this research, please contact Jennifer Chu
email: jennifer.chu@syd.catholic.edu.au

What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Committee at The University of Notre Dame Australia (approval number #####). If you wish to make a complaint regarding the manner in which this research project is conducted, it should be directed to the Executive Officer of the Human Research Ethics Committee, Research Office, The University of Notre Dame Australia, PO Box 1225 Fremantle WA 6959, phone (08) 9433 0943, research@nd.edu.au

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

Yours sincerely,

Jennifer Chu

Appendix F: Interviewee Consent Form



CONSENT FORM

The effects of de-privatising the mathematics classroom on the teacher

INFORMED CONSENT FORM

I, (*participant's name*) _____ hereby agree to being a participant in the above research project.

- I have read and understood the Information Sheet about this project and any questions have been answered to my satisfaction.
- I understand that I may withdraw from participating in the project at any time without prejudice.
- I understand that all information gathered by the researcher will be treated as strictly confidential, except in instances of legal requirements such as court subpoenas, freedom of information requests, or mandated reporting by some professionals.
- I understand that the protocol adopted by the University Of Notre Dame Australia Human Research Ethics Committee for the protection of privacy will be adhered to and relevant sections of the *Privacy Act* are available at <http://www.nhmrc.gov.au/>
- I agree that any research data gathered for the study may be published provided my name or other identifying information is not disclosed.
- I understand that I will be audio- / video-taped.

PARTICIPANT'S SIGNATURE:		DATE:	
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RESEARCHER'S FULL NAME:	
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RESEARCHER'S SIGNATURE:		DATE:	
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If participants have any complaint regarding the manner in which a research project is conducted, it should be directed to the Executive Officer of the Human Research Ethics Committee, Research Office, The University of Notre Dame Australia, PO Box 1225 Fremantle WA 6959, phone (08) 9433 0943, research@nd.edu.au

Appendix G: Letter to Principal about Interviewee



Dear Principal,

Recently teachers from your school participated in an online survey about the effects of de-privatising the mathematics classroom on the teacher in relation to their participation in RAMP. As part of this TEACHER X indicated that he/she would like to participate in a follow up interview to further discuss his/her views about this professional learning model.

It is my intention to contact TEACHER X in the coming days to establish a mutually convenient time and place to conduct this interview. For your information I have attached the Interviewee Information Sheet which includes details of what will be involved. I have also attached a letter for TEACHER X which also includes this information sheet.

If you would like more information about this research, please feel free to contact me on. 8344 3000 or email jennifer.chu@syd.catholic.edu.au

Thank you for your support.

Kind regards,

Jennifer Chu

*Numeracy Adviser K-6
Eastern Region Catholic Education Office
8344 3000*