THESIS TITLE:

Lessons from Lesson Study: Exploring School Climate, Teacher Learning and Teacher Self-Efficacy in an Inner London Primary School

SUBMITTED BY:

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I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature: .....

Abstract

England has a school teacher recruitment and retention crisis. Fewer people are turning to teaching as a career and of those that do, nearly half of them leave the profession within a few years in the classroom. Common reasons for this include micromanagement, excessive workload, and low professional morale. School leaders must balance the weight of high-stakes external accountability through standardised assessment and inspection with a positive school climate where teachers deeply believe in their capacity to improve and impact upon pupils' achievement. It is therefore important that school leaders are able to draw upon theories in action that positively impact on teachers' perceptions of the school climate and self-efficacy that simultaneously support deep teacher learning and pupil outcomes. Professional capital theory posits that through the systematic development and integration of three kinds of capital – human, social and decisional – learning and achievement can improve everywhere (A. Hargreaves & Fullan, 2012). Lesson Study (LS) is a model of teacher development that has been widely researched for its impact on teacher learning and pupil outcomes, but with little evidence about its association with teachers' perceptions of school climate and teacher self-efficacy. While a small number of recent studies have considered the impact of LS on school culture and teacher self-efficacy, they have focused primarily on quantitative measures and have been conducted by external researchers, without considering the voice of the teachers in an emerging picture of LS in shaping the school climate or teacher self-efficacy. LS is positioned within the study as an approach aligned with social capital while, crucially, the research is being conducted at a school situated within a system that is not conducive to professional capital in action. This is of importance to school

leaders as teachers' perspectives on school climate and self-efficacy as a result of improvement approaches are fundamental in teacher satisfaction, development, improvement and job performance. Teachers' perspectives about school improvement are fundamental to its sustainability and long term impact.

The aims of this study were: 1) To positively change school culture/climate through the introduction of Lesson Study as professional learning and development; 2) To improve teacher self-efficacy in teaching mixed-ability classes in mathematics, ultimately phasing out "ability grouping"; and, 3) To interrogate current teaching strategies being used with struggling and advanced learners in primary mathematics with regard to pupil progress. The following research questions were formulated to explore the aims: 1) Will initiating a programme of Lesson Study be associated with a positive impact on the climate of a primary school? 2) Will initiating a programme of Lesson Study be associated with a positive impact on teacher self-efficacy in implementing inclusive practice? 3) What conclusions did the teachers draw about improving the teaching following the Lesson Study cycle? 4) What changes to practice will teachers sustain after engaging in a wave of Lesson Study? 5) What changes in pupil maths attainment will follow a programme of Lesson Study?

This research presents the case study of a primary school in inner London conducting LS for the first time in 2015/16, with a prologue discussing the events leading up to the study itself from 2012, concluding with an epilogue exploring the outcomes over time in 2020/21. Using professional capital theory, I collected data from semi-structured individual interviews, group interviews, pre- and post-LS questionnaires and a review of group research posters and pupil mathematics assessment data. I then critically examined this data to identify qualitative

themes in teacher perspectives. Finally, these analyses were combined to consider what associations teachers perceived LS to have. Quantitative analysis showed both high initial ratings from teachers and overall mean score improvements to both climate and self-efficacy scales. These results were expanded upon through interview and teachers identified new potential domains for the analysis of the school climate and teacher self-efficacy. Teachers' responses to questions about their learning and sustained changes to practice were in line with relevant LS literature and pupil outcomes reflected a significant difference when comparing Wave 1 to Wave 2 and a difference between prior low-attaining pupils and prior high attainers. There is also evidence to support a change in teacher practice as it related to “ability grouping” due to the construct of LS itself.

The research undertaken in this project is significant as it supports and furthers the work in the field of LS. It contends that LS is both a vehicle for teacher development and pupil achievement, but adds to the field that LS is a mechanism that can be used to positively influence the climate in a primary school and improve the self-efficacy of teachers in implementing inclusive practices in the context of professional capital theory over time. In addition to this, this study adds content to the body of knowledge about school climate and teacher self-efficacy beyond the realm of LS, which could be used in designing quantitative tools to measure climate and efficacy in other settings. It also provides a longitudinal look at the place of LS and professional capital theory in action at an English primary school over time, with work analysed in both the initial stages and five years on. Future research could be pursued about those elements that allow effective LS to be sustained in English primary schools and the factors that support or

dissuade leaders from adopting Lesson Study in system-based cultures less conducive to LS. An analysis of current school climate and self-efficacy scales could be undertaken to further develop the coverage of school climate and teacher self-efficacy measures.

Dedication

This work is dedicated to my beautiful son, Jackson.

Here's to the crazy ones. The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently. They're not fond of rules. And they have no respect for the status quo. You can quote them, disagree with them, glorify or vilify them. About the only thing you can't do is ignore them. Because they change things. They push the human race forward. And while some may see them as the crazy ones, we see genius. Because the people who are crazy enough to think they can change the world, are the ones who do.

(Siltanen, 1997)

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First and foremost, I would like to thank my supervisor, Professor Brahm Norwich, for your patience, guidance and unwavering belief throughout this project. This would not have happened without your wisdom and support. I am forever grateful.

I would like to thank Francesca Rowland for undertaking the role of interviewer, observer and recorder. Also, for regularly asking, “how is the writing going?” in your very best headteacher voice ☺.

I would like to thank my work family – the governing board for seeing the intrinsic value in this endeavour and providing me with both financial support and the time to be a researcher and headteacher. And to my incredible staff for allowing me to tinker with your world.

I would like to thank my partner – in love, in life, in parenthood – Jo. You are my best friend and the best mother in the world. Even at this very moment, I am writing this while you are at home caring for our boy. I know it’s been hard – but you’ve never made me feel that way. I love you.

I would like to thank Charles Austin – for your mentorship, your friendship, and your selfless investment in me. You showed me the meaning of leadership every day – and your voice echoes through the pages of this thesis and the corridors of my school.

And – finally – thank you, mom. I didn’t appreciate everything you were when I was growing up until 13 April 2020. I thought I did. But I didn’t. I get it now. No words will ever be enough – but – thank you. This is ours.

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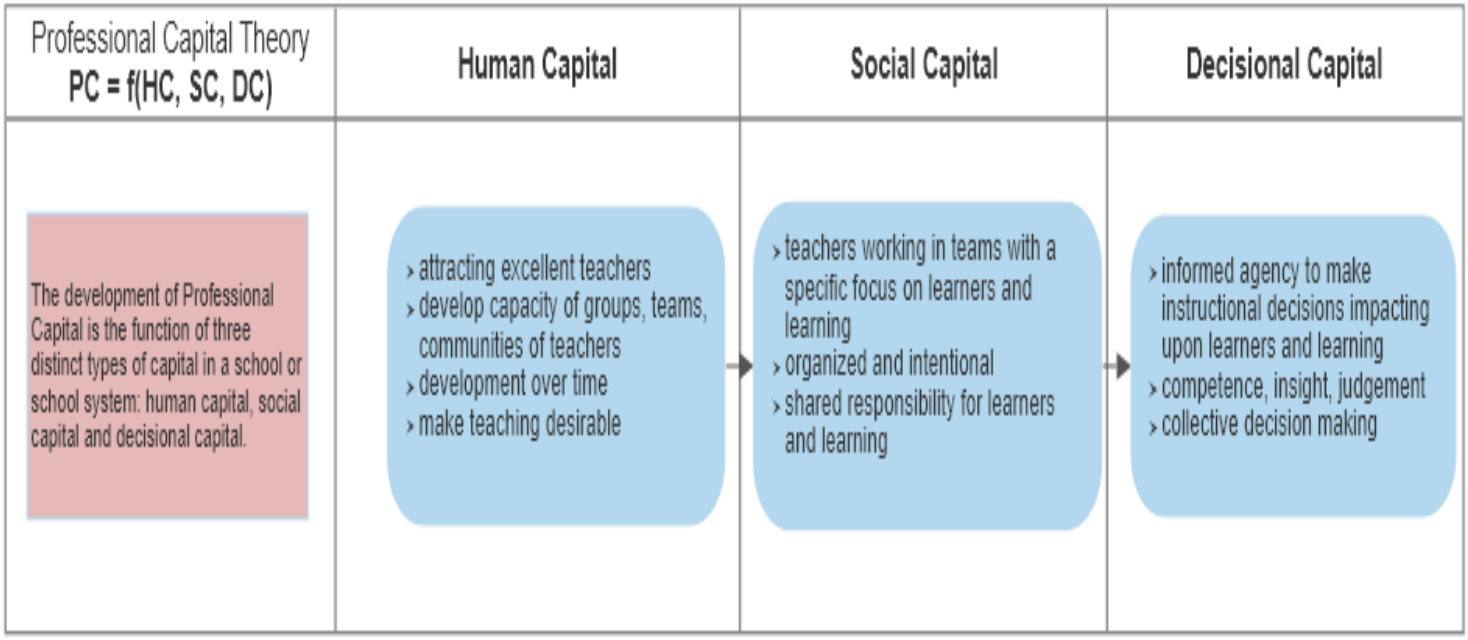
Prologue – Leading to Lesson Study (2012-2015)

In order to successfully position the associations of Lesson Study (LS) with the wider aims and research questions of this study, it is important to understand the position of LS in the wider context of school development and improvement initiated in the years leading up to the research project and the introduction of LS as social capital (SC). While the theoretical underpinnings of this study will be explored in greater detail in the literature review, it is important to give a brief introduction to professional capital theory (PC) (A. Hargreaves & Fullan, 2012). PC posits that through the systematic development and integration of three kinds of capital – human, social and decisional – learning and achievement can improve everywhere (A. Hargreaves & Fullan, 2012). This is an important factor as it both frames the research study and, more importantly, is countercultural to the present policies, approaches and beliefs of the education system in England, where this research took place. It was also countercultural at the school itself when the researcher joined the school in 2012. Although widely accepted in top performing nations (Canada, Finland, Singapore), the application of professional capital in an English primary school was unorthodox, untested and potentially dangerous leadership.

Table 1
Professional Capital Theory



Source: A.Hargreaves and Fullan, 2012

Throughout the last thirty years, with the initiation of standardised national curriculum testing (SATs) and the inception of the Office for Standards in Education (Ofsted), England's education system has been a leader in the Global Education Reform Movement (Fullan, Rincon-Gallardo, & Hargreaves, 2015; A.Hargreaves & Fullan, 2012; Levin, Glaze, & Fullan, 2008; Sahlberg, 2012a, 2012b). This is often characterised by great intentions – the improvement of educational outcomes for all children. However, these are ultimately let down by an over-reliance on narrow performance data, prescriptive control and compliance measures, and a dependence on high-stakes enforcement – high-stakes support programmes, capability procedures and job insecurity. The unintended consequences of this approach to reform have been widespread: teachers leaving the profession in droves (DfE, 2018a) and staff morale at an all-time low (Hannay, 2016d, 2018a; NEU, 2019). Arguably, the approaches

designed to improve schools were ultimately holding them back.

In the initial stage, a focus on developing human capital (HC) was important. This meant recruiting strong candidates, but more importantly, focusing on creating the kind of conditions that made excellent teachers want to remain at the school.

Three Bridges, the research school, is a large, two-form entry primary school in west London. Although it always had a friendly atmosphere, it was subject to the same problems pervasive in the English educational landscape. Staff worked in competition with each other; practice was judged on short-term, surface success; change was enforced upon teachers and quickly compliance checked; the school was losing 30-40% of its teaching staff each year. Results were staggeringly low, with only 58-65% of children meeting the expected standards by the end of primary school. Tacit beliefs explained why the children could not achieve: they came from a tough neighbourhood; they did not speak English at home; they were highly transient. Teachers were being regularly monitored and observed; the pupil books were being regularly scrutinised alongside teacher planning; overly prescriptive policies were in place to enforce compliance. Results flatlined towards the expected standard.

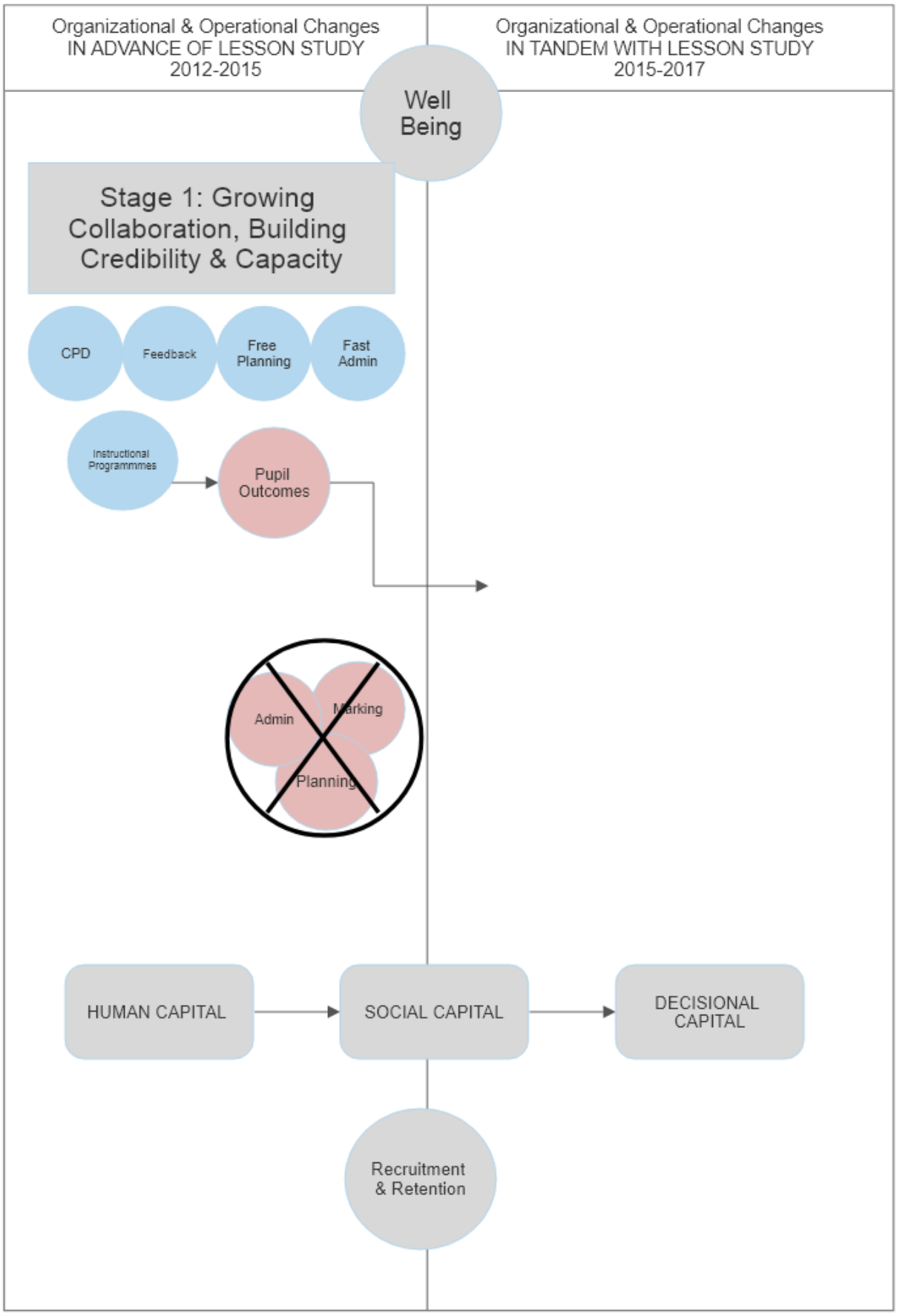


Figure 1: PC in Action Prior to LS 2012-2015

As shown in Figure 1, prior to and during the research study, professional capital theory was used in the sequence: first a focus on human capital, followed by informal approaches to social capital before transitioning to more formal Lesson Study in the second stage, ultimately leading to a newly discovered decisional capital. Initially, the school looked to focus heavily on developing human capital through improving the conditions under which teachers were working, with an added focus on informal social capital. The social capital element was characterised by working together to build the instructional programme and improve results at the school. As these were the initial attempts at changing the school climate, it was important to establish each of them on their own, with human capital being prioritised earlier on, followed by a focus on social capital through collaborative design of the instructional programmes using professional enquiry, and collective work on elements like the data entry spreadsheets. This was then followed by more formal collaboration and research that is "close-to-practice" through Lesson Study. In both initial stages, this also involved discarding practices and policies that were misaligned with professional capital, either creating a disincentive to continue as a teacher or overemphasis on practices that were time-consuming, yet not yielding strong results. This included (but was not limited to) practices in Stage 1 such as extensive written marking in pupil books, scrutinised and monitored proforma-based planning, and repetitive data entry (admin).

The first stage of change, as shown in Figure 1, largely focused on two key areas of human capital: i) improving pupil outcomes through the development of a systems-based approach to learning and teaching in Key Stage 2 (KS2) with

extensive, regular staff development, and ii) the transformation of working conditions based on staff feedback. These were absolutely crucial in setting the scene for larger, staff dependent changes via social and decisional capital.

With a view to building credibility and trust as a school leader, the first changes made were to the instructional programme, through a systems-based approach to learning and teaching. This was also done to improve progress and attainment measures at the school, the key inspection framework indicators at the time (Ofsted, 2012). The school was at risk of a poor judgement result after a framework change in 2012 and ensuring the school's results improved was an important first step in securing both the freedom from external scrutiny and the trust of the staff about the leader's knowledge, experience and understanding of high-quality learning and teaching. A systems-based approach is defined by the researcher as a clear and coherent evidence-informed instructional approach, including consistent lesson structures and sequences used by all staff. It is subject-based, not universal, meaning that the way reading is taught may differ from other subjects, like writing and mathematics. However, each core subject would have their own approach used by all staff in an age- and stage-appropriate way (Hannay, 2016d, 2017e).

The other important point here is how the changes to the instructional programme were made. The KS2 staff assembled after school each week to read and reflect upon evidence-informed practice provided by the researcher. At each meeting, the group would agree upon practices they would use over the next two-week period to "go away and have a play" with. They would then reassemble to discuss strengths and areas of concern (Hannay, 2016c, 2017a, 2017b). In essence, the

staff were trialling and feeding back on the instructional programme they were developing. If there was agreement that the approaches did not work, they were revised and tried in new ways or discarded completely. If there was agreement that they were working, they continued. By the end of two terms, new approaches to reading and writing were in place and agreed by all. This created a shared language and consistency across the phase, with a view that teachers could support one another in their development as they were all doing very similar things in lessons. Prior to this, every teacher taught using very different pedagogical models, intentionally or unintentionally, making shared discussion and collaboration very difficult. It was an environment that one teacher characterised as “every teacher for themselves”. The changes to the instructional programme were collaborative and collective, with everyone’s voice heard and valued. Teachers were reading and reflecting on best practice, before trying it themselves. The approach was “from the middle” rather than “from the top” (A. Hargreaves & O'Connor, 2018). This laid the foundation for further collaborative work and built the credibility needed to begin looking more in-depth at the human capital working conditions.

Addressing the condition in which the staff were working (human capital) was necessary before asking the staff to:

a) develop the trust and relationships necessary in school leaders before making more significant changes to pedagogy and practice through more extensive after-school development,

b) take on greater responsibility for enquiry, research, and professional agency.

Understanding the challenges in 2012 associated with the conditions under which

the staff worked was easy, but quite challenging to address. It was no secret at the case school that there were very standard practices that were making teachers unhappy. While some of their unhappiness came from the long working hours (many staff arriving at 7am and not leaving the school until 6pm), when questioned about their working conditions, teachers spoke much more about the time they were *wasting* on tasks that they felt had little or no impact, but took up significant portions of non-contact time. This was important on a number of fronts:

a) teachers were not averse to long hours,

b) teachers wanted more agency over how they spent their time,

c) teachers had initial views on what was having an impact and what was not.

The key factors at the time and the approaches taken to address them, identified by the teachers through informal conversation, were:

a) Marking: this was phased out, beginning with parent meetings and staff development sessions on a much wider range of feedback, ultimately replacing a “Marking” policy with a “Feedback” policy co-authored by all staff (Hannay, 2016a; Hattie & Clarke, 2018);

b) Planning: this was no longer monitored or scrutinised by senior staff and wider development was initiated on developing clear, system-driven, instructional programmes, whereby planning was shared and done in a manner that was best for the teachers (Gillen, 2018; Hannay, 2016c, 2017e; Stokes, 2017; Watson, 2018); and,

c) The school created a new assessment system that used enhanced technology, requiring teachers to enter a single data point that would automatically populate multiple sheets and develop a parent report, drastically reducing teacher admin

time (Stokes, 2017).

Marking was the first major “human capital” change made at the school, alongside looking at the instructional programme for English in KS2 in 2012/13 (Hannay, 2016a). It was highly featured in the workload reviews by the government in 2018 (DfE, 2018b); however, it was something addressed much earlier at the case school. However risky, it was necessary to provide teachers with the time they needed to focus on learning. It was common practice in many primary schools to expect teachers to submit planning for scrutiny, and was being recommended at the time by the local authority in the “good to outstanding” course that the headteacher and researcher were required to attend. The collection and analysis of pupil data was still paper-based and labour-intensive, with no clear way to streamline the data due to the assessment system in place at the time and the expected level of granularity perceived necessary by the local authority advisors and improvement partners. These challenges made change very risky. However, as attainment and progress results at the school improved drastically after developing and adopting a systems-based approach to instruction, the school had the confidence to make changes to marking, planning and data admin regardless of Ofsted’s potential view.

The school’s results from 2013 through to 2015 remained very strong, however, the school was visited by Ofsted in the early spring of 2014 (Ofsted, 2014). This was three years to the day from its 2011 “Outstanding” judgement. Although Outstanding schools were exempt from inspection, a new 2012 framework coupled with the poor results at the school in 2011 and 2012 sparked concern (Ofsted, 2012). While the 2013 results showed major improvement, the three-

year averages were very problematic. The school was able to show strong results from the 2013 year and evidence of sustained improvements that would result in continued success in 2014; however, the tests had not yet been taken and results not awarded. The school narrowly avoided a “requires improvement” judgement and achieved a “good” judgement overall. Although no school is happy about receiving a downgraded judgement, it gave the school space to continue on its development path. Ofsted was still making comments on judgement reports about marking in pupil books, as was indeed the case at the case school (Ofsted, 2014). However, the school was not deterred from its position. Later in 2016, Ofsted would publish “mythbusting” reports suggesting that they did not expect any amount or type of marking (Ofsted, 2016).

In Stage 2, from the 2015/16 school year (three years after the initiation of stage 1), the school was ready for the next series of substantial changes. This was focussed on the replacement of high-stakes monitoring, scrutiny, and accountability practices in addition to the perceived-ability grouping of pupils (Hannay, 2016c, 2017d). This included the removal of standard practices like book scrutinies, lesson observations, planning scrutinies, and learning walks (Hannay, 2019b). The view of the school was that LS would be far more powerful at improving practice than observation (Hannay, 2019a, 2019c, 2019d, 2020).

Initiating LS alongside the idea that teachers supporting teachers and teachers supporting themselves are more powerful than observation, scrutiny and monitoring was also both unconventional and potentially dangerous. The school maintaining strong results was essential to building the confidence necessary to continue to challenge accepted and promoted practices of school development

and improvement. Most often, when looking to challenge conventional wisdom, the discussion ultimately would always go back to pupil results. There was an explicit belief that the only way to raise pupil results was through top-down observation, monitoring and scrutiny. The national discourse was so focussed on these approaches that discussion about alternatives faded over time, to the point that they were no longer discussed.

As a foreign teacher and leader, I started my career outside the UK. I experienced success and watched other schools improve without the use of “high stakes” measures. I was confident that professional capital theory in practice, would not only sustain the quality of teaching, learning and pupil results, I was confident that it would release over time, a much greater potential in the teachers and their pupils. I was confident that what we had been doing to improve the school through high-stakes management practice was the same thing that was limiting our potential (Hannay, 2018b, 2019d).

Stage 1 was designed to build confidence in the power of collaboration and collective work through the design of instructional programmes. It was aimed at improving the basic working conditions of the staff through listening to their views and making swift changes to the practices the professionals found pointless or fruitless. It was the start of the journey. As shown in Figure 1, Stage 2 was designed to discard the approaches that told staff they needed to be monitored and scrutinised, replaced with an approach that would not only sustain the strong pupil performance, but improve it (Hannay, 2017c). It was meant to purposefully build upon the collaboration and collective work that had been initiated in Stage 1, furthering the use of research and evidence in refining and redesigning

pedagogy and practice. Stage 2 was also aimed at the elimination of ability grouping, the growth of teacher agency, and the enactment of teacher decisional capital (Hannay, 2018a).

Chapter 1: Introduction

I grew up the son of a single mother and absent father in poverty. Incredible teachers and improving schools changed the course of my life. While no one in my family had a big education or fancy degree, it was always assumed I would graduate from high school and attend university. I never went to an "Outstanding" school. I never had an "Outstanding" teacher. I never took a standardised test. I am the product of a system that did not – and does not – employ high-stakes accountability as media to improve schools (Levin, Glaze, & Fullan, 2008). I went to continuously improving schools, led by continuously improving teachers. It was never perfect; but always improving.

Fast forward twenty years, as a budding educator in Ontario, Canada in the '00s, the English education system was being branded as the "gold standard" to Ontario's struggling schools; schools that predominantly served highly disadvantaged communities, like the one I grew up in (MOE, 2016). The Literacy and Numeracy Strategies (DfES, 2006) were being sold to struggling Ontario schools as more coherent and cohesive programmes than Ontario's strategy at that time; they were more explicit, impressively sequenced, and getting great results in challenging schools in England (Earl & Fullan, 2002). In 2010, I had the opportunity to live and teach in London, England while completing graduate study, with the aim of returning to Ontario with the experience of having worked directly in English schools using the English model. I was excited to bring my experiences back to Ontario to help disadvantaged schools succeed.

However, what I found when I arrived was teachers haemorrhaging out of schools and terribly low staff morale. I worked in English schools where hours each day

were being spent on monotonous tasks, like mandated marking or highlighting target grids. I watched senior leaders spend their “leadership” time engaged in endless management tasks: monitoring teacher planning, scrutinising pupils’ work, observing teachers teaching, completing learning walks, or managing the performance of teachers with test data. There was limited opportunity to professionally reflect, research, or ask big questions about learners or learning. Teacher development was seen as a result of teacher management (Davies & Lim, 2008; Freedman & Lipson, 2008; Freedman, Lipson, & Hargreaves, 2008). Teachers in England were prescribed what to do, when to do it and “improved” through measurement and feedback. Teachers were anxious, feeling the stress of constant monitoring, scrutiny and judgement without the support of any teacher learning, development, or professional collaboration (NEU, 2019). The climate in schools was toxic. In many schools, there were leaders and there were teachers, divided by the managers and the managed. Sir Michael Wilshaw, former Chief Inspector of the Office of Standards in Education (Ofsted) from 2012-16, made a comment about his school improvement views in the Guardian:

> “A good head would never be loved by his or her staff.”
>
> He added: "If anyone says to you that 'staff morale is at an all-time low' you know you are doing something right" (Abrams, 2012).

Schools in England had used this same kind of model with the children. In primary schools, it was common to have children grouped by perceived “ability”, labelled “low/middle/high” throughout their primary years in English and mathematics as a result of their attainment level in the previous year, often benchmarked by a standardised test. Although research had emerged within

England about the short- and long-term damaging effects of this view of learners and learning, it was still common practice (Hart, 1998; Hart, Dixon, Drummond, & McIntyre, 2004; Swann, Peacock, Hart, & Drummond, 2012).

After having been a supply teacher in about 50 schools in London in addition to my own experience in a permanent role between 2010-2012, I decided two things: i) that I would endeavour to successfully lead a continuously improving school in direct opposition to this narrative in the English landscape, and ii) that I would engage in doctoral research aimed at exploring an alternative to England's school improvement model.

In 2012, Michael Fullan and Andy Hargreaves published a book, *Professional Capital* (A. Hargreaves & Fullan, 2012), which spoke specifically to my frustration with the English education model, and Pasi Sahlberg began publishing articles about the Global Education Reform Movement (GERM) and its impact on systems, schools and teachers (Sahlberg, 2012a, 2012b, 2015, 2018). I was intrigued by their analysis of the problems and inspired by their solutions. However, in all of their writings, I did not feel I came away with a practical set of actionable solutions. What was professional capital *in action* in an inner London primary school? If living in a country that has adopted the GERM model of school improvement, what could I do, *practically and realistically*, as a school leader to achieve the required results while developing a climate of trust and confidence in teachers and uncovering happy, whole students and staff inspired by curiosity, imagination and creativity? There did not seem to be a clear set of actionable steps.

In 2013, I was introduced to Lesson Study. I had been given a copy of an article in Phi Delta Kappan by Wellford Wilms at UCLA from 2003. This early article about Lesson Study was the link I needed between professional capital, the GERM alternative, and practice. Wilms asserted that Lesson Study (LS) could fundamentally shift the structure and culture of American schools through building professional capital, although the terms were not yet in existence (Wilms, 2003). However, when examining the wider literature on LS, it seemed that LS was often evaluated for its impact on teacher learning and pupil outcomes in the shorter term (Cheung & Wong, 2014; Dudley, 2013, 2015a; Lewis, Friedkin, Emerson, Henn, & Goldsmith, 2019; Lewis & Perry, 2017; Lewis, Perry, Foster, Hurd, & Fisher, 2011; Lewis, Perry, Friedkin, & Roth, 2012; Lewis, Perry, & Hurd, 2009; Xu & Pedder, 2015; Ylonen & Norwich, 2015). While it is important for teachers to be engaged in processes that support their growth and development, and equally important for pupils to achieve positive outcomes, the simplest notion is that teachers must remain in the profession for this to happen (Fullan, Rincon-Gallardo, & Hargreaves, 2015; Giles & Hargreaves, 2006; D. H. Hargreaves, 2012; Levin, 2010; Levin et al., 2008). With teacher attrition in London at an all-time high, and teacher morale at an all-time low, could LS also develop a teacher's belief in their ability to impact upon pupil achievement? Could it improve the climate of the school itself?

A famous Canadian philosopher and English professor, Marshall McLuhan, coined the phrase "the medium is the message" in the 1960s (McLuhan, 1964). He asserted that we should endeavour to study the medium itself as priority over the content or character within the message. In looking at the conventional media we use to improve schools in England (inspection, observation, monitoring and

scrutiny), the implicit message to school leaders and teachers was embedded within the constructs of those processes. The result was high teacher attrition and low staff morale (DfE, 2018; NEU, 2019). If LS was going to be different, it needed to impact positively on a school's climate and the teachers' self-efficacy.

The culmination of my experiences in both Ontario and England, the emergence of professional capital as a school improvement framework, and the Wilms (2003) article on Lesson Study all combined to develop this research aimed at examining the introduction of Lesson Study in an inner London primary school and its associations with school climate, teacher self-efficacy, teacher learning, and pupil outcomes.

As a serving headteacher, I felt having a repertoire of approaches to use that support the school's continuously improving agenda, combined with implicitly and explicitly modelling the values of professional trust, agency, reflection, and research in practice, was crucial to combatting the onslaught of direction coming from consultants and training that involved more conventional approaches. When you need a template for observation or monitoring exercises, everyone has a solution. When you want to move to some alternatives, headteachers are left with broad concepts and big ideas, but very few practical and proven approaches that align.

Initially, the significance of this research was to support school leaders in choosing an alternative to teacher development and school improvement through the enactment of professional capital theory in action, specifically undertaking a systematic evaluation of LS as it related to school climate, teacher learning, teacher self-efficacy to use inclusive practices and pupil results. Throughout the

project, the researcher came to see this “cause and effect” narrative as overly simplistic and not reflective of the wider changes happening at the school during the year leading up to the study and the years following the study. As the research project evolved over six years, what emerged was a far more complex set of conditions that both supported the outcomes of LS in the short and longer term. With an underpinning view of professional capital theory (Fullan et al., 2015; A. Hargreaves & Fullan, 2012; Kitising, Boyle, Kukemelk, & Mikk, 2016; Tong & Razniak, 2017), it was crucial to discuss the dynamic human, social and decisional capital factors which interplayed in the lead up to the research project, in addition to later discussing the outcomes over time. Therefore, this research project has a prologue, providing the context of the study, the research study itself, and, an epilogue, to explore the association of LS and other dynamic professional capital factors which worked synergistically on the original outcomes over time. The ultimate significance of this research is to show school leaders the role of LS inside a complex organisation and its association with altering, deeply and sustainably, the school climate, teacher self-efficacy in using inclusive practices, teacher learning and pupil outcomes using professional capital theory (A. Hargreaves & Fullan, 2012).

The initial central aims of the research project were:

1 – To positively change school culture/climate through the introduction of Lesson Study as professional learning and development

2 – To improve teacher self-efficacy in teaching mixed-ability classes in mathematics, while phasing out “ability grouping”

3 – To interrogate current teaching strategies being used with struggling and advanced learners in primary mathematics with regard to pupil progress

In order to explore the association of Lesson Study with these aims, five research questions were developed to guide the study:

RQ1: Will initiating a programme of Lesson Study be associated with a positive impact on the climate of a primary school?

RQ2: Will initiating a programme of Lesson Study be associated with a positive impact on teacher self-efficacy in implementing inclusive practice?

RQ3: What conclusions did the teachers draw about improving the teaching following the Lesson Study cycle?

RQ4: What changes to practice will teachers sustain after engaging in a wave of Lesson Study?

RQ5: What changes in pupil maths attainment will follow a programme of Lesson Study?

The thesis will look at the context of schooling in England and examine the literature about Lesson Study, school climate, teacher self-efficacy and teacher learning. This study will be situated within the literature in the next chapter to provide a new and unique contribution to the field of LS as it relates to school climate and teacher self-efficacy. The following chapter will explore the methodology and methods used to answer the research questions, employing a mixed methods approach to secure both quantitative and qualitative data from teachers at an inner London primary school after introducing LS. The fourth chapter will subsequently present the results obtained through pre- and post-LS

questionnaires on school climate and teacher self-efficacy, in addition to data collected through teacher interviews, group interviews and teacher-produced research posters after each of the two waves of LS. After this, the paper will summarise the findings of the research and their significance, making comments on the strengths and limitations of this study, ultimately remarking on the implications of this research for policy and practice in primary schools in England and abroad. Finally, the paper will explore the place of LS inside a wider programme of change at the school, both before and after the research study, to place LS in the wider context of an improving climate, teacher self-efficacy, teacher learning and pupil outcomes.

Chapter 2: Literature Review

2.1. Conceptual Framework

To position the research undertaken in this project, the review of the literature will focus on a conceptual framework that explores a number of areas. This review of the literature will examine current education policy and practice at the system level in England, making links to the association of these system-level approaches at the school level and the associated challenges. Then, the paper explores an alternative theoretical approach in professional capital (A. Hargreaves & Fullan, 2012), whereby schools and teachers are seen as continuously improving. The section will then explore the role of leadership in the enactment of both models in schools. Next, the review will look at school climate and teacher self-efficacy as constructs within the educational literature and their correlations with teacher performance, learning and pupil outcomes. Finally, Lesson Study (LS) will be examined as a model of social capital and teacher development, in which the present study will be situated.

The central aims of the research project were:

1 – To positively change the school culture/climate through the introduction of Lesson Study as professional learning and development

2 – To improve teacher self-efficacy in teaching mixed-ability classes in mathematics

3 – To interrogate current teaching strategies being used with struggling and advanced learners in primary mathematics with regard to pupil progress in a lesson

The research undertaken for this project was initially inspired by the work of Michael Fullan and Andy Hargreaves' book entitled, *Professional Capital*, published in 2012 (A.Hargreaves & Fullan, 2012) and an article I read about the potential link of LS to the change of structure and culture of American schools (Wilms, 2003). The reference lists for those works were the initial starting points for more formal reading of the forms of capital within a school and system and the view of LS as an agent of change. This review of sources ultimately led to the role of social capital in schools and its impact upon leaders, teachers and pupils. LS also emerged in the literature when reviewing a leadership report by David Hargreaves (2012) as the best form of "joint practice development" he had seen. It was a culmination of that reading which provided the researcher with a framework and integral components. What would be the association of the best form of joint practice development and social capital (A.Hargreaves & Fullan, 2012; D.H.Hargreaves, 2012) and how would they relate to the climate of a school, the self-efficacy of its teachers, and overall teacher learning and pupils' achievement?

To conduct a review of the literature on professional capital and teacher learning, a thorough review of the *Journal of Professional Capital and Community* was undertaken from its inception in 2012 through to the present day in addition to a systematic review of the *International Journal for Lesson and Learning Studies* using key words (climate, culture, ethos, environment, conditions).

Additionally, online databases were searched, Education Research Complete, ERIC, the British Education Index, JSTOR, and Sage, with both Boolean phrases listed in the abstract, and an author search was completed.

- Professional Capital AND Leadership
- Professional Capital
- Social Capital AND School
- Social Capital AND Primary School
- Michael Fullan
- Andy Hargreaves
- David Hargreaves
- Ben Levin
- Kenneth Leithwood
- Louise Stoll
- Professional Development
- Professional Development AND Lesson Study
- Learning Communities
- Learning Community AND Lesson Study

In order to conduct a thorough review of the literature on LS for this project, online database searches were done using Education Research Complete, ERIC, the British Education Index, JSTOR, and Sage. This gave access to a wide range of publications from peer reviewed sources. Searches were completed using the following Boolean phrases, with phrases listed in the abstract (AB):

- Lesson Study AND Climate
- Lesson Study AND Culture
- Lesson Study AND Self-efficacy
- Lesson Study AND Leadership
- Lesson Study AND Student Achievement
- Lesson Study AND Pupil Achievement

- Lesson Study AND UK (United Kingdom)
- Lesson Study AND Professional Capital

Additionally, searches for particular authors that are well known in the UK LS community were also searched:

- Peter Dudley AND Lesson Study
- Catherine Lewis AND Lesson Study
- Tijmen Schipper AND Lesson Study
- Brahm Norwich AND Lesson Study

In addition to personal and professional reading that had been completed prior to the research study itself, these searches provided ample resources for the review in preparation. Date ranges were limited to the past ten years (2010-2020); however, sources from the last five years were prioritised where appropriate. In reality, very limited research has been conducted in the area of LS and school climate and there is limited research relating to LS's association with teacher self-efficacy. As the academic literature on school and system improvement is often highly supportive of concepts like joint practice development and professional capital, reviews of reports and publications authored by government advisory groups, such as the Policy Exchange in England and the Fraser Institute in Canada, were undertaken to deepen the analysis.

2.2. England's Climate Crisis

The English Education Model – Accountability of Teachers and Teaching

The Policy Exchange, which describes itself as the UK's leading think tank, has successfully advocated for a number of school reforms, including the emergence

of “free schools” in England and the reforms to school choice (Meyland-Smith & Evans, 2009). In the lead-up to the 2010 general election, which saw the Conservative government form a coalition with the Liberal Democrats, the Policy Exchange was promoting new approaches to attract and develop better teachers in England (Freedman et al., 2008). In their 2010 White Paper (DfE, 2010b) on education, the coalition government of the Conservatives and Liberal Democrats opened by stating that no education system could be better than the quality of its teachers. The purpose of a White Paper is to communicate the philosophy or system of beliefs of a government on a complex issue before introducing new legislation. In this case, it was outlining the substantial changes about to occur in the English educational landscape. Nearly a decade later, after successive Conservative governments and a number of reforms with a heavy emphasis on external accountability, teacher observation, monitoring, scrutiny and pay linked to performance, teachers are exiting the profession at record rates (DfE, 2018). To begin this section, it is important to note that a number of government policies adopted after the 2010 election were based on grey literature published by the Policy Exchange, with some prominent examples listed below.

In a review of teacher competence and conduct conducted by the think tank Policy Exchange, teaching has a very low rate of referrals to the appropriate body in both regards (Freedman & Lipson, 2008). Their paper demonstrated that the majority of local education authorities, some 97 of 150, had not made a single referral to the appropriate body regulating the teaching profession (Freedman & Lipson, 2008). Out of a workforce that accounts for nearly half a million professionals, this seems implausible. One of the recommendations of the paper was to reduce the amount of time it takes to undertake a review of a teacher’s

capability, which at the time was nearly a year. This would give employers the power to dismiss a teacher for incompetence more quickly, and replace them with a competent teacher. However, this position negates the responsibility of employers (school leaders) to develop and support teachers with poor performance. It also does not clearly define what makes a poor or high quality teacher. Presumably, in a system where schools have more autonomy and agency to act as they wish, this would also vary significantly from school to school. This leaves individual teachers at the whim of individual headteachers; in one school someone could be seen as a brilliant teacher and at another, they might be seen as incompetent. It also neglects the view of how a teacher develops over time. A capable newly qualified teacher is unlikely to possess the nuance of a strong teacher with ten years' experience. Another challenge is that the conditions we create for our teachers are often similar to the conditions the teachers then recreate for our young people. Children learn, grow and develop at different rates. Our teachers should be afforded the same opportunity. The authors have not compared this data to any other international data, and the reader is left wondering how many incompetent teachers there are in Finland, Singapore or Ontario each year. Having very capable teachers in front of classrooms is important, as is having a clear and fair process to remove a teacher if they are not up to the job or conduct themselves poorly. However, creating a climate in which professional teachers are supported, developed, challenged and treated as individuals is equally important (Donohoo, 2017; Fullan et al., 2015; A. Hargreaves & Fullan, 2012; D. H. Hargreaves, 2012; Kitising et al., 2016; Levin et al., 2008; Netolicky, 2016). Despite this, teacher appraisal and capability were revised and streamlined by the DfE in their model policy for schools (DfE, 2012c) to favour the faster removal of teachers deemed incapable by headteachers.

Among the other propositions of the Policy Exchange related to teachers was the view that teaching should accommodate graduates that want to “give something back” but do not see teaching as a career for life and that teaching should include fast tracks to higher degrees of responsibility and pay (Freedman et al., 2008). While their propositions and recommendations related to teacher development and teacher pay were aimed initially at uplifting the status of the profession, their views on how to recruit, retain and train more highly qualified teachers appear to frame the profession as a revolving door, with quick entry and exit from the role as expected. This policy was also adopted by the government, with new approaches to teacher training like Schools Direct (DfE, 2012b) and Teach First rolled out or expanded shortly thereafter (DfE, 2012a). In one of their recommendations, they argue that teachers should have far more on-site training, which, in principle, is exciting and aligns with the aims of LS as a practice-based professional development approach (Dudley, 2015a; Dudley, Xu, Vermunt, & Lang, 2019; Lewis et al., 2019; Lewis et al., 2012; Lewis, Perry, & Murata, 2006). However, this is increasingly difficult in a job where turnover is high, limiting the number of experienced teachers and school leaders who can support new and inexperienced entrants while they direct learning (DfE, 2018). What also seems to be missing from the Freedman et al (2008) analysis are both the power constructs and perverse incentives that can emerge in schools using performativity as the driver of improvement, in addition to the longer term impact of locally determined pay on particular groups of teachers, such as women and minority groups (Davies & Lim, 2008). With regard to their recommendations of on-site training, while dissolving the degree-level route into teaching, practical learning in other professions is often part of professional training after securing the relevant, initial degree-level qualification. It is not supported in the literature

for doctors, whereby surgeons have on-site training prior to a medical degree, or where lawyers complete on-site training prior to a law degree. It has, however, been used in policing (PoliceNow, 2020) and prison work (UnLocked, 2020).

From their 2019 *State of Education* survey and national conference, the National Education Union, the largest teaching union in the United Kingdom, clearly articulates the views of its members, where 40% said that in five years' time, they do not see themselves in education anymore. While this data is difficult to verify as it was generated by a special interest group, it is corroborated by the Department for Education's own statistics (2018) that show attrition rates in Inner London to be over 40% within five years of becoming a teacher. The top two responses from members showed that both workload and the accountability regime are the reason for leaving (NEU, 2019). When asked what would make their job better in the next 12 months, one respondent, reflecting the view of workload and accountability said, "To be trusted more as a professional and scrutinised less. The amount of monitoring in our school is excessive" (NEU, 2019, para. 14).

In their position paper on system reform, Lim and Davies (2008) of the Policy Exchange studied five education jurisdictions: New Zealand, Canada (Alberta and Ontario), Hong Kong and Sweden. In Canada, they note the accountability system design is based on collective responsibility, targeted support structures and collaborative networks. But they note that this system is due to the fractious history of education reform in that country. In alignment with the findings of this paper, collaboration and collective responsibility feature highly in the participants' view of the impact of LS on both self-efficacy and school climate. In 2010, the English DfE White Paper on schools states that the best education systems in

the world have given more freedoms to schools and strengthened accountability systems (DfE, 2010a). This is relevant as it makes a further link between position papers written by the Policy Exchange in the lead up to the 2010 national elections and the subsequent policy formed by the coalition government thereafter. Their paper also mentions the Canadian system, where socio-economics is least correlated with school achievement for pupils, compared to other OECD nations. However, when examining the success of Canada, Finland, Singapore and other countries, Lim and Davies (2008) seemingly overlook the impact of professional collaboration and collective responsibility, professional autonomy, development, and trust, core approaches these nations have used to improve their systems (Kitising et al., 2016; Levin, 2010; Levin et al., 2008; Sahlberg, 2015, 2018). Instead, they have focused on very different constructs of accountability indicators, such as increased testing and performance measures (Sahlberg, 2012a, 2012b). Today, it would appear that these are the same forces keeping English schools at a turnstile, unable to attract very capable teachers or retain them, with many not making it beyond a few years in the classroom before leaving the profession entirely (DfE, 2018; NEU, 2019). While it is certain that teachers are at the heart of all successful schools and systems, the culture of leadership and management practices in relationship to those teachers is equally important (Leithwood, Day, Harris, & Hopkins, 2006; Leithwood, Harris, & Hopkins, 2019; Silins, Mulford, & Zairns, 2002).

While causality cannot be attached to the NEU claims, there seems to be an association between think-tank position papers, DfE policy, teacher job satisfaction and the DfE teacher attrition data.

In looking at the conventional media we use to improve schools in England (inspection, observation, monitoring and scrutiny), the implicit message to school leaders and teachers is embedded within the constructs of those processes (McLuhan, 1964). And the result is high teacher attrition and low staff morale (DfE, 2018; NEU, 2019).

2.3. The Influence of Leadership

Leadership and management are clearly defined in the Ontario Leadership Framework (IfEL, 2013), published by the Institute for Education Leadership in Canada, a well-respected collective voice for the advancement of evidence-based leadership practices across Ontario (IfEL, 2020). School leadership is defined as the exercise of influence over all stakeholders toward both the identification and achievement of the school's vision and goals. For leadership to be effective, it should make significant and positive contributions to the progress of the school. School management is defined as an integral part of the leadership itself and is focused on processes and procedures that keep the organisation running smoothly, like timetabling, policies and procedures (IfEL, 2013).

In their paper, Leithwood et al. (2006) make seven claims about successful school leadership. Their first claim is that school leadership is second only to classroom teaching as an influence on pupil achievement. Leithwood et al. (2019) revisited these claims almost a decade later to challenge their own findings from the first paper. In the follow-up paper, they redefine their first claim as:

> “School leadership has a significant effect on features of the school organisation which positively influences the quality of teaching and learning” Leithwood et al. (2019, p. 2).

This is a crucial statement as it has implications at both the school and systems levels. While growing a plant without a seed is unthinkable, neglecting the soil in which the seed is placed is equally disastrous. If schools are the seeds, governance is the soil. If teachers are the seeds, it is leadership that acts as the soil.

At the system level, this influence can be reflected upon in terms of the level of antagonism or respect that the government is perceived to have for the profession (Levin, 2010). This is evident in the communications from government to the public about the profession; the review of all policy and practice at the national level of measures perceived to be punitive or performative; the collaborative review of teacher workload and well-being; coherent and aligned partnership between the government and educators; and supported capacity building across the system of leaders, teachers and policy makers (A.Hargreaves & Fullan, 2012; Kitising et al., 2016; Levin, 2010; Levin et al., 2008; Sahlberg, 2015, 2018).

The systems level has direct influence over the metrics and mechanisms used at the school level. If high-stakes external school inspection and scrutiny are the key drivers of school improvement from government, the resulting influence is that the key drivers for teacher improvement in schools is the same: high stakes observation, monitoring, and scrutiny of staff (Bryant, Day, Rea, & Wilson, 2018; McAleavy, Riggall, & Fitzpatrick, 2016).

It has been nearly a decade since Pasi Sahlberg (2012b) first coined the acronym-as-analogy GERM: The Global Education Reform Movement, describing the neoliberal reforms happening to education around the globe, in his blog. His view is that this movement has strongly influenced the English approach to education throughout the last decade. Sahlberg describes the movement as an epidemic - a crisis, of sorts - spreading and infecting education like a virus. Ball and Olmedo (2013) comment on his use of language as a signifier of the experience of educators and pupils of the vast array of policies and practices of education systems that feel broken. In his blog, Sahlberg (2012b) identifies the characteristics of the GERM movement using four tenets: increased standardised testing; a narrow curriculum with emphasis on core subjects and core knowledge; high-stakes accountability of school leaders and teachers; and reliance on corporate performance management approaches. While this is not empirically evidenced, it characterises and frames some of the key positions of both the Policy Exchange and, subsequently, the DfE.

In their seminal book, *Professional Capital*, Hargreaves and Fullan (2012) take this concept a step further, using the term “business capital” to describe the characteristics of the GERM. It views education as an investment opportunity (in technology, curriculum and testing materials) and schools as profit-making enterprises (Fullan, 2000; A. Hargreaves & Fullan, 2012). To this end, education is organised to produce quick financial returns. To accomplish this, it requires a teaching force that is young, flexible, temporary, inexpensive, un-pensioned, and replaceable wherever possible by technology (A.Hargreaves & Fullan, 2012).

The policy that the government legislates and the way in which those policies are enacted by system and school leaders ultimately result in the climate and culture of the system and its schools.

2.4. School Climate and Culture

The notions of school climate and school culture are complex and often intertwined. Schein (1985) argues that school culture is:

> a pattern of basic assumptions - invented, discovered, or developed by a given group as it learns to cope with problems . . . that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems.

MacNeil et al. (MacNeil, Prater, & Busch, 2009) hold that “values, norms, rituals, and climate are all a manifestation of culture”. Conversely, Deal and Peterson (2016) argue that culture and climate are two clearly distinct terms: climate stresses the feeling and current tone of the school, the feeling of the relationships, and the morale of the organisation; while culture best represents the complex elements of values, traditions, language and purpose. The Association for Supervision and Curriculum Development (ASCD) (2020), a well-respected American organisation dedicated to the support and development of educators worldwide, defines both school climate and school culture as distinct concepts. They define climate as the effect that the school has on pupils, including the teaching itself and the relationships between school leaders, teachers, parents and pupils. They define school culture as the way the staff work together, including the beliefs, values and assumptions they share. They state that a

positive school climate and school culture promote pupils' ability to learn (ASCD, 2020). Studying one aspect without the other is difficult.

School climate can be described in terms of the effect that the school has on its teachers and pupils, including the relationships between school leaders, teachers, pupils and parents. Relationships in schools play an integral role in how well schools use research and evidence in improvement efforts (Brown, Daly, & Liou, 2016). Instrumental in building relationships in schools is the intra-school trust that exists between teachers and also between teachers and school leaders (Brown et al., 2016).

Following on from the work of Kallestad (2010), the term “positive school climate” is defined as one where teachers:

a) feel empowered to collaborate with leaders and each other;

b) feel that leaders are concerned about their wellbeing;

c) feel communication is open and they have a positive orientation to change;

d) are keen to try out new ways of teaching; and

e) have a great deal of influence over their classroom work.

Learning as a professional in a positive school climate tends to be a social and situational matter (Borko, 2004; Little, 2012). In the literature, a professional collaborative climate is often referred to as a “community of practice” (Wenger, 1998), a “professional learning community” (PLC) (Little, 2012; Stoll, 2006) or a “community of inquiry” (Cochran-Smith & Lytle, 2001; Jaworski, 2006). PLCs have received a great deal of attention and are often connected to a positive

school climate (Cochran-Smith & Lytle, 2001; A. Hargreaves, 2000). According to Giles and Hargreaves (2006), PLCs emphasise three characteristics related to positive school climate and Lesson Study: collaborative work and discussion among the teachers, a consistent focus on teaching and learning within the collaboration, and the collection and use of robust data for assessment and use over time. In their review of LS, Lewis et al. (2019) clearly align Lesson Study with the Giles and Hargreaves (2006) framework. However, to date there are limited studies that explore the association enacting LS has with the professional climate of a school, none of which take place in England through the lens of professional capital theory (Cravens & Drake, 2017; Fullan et al., 2015; Gero, 2015; A. Hargreaves & Fullan, 2012; Khokhotva & Albizuri, 2020; Schipper, Vries, Goei, & Vleen, 2020).

2.5. Self-Efficacy

Self-efficacy, or teacher self-efficacy (TSE) as it relates to this research, is a well-researched concept situated in both the “locus of control” (Rotter, 1966) and social cognitive (Bandura, 1977) theoretical standpoints. One’s beliefs or convictions to successfully execute a given type of performance is how Bandura (1977) initially defined self-efficacy. While he did modify this definition about 10 years later, studies often use the definition of Guskey and Passaro (1994), which defines teacher self-efficacy (TSE) as a teacher's belief or conviction that they can influence how well pupils learn, including those that may be challenging or unmotivated. TSE is regarded as an important concept in teacher effectiveness as some studies suggest that TSE could be a predictor of teacher behaviour (Klassen & Tze, 2014; Tschannen-Moran & Hoy, 2001, 2007; Zee & Koomen, 2016), which is linked to the idea that when a teacher feels more confident in their

capacity to meet the needs of pupils, they focus more on their own teaching (Schipper, Goel, Vries, & Veen, 2018; Summers, David, & Hoy, 2017; Tschannen-Moran & Hoy, 2001)

It has been argued that teachers with a high degree of self-efficacy involve their pupils more in lessons, feel more confident using new instructional strategies, and feel more in control of their classrooms (Summers et al., 2017; Tschannen-Moran & Hoy, 2001). It has also been asserted that these teachers are more likely to implement what they have gained from continuing professional development (CPD) activities (Zee & Koomen, 2016). Overall, these factors can ultimately lead to improved pupil outcomes (Skaalvik & Skaalvik, 2007; Tschannen-Moran & Hoy, 2001). The opposite applies to teachers with low self-efficacy, where teachers ask easier questions, provide less time for answering questions, provide fewer pupil prompts, and behave less warmly with pupils (Skaalvik & Skaalvik, 2007; Summers et al., 2017). In relation to this study, it has also been shown that teachers with a high degree of self-efficacy are shown to be more positive towards inclusive education practices (Schipper et al., 2020).

In the first study linking teacher self-efficacy and LS (Sibbald, 2009), it was established that LS has a positive association with teacher self-efficacy and that this improved self-efficacy could lead to improved pupil outcomes. It positions LS as a vehicle for collaboration and instructional improvement also linked to resolving future instructional challenges, which positively affects self-efficacy (Sibbald, 2009). In relation to the time period in which gains to self-efficacy were greatest, Sibbald recorded this as the middle phase of LS, where teachers were able to speak more specifically about learners and learning and had the confidence and trust in one another to try out novel ideas. However, the teacher's

voice in qualitative study is not present in this work. Self-efficacy scales, like the self-efficacy to implement inclusive practice (Sharma, Loreman, & Forlin, 2012) and the quantitative scales used by Schipper et al. (2020) are often blunt instruments on their own, unable to highlight the voice of the participant and limiting responses to the questions asked. Further research is needed from a mixed methods or qualitative perspective to get participants' voices and be able to expand upon the defined parameters of self-efficacy on the scales themselves (Schipper et al., 2018; Schipper et al., 2020).

In the most recent study of LS and teacher self-efficacy (Schipper et al., 2020), researchers found that there was a strong positive relationship between teacher self-efficacy as it related to pupil engagement, likely due to studying case pupils. The other subscales in their study, instructional strategies and classroom management, also showed significant increases in the LS group compared to the control group. As the quantitative evidence is beginning to place a clear link between teacher self-efficacy and LS (Puchner & Taylor, 2006; Schipper, Goei, Vries, & Vleen, 2017; Schipper et al., 2018; Schipper et al., 2020; Sibbald, 2009) further qualitative study is needed to determine the patterns between teacher self-efficacy, the school climate and how this impacts upon teacher learning (Schipper et al., 2020).

2.6. The Emergence of Professional Capital Theory

Table 2
Professional Capital Theory

Professional Capital Theory PC = f(HC, SC, DC)	Human Capital	Social Capital	Decisional Capital
The development of Professional Capital is the function of three distinct types of capital in a school or school system: human capital, social capital and decisional capital.	› attracting excellent teachers › develop capacity of groups, teams, communities of teachers › development over time › make teaching desirable	› teachers working in teams with a specific focus on learners and learning › organized and intentional › shared responsibility for learners and learning	› informed agency to make instructional decisions impacting upon learners and learning › competence, insight, judgement › collective decision making

Source: A. Hargreaves and Fullan, 2012

Merriam-Webster's online dictionary defines "capital" as "relating to or being assets that add to the long-term net worth." Bourdieu (1979) wrote extensively on the topic of cultural and social capital. In education, there are two theories of capital driving large-scale reform internationally: business capital and professional capital theory (Earl & Fullan, 2002; A. Hargreaves & Fullan, 2012; Levin et al., 2008). While the two theories are opposed, all nations agree about the importance of recruiting and retaining good teachers and good teaching (Freedman et al., 2008; Fullan et al., 2015; A.Hargreaves & Fullan, 2012; IfEL, 2013; Kitising et al., 2016; Sahlberg, 2018). However, the two theories take nations, systems and schools in very different directions.

Professional capital theory (Table 2) has been conceptualised as the function of three distinct types of combined capital: human, social and decisional (PC = f(HC,

SC, DC)). *Human capital (HC)*, described by Odden (2011) as “talent”, is about attracting the best and brightest teachers to the profession. When aiming to develop these teachers, human capital is interested in the development of the capacity of groups, teams and communities of teachers collectively, rather than monitoring, scrutinising and observing individual teachers (A.Hargreaves & Fullan, 2012). Nations that perform consistently well on international education tests, such as PISA, draw their teaching force from the top 10% of graduates, whereas less successful but economically advanced nations, like England, are unable to consistently attract top graduates into teaching (A.Hargreaves & Fullan, 2012). To address this issue, England and the United States have developed programmes like Teach First and Teach for America, concentrating teacher preparation into a few short weeks using alternative methods, open to only the top graduates. These programmes are a form of “on-site” teacher preparation, whereby teachers-in-training are given the responsibility of a class (or classes, as the case may be in high school) and remunerated as paid employees during their training. While these programmes have attracted many top graduates into the classroom, addressing the issue of top graduates entering the profession, longer-term study reveals that they leave the profession within the first few years (Darling-Hammond, Holtzman, Gatlin, & Heilig, 2005). These short-term approaches have not solved the recruitment or retention crisis and deprive younger teachers of the social capital of working with long-term professional communities in the school and with the wider communities served by their schools (A.Hargreaves & Fullan, 2012; Levin et al., 2008). As a result of the short-term nature of retention, teachers then have insufficient opportunities to develop their practice and experience over the many years that underpin the decisional capital of professional judgement (Fullan, 2000; A.Hargreaves & Fullan, 2012; Levin et

al., 2008). Recruiting and retaining more top graduates in teaching requires that we make teaching a more attractive, long-term career by responding to the climate crisis being experienced in schools by the teachers themselves (NEU, 2019); we must reduce the level of micromanagement, increase teacher pay, and develop a collaborative approach within the profession and between government (Fullan, 2000; A. Hargreaves & Fullan, 2012; Levin, 2010; Levin et al., 2008; Rincon-Gallardo & Fullan, 2016). Fundamentally, we must focus on the climate of the school and conditions in which teachers work.

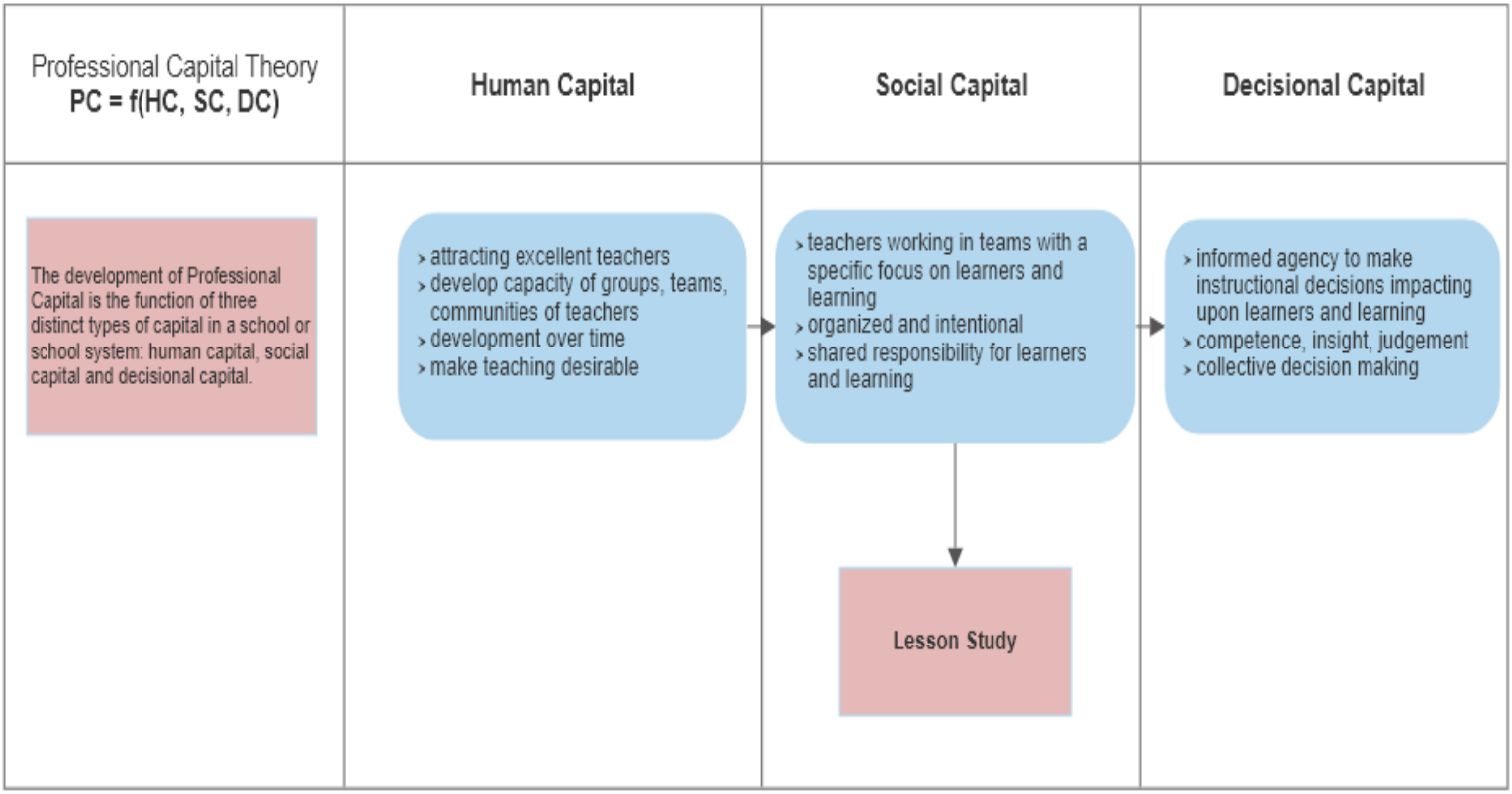
Social capital (SC) is linked to Human Capital. SC is based on intentional interactions focused on pupil learning between teachers, and between teachers and school leaders, which has been shown to improve pupil achievement and sustain improvement (Fullan, 2000; A. Hargreaves & Fullan, 2012; Levin et al., 2008; Lewis et al., 2019; Lewis & Perry, 2017; Lewis et al., 2012; Rincon-Gallardo, 2020; Rincon-Gallardo & Fullan, 2016). Good teachers in schools with low levels of social capital are expected by school leaders to make a difference through individual effort, which can add to low morale, poor teacher perception of workload and wellbeing, ultimately making that teacher more than likely to burn out or leave the profession (Fullan et al., 2015; A.Hargreaves & Fullan, 2012; Levin et al., 2008; NEU, 2019). As a result of this approach, schools focus their efforts on finding better teachers, removing weak teachers, finding the right individual leader or bringing in the right intervention team. Little emphasis is placed on creating the conditions for teachers to flourish and teachers are judged as good or bad rather than continuously improving (Shirley, 2016). The gains made through this method often fail once the intervention team pulls out, the key leaders leave, or when the overworked and isolated staff run out of energy

(Fullan, 2000; Levin, 2010; Levin et al., 2008). Social capital involves collaboration, collective effort, and shared responsibility for pupils and their learning (Fullan et al., 2015; A.Hargreaves & Fullan, 2012).

Decisional capital (DC), the ability to have competence, judgement, insight, inspiration and the capacity for improvisation, is the result of high levels of human and social capital (Fullan et al., 2015; A.Hargreaves & Fullan, 2012; Rincon-Gallardo & Fullan, 2016). Schools enacting DC hire great, improving teachers and intentionally have them discuss learners and learning. Schools with teachers using DC act with a sense of collective responsibility, openness to feedback and transparency. By design, they feel comfortable making mistakes and learn from them, work in collaboration with their peers and are respected by the community for knowing what they are doing (A. Hargreaves & O'Connor, 2017, 2018). DC is the result of teachers working and learning together by design, freely able to make instructional decisions together to impact upon pupil learning and outcomes. In schools with limited decisional capital, teachers are individually responsible for their group of pupils and collaboration conflicts with models of performance-related pay and job security through scrutiny, observation and regular monitoring. This model can place teachers in competition with one another, limiting the collective responsibility and desire to create social capital out of fear that it may give a competing teacher an advantage.

2.7. Lesson Study as Social Capital

Table 3
Lesson Study as Social Capital



Source: A. Hargreaves and Fullan, 2012

Lesson Study (LS) is defined as “a systematic investigation of classroom pedagogy conducted collectively by a group of teachers rather than by individuals, with the aim of improving the quality of teaching and learning” (Tsui & Law, 2007, p. 1301).

In Japan, LS has been an integral part of teaching for more than one hundred years (Takahashi & McDougal, 2016). LS originated in Japan in the 1870s, predating action- and practice-based research as we know it in the West by at least 70 years (Dudley, 2015b). As noted by Hargreaves (2012), LS is one of the best forms of joint practice development. Some

research supports the view that collaborative enquiry into learning and teaching is one of the most powerful things that a school leader can do to improve educational outcomes (Cajkler, Wood, Norton, & Pedder, 2014; Dudley et al., 2019). LS in Japan initially grew as an informal, teacher-led approach based on developing professional dialogue. This long-term development in the use of LS in Japan has led to a national culture of teacher self-improvement driven by use of the technique across the school sector, and also in some university contexts (Cajkler et al., 2014).

The approach began to spread to other education systems in Asia, including those of China, Singapore, Hong Kong and Indonesia. In addition, following the publication of a book called *The Teaching Gap* (Stigler & Hiebert, 1999) and the work of Lesson Study UK (Dudley, 2015a, 2015b) Lesson Study has also been increasingly adopted in North America and Europe.

LS is taken a step further by Dudley et al (2019), associated with learning in addition to school and system knowledge creation and change. In the UK, Research LS brings teams of teachers together as action- and practice-based researchers to analyse and improve upon classroom practice, with a sharp focus on the learners themselves, learning, and the responses to teaching. This approach is organised by the team of teachers collaboratively determining the focus of the research, planning lessons together and analysing the impact of their instructional decisions on the learners in real time. The teachers then interview the case pupils themselves before spending time reflecting upon the observations of the team, and planning subsequent lessons based on their mutual learning. At the end of the Lesson Study cycle, teachers present their findings to the wider staff in order to share the new knowledge. Dudley (2015a) suggests that LS is

the fastest growing form of teacher development in the world. This study will show LS as a sophisticated form of SC in professional capital theory. Ultimately, this will lead to teachers developing the competence, judgement and insight required to successfully enact DC.

2.8. Lesson Study, Teacher Development and Pupil Outcomes

While there is wide agreement that teacher development is important for improving teaching and learning (Jayaram, Moffit, & Scott, 2012), what the development looks like is not agreed upon. Desimone (2009) analysed a large body of work focused on teacher development and developed a model that has five key features of effective teacher development: 1 - focuses on content; 2 - involves active learning; 3 - aligns with teacher beliefs and relevant local policy; 4 - provides sufficient time to develop; and 5 - ensures collective participation from all teachers. Lewis and Perry (2017) have aligned LS with this analysis of teacher development, supporting LS as an effective development process for teachers.

Historically, development opportunities for teachers and school leaders have been rooted in external courses and out-of-school activities (Opfer & Pedder, 2011). Schools invest heavily in this type of development for teachers, often to find that shortly thereafter only a small number of teachers still use the strategies or materials from the courses:

> The fact that teachers and principals remain passive recipients and are provided only limited opportunities to reflect upon new information does little to provide them with the expert knowledge

> and skills to effectively deal with the range of problems and the educational needs of today's students. (Bredeson, 2003, p. 13)

As the body of evidence grew that supported the idea that teacher development was not a quick fix (Cordingley, Bell, Rundell, Evans, & Curtis, 2004), LS also began to grow in popularity in the United Kingdom. Good teacher development is centred upon the notion that development takes time and teachers need to be working in collaboration with one another in order to sustainably improve (Cordingley et al.,2004). This work has been furthered in Ontario, Canada, through a joint partnership between the Ontario Teachers' Federation and the Ministry of Education in the Teacher Learning and Leadership Program (Campbell, Lieberman, Yashkina, Alexander, & Rodway, 2018; Lieberman, Campbell, & Yashkina, 2015, 2016). This six-year-long study found that teacher self-directed learning provided teachers with active and collaborative learning experiences that were grounded in their own practice and provided authentic leadership experiences. 90% of teachers involved in the project reported changes to their instructional practice as a result of the program and 95% reported learning new knowledge and gaining an improved understanding of instruction. Franke et al. (1998) suggest that development should involve "teachers changing in ways that provide a basis for continued growth and problem solving" in what they refer to as "self-sustaining, generative change". They continue:

> In order for change to become self-sustaining, teachers must begin to engage in practices that have built-in support for the changes that they have made...for change to become generative, teachers must engage in

> practices that serve as a basis for continued learning. (Franke et al., 1998, p. 67)

LS is an example of a model that supports this framework (Xu & Pedder, 2015). A later study by Cordingley et al. (2015) improved upon the framework by including the value of expertise in the LS process. This is supported and developed by Ball et al. (2008), indicating that the expertise must be broader than subject knowledge and support the development of pedagogical content knowledge, which, as Lewis et al. (2019) argue, are criteria that LS meets. A study by Silins, Mulfurd and Zarins (2002) shows that teachers should play a pivotal role in any initiative that aims to affect the development of students.

In addition to this, the study (Silins et al., 2002) shows the role of leadership in organisational learning. It concludes that four factors are required for organisational learning: a trusting and collaborative climate, taking initiatives and risks, a shared and monitored mission, and professional development where there is use of academic literature and research, adequate time provided for development, and engagement in ongoing development. In their study, they conclude,

> The school as a learning organisation is defined by the level and quality of the leadership that characterises the everyday work of the school as defined by two dimensions: the leadership behaviours of the principal and leadership team in addition the extent of distributed leadership throughout the whole teaching staff (2002, p. 635).

This supports the position (Leithwood et al., 2019) that leadership is only second in influence on pupil achievement after the teacher themselves as well as the

notion that leaders have a significant effect on school organisation, which leads to pupil learning. It is the conditions we create in our organisations that foster or inhibit professional learning, teacher development and school development.

The relevance of LS to teacher development is the wide acceptance of its impact on teachers' knowledge and beliefs, the impact on teachers' instructional strategies, in addition to its association with a teacher's appreciation and use of professional learning (Guskey & Passaro, 1994). While there is a growing body of knowledge on LS which shows that participating increases teacher knowledge and skills (Dudley, 2013; Leavy & Hourigan, 2016; Lewis et al., 2009; Takahashi & McDougal, 2016; M. Vrikki, Warwick, Vermunt, Mercer, & Halem, 2017), creates intervening changes to teachers' attitudes and beliefs (Cajkler et al., 2014; Puchner & Taylor, 2006; Schipper et al., 2017; Sibbald, 2009), and improves instructional practice (Lewis et al., 2009; Lewis et al., 2006), confirmation of its impact on pupil outcomes is still debated (EEF, 2018; Lewis & Perry, 2017; Ylonen & Norwich, 2015). In their 2017 experimental study, Lewis and Perry showed that when using a toolkit for teaching fractions, LS had a strong effect on pupil outcomes, whereby the lowest attaining children attained in line with the previous cohort's average attainment and the average attainers achieved in line with the highest attainers of the previous cohorts. However, a 2018 study funded by the Education Endowment Foundation (EEF) showed that LS had no impact upon maths or reading attainment in KS2. It went on to say that some teachers found it a useful process and that it may underestimate the impact of LS in schools that are not already conducting similar tasks, such as lesson observation. Lesson observation has a high degree of unreliability, making it a poor form of teacher development (Coe, 2014; Ofsted, 2019a). Furthermore, the

EEF trial appears to have adopted a “slimmed-down” version of LS, calling it peer-to-peer observation. LS is a complex process that has many stages, and it is not simply an exercise in observation. As the impact of LS was largely being determined by the impact on pupil standardised test scores 12-18 months after the LS itself, we can question whether the classroom practices, namely “talk for learning” approaches, could be expected to have a positive impact on test results without LS. Furthermore, LS is an andragogic programme, intended to impact initially upon teacher learning and development. Being measured solely for its impact on pupil attainment seems misaligned with its core function. This function is not a ‘quick-fix’. LS has been shown to act as a vehicle to support the shift in deeply rooted and long-standing teacher views about pedagogy (Dudley, 2013). It was not intended to quickly impact upon pupil test scores (Lewis & Perry, 2017).

Despite the growing amount of research supporting the use of LS as a mechanism that supports the development of teachers, there is still a very limited knowledge base which investigates the association of LS and the development of a teacher’s beliefs about self-efficacy (Puchner & Taylor, 2006; Sibbald, 2009).

2.9.1. The Present Study

As the school had supported the development of Human Capital while engaging the staff team in pre-LS Social Capital work, as shown in Figure 1 of the Prologue, the school believed it was ready to engage in more well developed Social Capital through LS.

The review of the literature has shown that current policy and practice at the system level in England is based on a programme of inspection, monitoring, scrutiny and high-stakes accountability. The combination of these media,

intended to create intervening changes in schools and teacher performance, have been used at the school level as models of school and teacher improvement. The result has been high teacher attrition, low recruitment and low teacher morale ultimately reflective of a poor school climate and low levels of self-efficacy. However, there is an alternative approach in professional capital theory, whereby school improvement is seen as a function of developing human, social and decisional capital (PC = f(HC, SC, DC)), where schools and teachers are seen as continuously improving (A. Hargreaves & Fullan, 2012). Leaders have been shown to have a highly influential role in the factors related to enacting either model in a school, impacting directly upon the school's climate and the teachers' self-efficacy. The school climate has been linked to increased use of professional development and teacher retention and self-efficacy has been linked to teacher performance and how a teacher feels about themselves as a professional. Both are ultimately linked to continuous teacher improvement, school improvement and pupil outcomes. LS has been examined as a model of social capital and teacher development, which has some recent links to improved pupil outcomes.

This study, using professional capital theory in action, examines whether initiating LS at a primary school influences teachers' perceptions of a positive school climate as well as their feelings of self-efficacy, including their self-efficacy to implement inclusive practices in mathematics. This study will also examine whether participating in LS influences teaching practices, looking at both the conclusions they draw about improving the teaching and the changes to practice they sustain after engaging in LS. Finally, this study will look at the association that LS has with pupil progress and attainment in mathematics. Initially, this

paper will analyse the outcomes as they were researched at the time of the study in 2015/2016, subsequently followed by an analysis and discussion of the evolution of the outcomes over time in 2020/2021. This emerged as relevant to the project in light of the underpinning view that to be a continuously improving school - to view the associations of LS and professional capital theory in practice in a school - one must see beyond the “snapshot” of a point in time to appreciate the reality of both what preceded LS and what, catalysed by LS, led to sustainable, positive school improvement, teacher development, and school culture.

Based on a review of the literature above, a positive school climate is defined as one where teachers:

a) feel empowered to collaborate with leaders and each other;

b) feel that leaders are concerned about their wellbeing;

c) feel communication is open and they have a positive orientation to change;

d) are keen to try out new ways of teaching; and

e) have a great deal of influence over their classroom work.

Teacher self-efficacy in this study refers to their self-efficacy to use inclusive practice, and is concerned with four subscales: efficacy to use inclusive instructions, efficacy in collaboration, efficacy in managing disruptive behaviour and efficacy in teaching mixed-attainment mathematics. The following five research questions were used to address the central aims of this study:

1 – Will initiating a programme of Lesson Study be associated with a positive impact on the climate of a primary school?

2 – Will initiating a programme of Lesson Study be associated with a positive impact on teacher self-efficacy in implementing inclusive practice?

3 – What conclusions will the teachers draw about improving the teaching following Lesson Study?

4 - What changes to practice will teachers sustain after engaging in a wave of Lesson Study?

5 – What changes in pupil maths scores will follow a programme of Lesson Study?

Chapter 3: Methods

3.1. Introduction

In this chapter, the considerations of method are explored in detail. Initially, an overview of the rationale and design are provided before presenting more detailed descriptions. Subsequently, focus on the evaluation methodologies and philosophical assumptions are explored before examining the evaluations design of the research project. Key programmes used in the research project are defined before looking at methods of data collection and data analysis. Finally, ethical considerations are discussed along with the quality of the data collected and the limitations of the research.

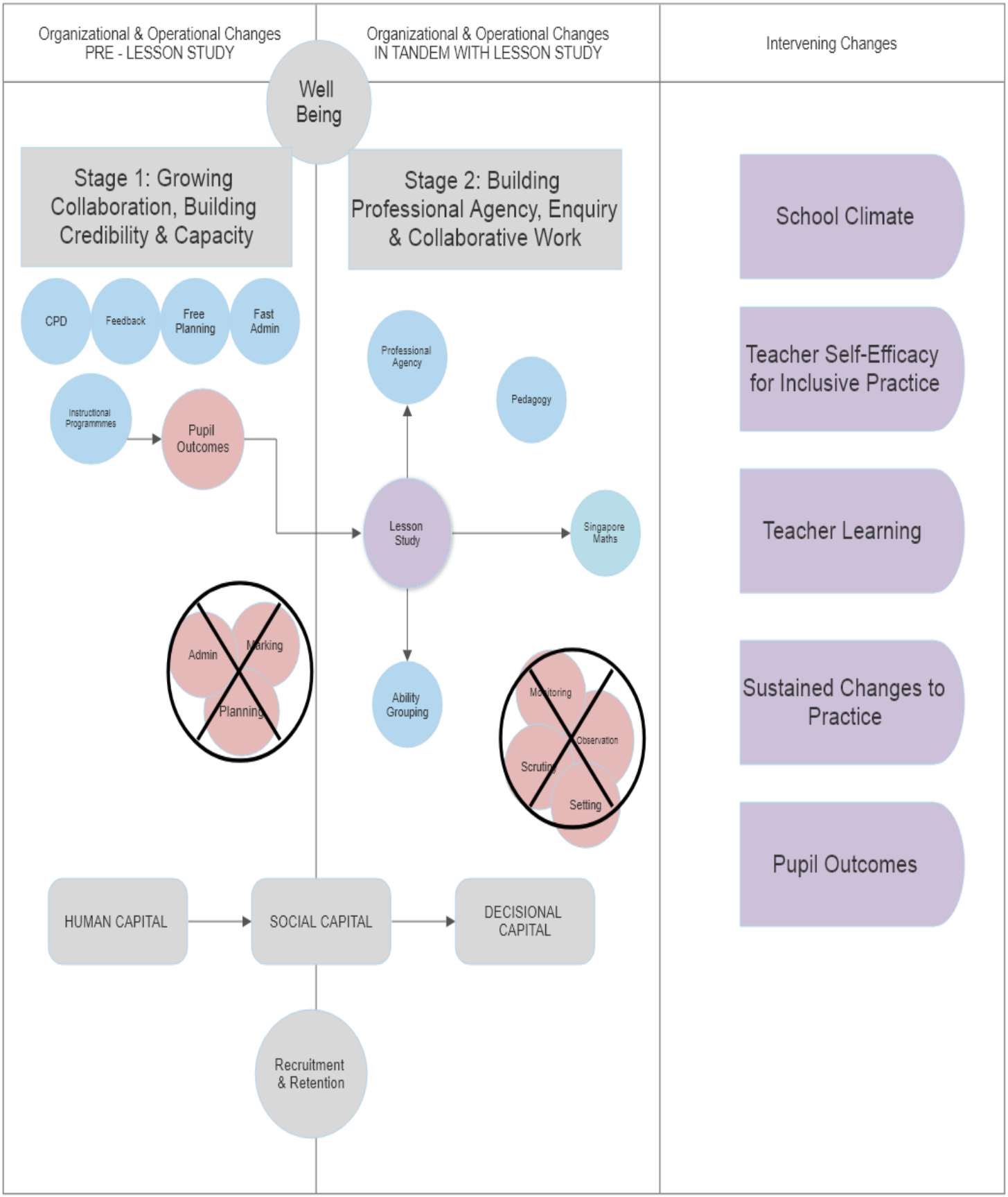


***Figure 2**: Initial Theoretical Structure, Stages 1 and 2*

Using professional capital theory (PC) (A. Hargreaves & Fullan, 2012), the scope of the research focusses on the second stage of the model presented (Figure 2) and is centred on initiating Lesson Study (LS) as a model of social capital (SC) in the research school. LS was introduced in a two-form entry school in Southall, a multi-cultural and economically diverse part of London, in the 2015-16 academic year. As shown in Figure 2, and as discussed in the review of the literature and conceptual framework, the school had no previous experience with LS or action- and practice-based research. However, as discussed in the prologue, steps had been taken in the years leading up to the introduction of LS to build HC and informal SC at the study school. This study used mixed-methods data in the evaluation research in order to triangulate the research findings, but intentionally has a greater focus on qualitative data, as the voice of participants was seen as crucial in understanding the outcomes. In the case of both the school climate and teacher self-efficacy, the quantitative data reflects a standard framework that only partially tells the story of the impact of LS on the teachers and school. This was in the form of questionnaires which were designed to assess a clear framework of self-efficacy and school climate. This study also concentrated on the lived experience of teachers in the school to elaborate on and understand the quantitative data, giving a more robust view of LS from the perspective of teachers, and defined it as a workable model effective in the improvement of school climate and self-efficacy among other things.

The central aims of the research project were:

1 – To positively change school culture/climate through the introduction of Lesson Study as professional learning and development

2 – To improve teacher self-efficacy in teaching mixed-ability classes in mathematics, while phasing out “ability grouping”

3 – To interrogate current teaching strategies being used with struggling and advanced learners in primary mathematics with regard to pupil progress

The following research questions were designed to evaluate the aims of the research project and LS programme itself:

RQ1: Will initiating a programme of Lesson Study be associated with a positive impact on the climate of a primary school?

RQ2: Will initiating a programme of Lesson Study be associated with a positive impact on teacher self-efficacy in implementing inclusive practice?

RQ3: What conclusions will the teachers draw about improving the teaching following the Lesson Study cycle?

RQ4: What changes to practice will teachers sustain after engaging in a cycle of Lesson Study?

RQ5: What changes in pupil maths attainment will follow a programme of Lesson Study?

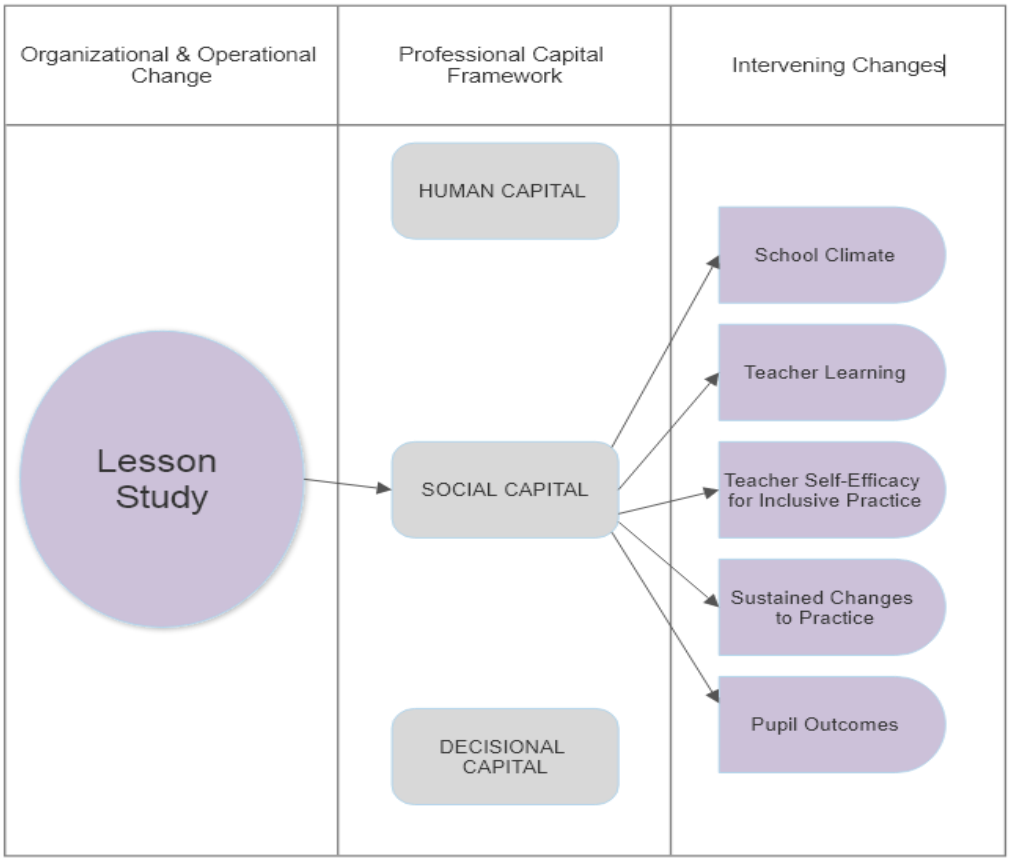


***Figure 3**: LS as SC aligned with the Research Questions*

3.2 Rationale and Overview of Research Design

As discussed in the introduction and review of the literature, school leaders in England do not have a strong repertoire of alternatives to high-stakes accountability measures to employ in schools that support school development, teacher learning, teacher self-efficacy to use inclusive practices, improve pupil outcomes or develop a positive school climate. There is a gap in the literature about the association of LS in England with school climate and teacher self-efficacy in using inclusive practices from the voice of the teachers themselves (Gero, 2015; Schipper et al., 2018; Schipper et al., 2020; Ylonen & Norwich, 2015). In addition, the research that has examined the association between LS

and teacher learning and pupil outcomes has often been conducted by external researchers not connected to the school itself and not in the context of the English schooling system. This context has been characterised in the literature review as one that is using a business capital or GERM model, whereby teachers are leaving the profession not long after joining. These could also be viewed as conditions hostile for authentic professional growth. Research conducted in "fertile" conditions that lead to teacher learning, teacher collaboration, and improved pupil outcomes seems less significant in the face of a nation unable to retain its teachers to begin with. The study of LS and its associations with school climate, teacher self-efficacy to use inclusive practices, teacher learning and pupil outcomes, under the practices and the theoretical framework of professional capital (A. Hargreaves & Fullan, 2012) will add to the body of literature both about the benefits of LS, but more precisely, about how this comes to fruition in a system associated with high teacher attrition and a poor school climate.

The research design itself is guided by mixed methods, collecting both standardised and comparable data sets about LS's association with school climate, teacher self-efficacy to use inclusive practices, and case pupil attainment data, coupled with rich, nuanced qualitative individual and group interview data that is thematically analysed and connected back to the research questions themselves. In line with PC theory, LS was introduced to the case school in sequence with a variety of other changes that took place at the school in the two to three years leading up to the study (see Figures 1 and 2), with commentary on both the evaluation and outcomes of the study itself and a follow-up five years after the study (Figure 12). The part-time researcher was the deputy headteacher of the school during the study and is currently the headteacher of the school.

Therefore a research assistant was hired to conduct all of the interviews with staff. At the time of the study, the school employed 19 teaching staff, not including the researcher. 12 completed questionnaires, with only 8 completing both pre and post sets. 5 teachers volunteered for individual interviews. There were 12 group interviews recorded and analysed with consent and 10 public research posters were analysed alongside pupil attainment data for all of the case pupils involved.

3.2. Evaluation Methodology and Philosophical Assumptions

The research is based on the belief that knowledge is contextually based and value-laden while being both deductive and inductive in its origins. It is broadly aligned with a constructionist philosophy that knowledge is an interplay between the subject and object of research and that the subject ultimately constructs their reality of the object (Cohen, Manion, & Morrison, 2010). The research itself has been undertaken through the lens of critical theory (Horkheimer, 1972a, 1972b). Critical theory has a distinct aim: to identify and reveal the ideology falsely justifying some form of social or economic oppression and, in so doing, to contribute to the task of ending that oppression (Horkheimer, 1972a, 1972b). Business capital theory, high-stakes accountability models, or the Global Education Reform Movement (Fullan et al., 2015; A. Hargreaves & Fullan, 2012; Sahlberg, 2012a, 2012b; Stone-Johnson, 2017) can be framed as involving an ideological element. In the case of the English landscape, these ideological models can be seen as limiting English schools, leaders and teachers to one way of doing things; leaving them with a limited set of options to draw upon to support the improvement of their schools and the development of their teachers, in order to support a positive school climate and higher degrees of self-efficacy within the

teachers themselves. Critical theory has informed this researcher and research by attempting to provide insight, information and robust data that would support other school leaders in making a change in their own school or setting with the hope that the findings and conclusions of the research can be emancipatory for schools, their leaders and teachers; the aim of the research is to assist school leaders in determining approaches to school and staff development that positively impact the climate of their schools and self-efficacy of their teachers while continuing to enhance teacher learning and pupil achievement.

3.3. Understanding Programmes - Lesson Study and Singapore Maths

LS was a planned intervention as part of the school's development plan, created by the senior leaders of a school with a focus on school improvement, for the 2015-16 school year. It was intended to continue to support the school across a number of development priorities throughout the year. The school's priorities were to:

1 - build the efficacy of teachers to teach "mixed ability/mixed-attainment" groups in mathematics across the school, **phasing out "ability grouping" (setting)**;

2 - **develop teachers' pedagogical content knowledge in mathematics**, using the "Singapore approach" to teach mathematics across the school;

3 - **improve teachers' capacity for action- and practice-based research through the development of SC and DC**; and

4 - **improve the climate of the school** through the development of a professional learning community.

The school commissioned an experienced LS trainer from Edge Hill University to provide INSET training for the entire staff in September 2015, using the Lesson Study UK model (Dudley, 2015b). This model involves: teachers determining an area of instruction for improvement and identifying case pupils to study over the course of three research lessons; teachers collaborating in a joint planning session of a research lesson; teaching/observing the lesson; interviewing the case pupils; and, entering into a post-lesson discussion in order to plan a subsequent research lesson. This is repeated for two further research lessons before teachers write up what they have learnt in the form of a research poster. This is shown in Figure 4 :

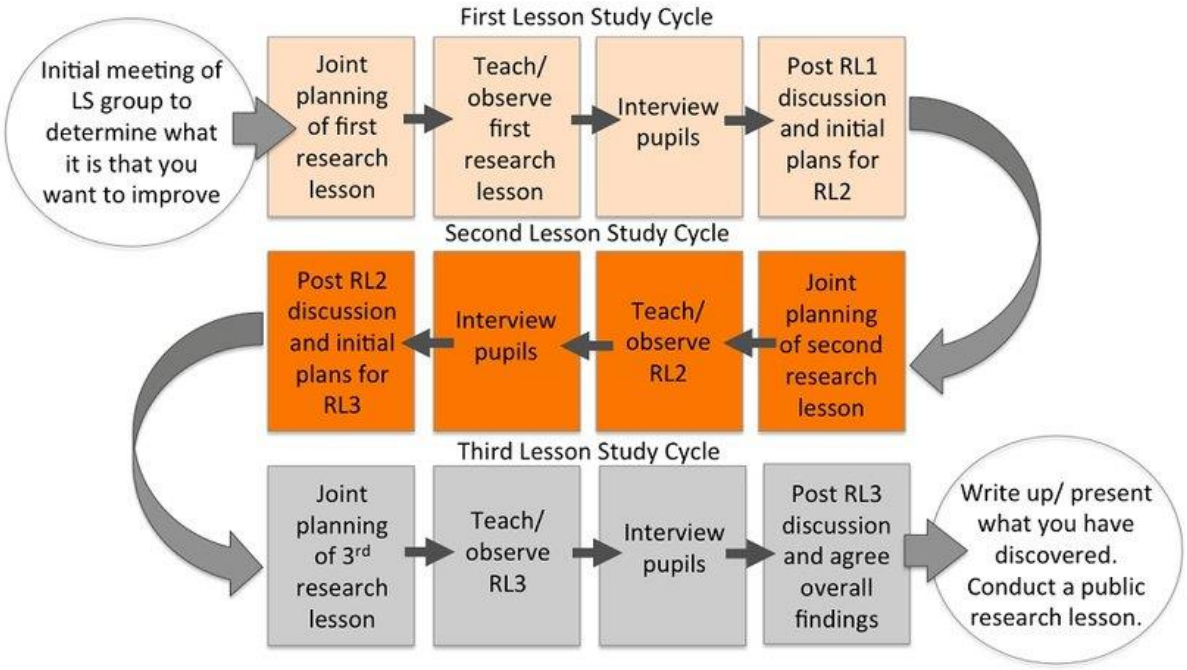


Figure 4*: Lesson Study Cycle*

Source: Dudley, 2015b

The school conducted two cycles of LS, one in the spring term 2016 during January and February and the other in the summer term, during May and June

2016. The two lesson studies were investigating the impact of the school's new maths approach on both struggling and advanced learners in addition to building teacher confidence in teaching mixed-attainment maths classes as a transition away from "ability grouping".

As LS was part of the school's own development plan, all teachers participated in at least one cycle of LS, with five Lesson Study groups, where each group consisted of three teachers, comprising 18 teachers in total completing both cycles. At the end of an academic year, teachers at the school were assigned a teaching role based on a number of factors, which ultimately informed this study. Considerations of teaching assignment were broadly looked at with regard to a teacher's level of experience (as both a teacher and in the particular key stage), their role within the school (class teacher or class teacher and team leader), and their own personal and professional preferences, requested from them in advance of decision making. Experienced teachers were placed in a year group with a less experienced teaching partner and teachers with leadership responsibility were not placed in the same key stage, in order to distribute the roles. In that particular year, the school had two newly qualified teachers, one in Y1 and the other in YR. Team leaders were in YR, Y2, Y4 and Y6. Teachers were grouped by the year group taught, and were given the time during the instructional day to complete each component of LS. Teachers selected "case pupils", which is one struggling learner and one advanced learner, for the cycles of Lesson Study based on their previous term's attainment on the Hodder Progress in Understanding Mathematics Assessment (PUMA). Struggling was defined as any child scoring below 85 as a standardised score in the previous summer term (Summer 2015). Advanced was defined as any child scoring above

115 as a standardised score in the previous summer term (Summer 2015). The use of the labels “advanced” and “struggling” was part of the school’s phased approach to eliminating ability grouping and labelling altogether. Historically, children were labelled “low ability” or “high ability” denoting future performance and a “within child” problem (Gross, 1994; Lauchlan & Boyle, 2007; Riddick, 2000). The shift from “ability” labels to “struggling” or “advanced” was aimed at shifting the challenge from the pupil themselves to the teacher. They were meant to also shift to the attainment levels of the children themselves, which are alterable, whereas previous terms implied less alterable characteristics and can lead to limited opportunities for the children and low expectations (Hart et al., 2004; Swann et al., 2012). At the end of a LS cycle, teachers at the school were expected to create a research poster and present their findings to the staff. All posters also went on to the school’s website for public dissemination. Table 4 shows the amount of time that LS took during a typical school day:

Table 4
LS Schedule on a Research Lesson Day

Time	**Typical Day**	**Lesson Study Schedule**
8.55-10.30	English Block	In Class
10.30-10.45	Break	LS Prep
10.45-12.00	Maths Block	Research Lesson
12.00-1.00	Lunch	10 min pupil interview
1.00-3.15	Foundation Subjects Block	Review & Planning Meeting

In line with professional capital theory, it was important that LS was seen as something deeply valued by the leadership team, as an improvement activity that

was moving from management led to teacher led. In this light, all LS activity took place during the teachers' scheduled working day. During the English block, LS groups were in their respective classes with the support of the supply teacher that had been booked to cover their remaining lessons. During the morning break, teachers gathered their proformas, reviewed the lesson plan and positioned themselves in the classroom as researchers. During the maths block, all three teachers on the LS team were in one classroom, with the other two classes covered by a supply teacher each. Internal coverage was used where possible. Immediately after the lesson, the teachers interviewed the case pupils for approximately 10 minutes during the lunch break. After lunch, the three teachers met in school to review the lesson based on observations recalled and recorded on the proformas. They would then plan a subsequent lesson to take place the following week. The LS schedule lasted for three weeks, with a different year group assigned to a specific day each week, ensuring only one group was out of class at a time and that the three-lesson cycle could take place. The only exception to this was in Week 1, when the first review meeting needed to take place prior to the research lesson. The decision was taken to have this the day before rather than the week before for continuity of planning and execution of the lesson. An example of the timetable can be seen in Table 5:

Table 5
Sample Group Timetable for LS

Y1

Review Meeting 1 Pedagogic Model	Tuesday 17 May
Research Lesson 1	Wednesday 18 May
Review & Planning 1	Wednesday 18 May
Research Lesson 2	Wednesday 25 May
Review & Planning 2	Wednesday 25 May
Research Lesson 3	Wednesday 8 June
Poster Meeting	Wednesday 8 June

Singapore Maths

For the purposes of this study, the “Singapore approach” to mathematics instruction was a new pedagogic model the school was using to teach all children mathematics. It is characterised in England as teaching mathematics for mastery, whereby the whole class works through the programme of study at the same pace with ample time on each topic before moving on. This is in contrast to the school’s previous pedagogy and approach, which had children learning a variety of different maths topics each week in set attainment groupings across the year group, labelled “low, middle or high ability”. The Singapore approach was initiated at the school in the previous academic year with a view to eliminate attainment groupings and reduce the amount of differentiation by task for pupils, ensuring that all children had access to the entire curriculum each year. Other unique elements of the Singapore approach are that the teacher follows a pre-designed scheme of work from a textbook, lessons have a five-part structure (anchor task, journaling, reading and reflecting, guided practice and independent practice), and pupils complete both a maths journal during the lesson and

workbook of problems at the end of each lesson. The approach emphasises use of the Concrete, Pictorial, Abstract (CPA) theory of learning new concepts in mathematics, whereby new concepts are introduced with concrete examples and resources, progressing to drawing pictorial representations before finally using more abstract symbols to represent their thinking. The researcher authored the teaching guides for one of the publishing companies (MathsNoProblem, 2020) and the school attained "Accredited School" status at the completion of the LS project, enabling the school to support other schools to adopt a similar approach to learning and teaching.

3.3. Evaluation Design

Table 6
Evaluation Design; Quantitative and Qualitative Measures

Quantitative Design Elements	Qualitative Design Elements
Rating Scale Questionnaire: School Climate	Individual Interviews
Rating Scale Questionnaire: Teacher Self-Efficacy in Using Inclusive Practices	Group Interviews
Pupil Attainment Outcomes in Mathematics PUMA	Teacher-Produced, Public Research Posters

The evaluation of LS focussed on the teaching of Singapore Maths in the study school employing a mixed-methods evaluation design based on analysing the data from a variety of qualitative and quantitative sources over two LS cycles, one in the spring and the other in the summer term. The quantitative data was collected using rating scale questionnaires for both measuring the perceived

climate (Kallestad, 2010) and self-efficacy to use inclusive practices (Sharma et al., 2012) of teachers at the study school. This data was collected in order to have standardised, comparable data sets between participants at the school in addition to data sets that were comparable between times (pre- and post-LS). The data in both cases was obtained both pre- and post-LS programme, first in the autumn term and then again in the summer term. Pupil standardised test data in mathematics was also gathered for the case pupils in the study. This was done with the permission of the headteacher. Participants for the research had to be teachers at the school during the time of the study and voluntarily participate. In collecting qualitative data, two types of interview, individual and group, were used and constructed with reference to Kvale's (1996) seven stages of an interview investigation: thematising, designing, interviewing, transcribing, analysing, verifying and reporting. This data was collected in order to give voice to some of the standardised questionnaire data and provide a more nuanced data set that could be explored in relation to the standardised data from the questionnaires. As PC theory itself is interested in the voice and agency of teachers, providing participants with the opportunity to speak beyond the scale measures about school climate, self-efficacy for inclusive practices and their own learning was vital in aligning theory with practice (Fullan et al., 2015; A. Hargreaves & Fullan, 2012; Stone-Johnson, 2017). The interviews were all conducted by an external research assistant and not the researcher due to the line management responsibility that the researcher had for the participants. The themes of the research, with regard to the theoretical basis for the study, aims of the study, practical value and interview approach have been outlined in the preceding paragraphs and sections. The design of the interviews was based on a schedule of open-ended items, defined (Kerlinger, 1970, 1986) as questions

that supply a frame of reference but place minimal restraint on answers and expression. One of the reasons open-ended questions were chosen was to assist in supporting the development of key themes (school climate and self-efficacy) outside of those identified on the scales used in the quantitative design. Documentary analysis was also undertaken, with the use of LS research posters produced by the teachers and posted publicly on the school's website. The posters were divided into sections that outlined the teacher-researchers, the anonymised case pupils, strategies analysed in the study, progress measures and professional learning and conclusions from the study. Posters were analysed for the professional learning and conclusions reached by the groups to add a layer of depth to supplement interviews. Documents were analysed using Bowen's (2009) document analysis framework.

3.4. Evaluation Methods

3.4.1. Quantitative data

Table 7 summarises the quantitative data collection methods used for the research questions.

Table 7
Quantitative Data Sources and Research Questions

Research Questions	Quantitative Data Sources
RQ1: Will initiating a programme of Lesson Study be associated with a positive impact on the climate of a primary school?	Pre-post questionnaire CLIMATE (8) Time 1 12 teacher responses Time 2 8 teacher responses
RQ2: Will initiating a programme of Lesson Study be associated with a positive impact on teacher self-efficacy in implementing inclusive practice?	Pre-post questionnaire EFFICACY (8) Time 1 12 teacher responses Time 2 8 teacher responses
RQ3: What conclusions will the teachers draw about improving the teaching following the Lesson Study cycle?	**n/a**
RQ4: What changes to practice will teachers sustain after engaging in a cycle of Lesson Study?	**n/a**
RQ5: How will initiating a programme of Lesson Study be associated with pupil progress and attainment?	Case pupil pre LS and post using PUMA T1/T2, 12 classes, spring/summer data standardised scores for all pupils from PUMA. Wave 1 = Autumn baseline and Spring End; Wave 2 = Spring Baseline and Summer End

Climate Scales

The climate survey (Kallestad, 2010) was designed to measure teacher reports of school climate across multiple domains, reviewing their beliefs in each domain both before the introduction of LS and after (Appendix D). *Teacher-Teacher collaboration*; *Openness in communication*; *Orientation to change*; and their *Influence over classroom work* were reported on by teachers and used to measure the potential change in climate associated with the introduction of Lesson Study. The original scale consists of five scales, including *teacher-leadership collaboration*; however, it was decided that this scale should be omitted as the researcher was the deputy headteacher at the time of the research and felt that it was a conflict of interest. Reliability analysis for the total scale, as well as factors for each school, suggested that the scale provides a reliable measure of teacher perceptions of the school climate for teachers (Kallestad, 2010). The internal reliability of the scales was: alpha coefficient for the total scale

was 0.80; alpha coefficients for the four factors from Kallestad ranged from 0.64-0.81.

Table 8
Climate Scale Statements

Domain	Statements
Teacher-Teacher Collaboration	I like the collegial atmosphere at this school. I like the teachers' professional attitude at this school. Teachers at this school are helpful towards each other. Teachers at this school generally agree on working and teaching methods. I enjoy working at this school. New teachers are easily accepted in the school. The teachers at this school are keen to try out new ways of working and cooperating.
Openness in Communication	I discuss with the other teachers at my school how I work with my pupils. I speak openly with the other teachers at school about my relationship with my pupils. The teachers at school speak openly to each other about their relationship with their pupils. The teachers at school collaborate with regard to working and teaching methods. Teachers at this school consult each other on professional issues and concerns. When a teacher has problems in her/his teaching, other teachers offer help and support.
Orientation to Change	To what extent have you changed your way of teaching in the past two years? To what extent has your relationship to your pupils changed in the past two years? I am keen to try out new ways of teaching. I am keen to try out new ways of dealing with pupils.
Influence Over their Classroom Work	I have a great deal of influence on the organisation of work in my classroom (within the general given framework). I have little opportunity to organise the work in my class as I would like. I am relatively free to organise the work in my class as I would like (within the general given framework).

Source: Kallestad, 2010

This type of questionnaire has been in use for decades, along with Osgood et al.'s (1957) pioneering evaluative questionnaires, and is widely used as an instrument in research (Cohen et al., 2010). In the climate survey, teachers responded to questions 1-13, 18-20 using a 6-point scale, where 1 was defined as "does not apply at all" and 6 was defined as "applies exactly". Questions 14-17 had slight variations to their wording (ex: not at all/significantly, never/very often), but were also rated on a 6-point scale with 1 representing a negative correlation with school climate and 6 representing a positive correlation with school climate. Kallestad (2010) discusses his own findings of reliability for the

scales, suggesting that the study shows that what distinguishes an organisation from other organisations is likely to change over time, which means that climate instruments have to be continuously examined. His results also suggest that what is regarded as an aspect of school climate at a particular point in time can be reflected as professional norms in a broader teacher community at another point in time. There is a lower reliability of teacher-teacher collaboration as a measure of climate and that “openness to change” should not be used as a measure of school climate.

Twelve teachers participated in the pre-intervention questionnaire and eight participated in the post questionnaire, providing eight sets of data to analyse. Teachers were asked to complete this survey during their own time rather than during the school day to avoid any potential bias in responses.

Self-Efficacy Scales

The Sharma scale (Sharma et al., 2012) was designed to measure perceived teacher efficacy to teach in inclusive classrooms (Appendix E).

Table 9
Self-efficacy Scale Statements

Domain	Statements
Efficacy in Managing Pupil Behaviour	I can make my expectations clear about pupil behaviour. I am able to calm a pupil who is disruptive or noisy. I am confident in my ability to prevent disruptive behaviour in the classroom before it occurs. I can control disruptive behaviour in the classroom. I am able to get pupils to follow classroom rules. I am confident when dealing with pupils who are physically aggressive.
Efficacy in Collaboration	I can make parents feel comfortable coming to school. I can assist families in helping their children do well in school. I am confident in my ability to get parents involved in school activities of their children with learning difficulties. I can collaborate with other professionals (e.g., itinerant teachers or speech pathologists) in designing educational plans for pupils with learning difficulties. I am able to work jointly with other professionals and staff (e.g., aides, other teachers) to teach pupils with learning difficulties in the classroom. I am confident in informing others who know little about laws and policies relating to the inclusion of pupils with learning difficulties.
Efficacy to Use Inclusive Instruction	I can accurately gauge pupil comprehension of what I have taught. I can provide appropriate challenges for very capable pupils. I am confident in designing learning tasks so that the individual needs of pupils with learning difficulties are accommodated. I am confident in my ability to get pupils to work together in pairs or in small groups. I can use a variety of assessment strategies (e.g., portfolio assessment, modified tests, performance-based assessment, etc.).
Efficacy in Teaching Mixed-Attainment Maths	I can ask a range of questions for pupils with different levels of understanding. I am confident finding different points of entry for different pupils within the same maths lesson. In a maths lesson, I can provide both written and oral ways for pupils to show what they have learned. In a maths lesson, I can provide pictorial or concrete approaches for pupils to show what they have learned. I can introduce different learning strategies for pupils to approach the same learning task. I can provide visual or other materials to support pupils in solving a maths task.

Source: Sharma et al., 2012

An 18-item scale was developed on a sample of 607 pre-service teachers selected from four countries (Canada, Australia, Hong Kong and India). Factor analysis of responses from the sample revealed three factors: efficacy in using inclusive instruction, efficacy in collaboration and efficacy in dealing with disruptive behaviours. Reliability analysis for the total scale as well as factors for each country suggested that the scale provides a reliable measure of pre-service teacher perceptions of self-efficacy for inclusion across different countries. In the

self-efficacy questionnaire, teachers were responding to questions on a 6-point scale, with opinion/agreement categories used for teacher response i.e. 1 - strongly disagree, 2 - disagree, 3 - disagree somewhat, 4 - agree somewhat, 5 - agree, 6 - strongly agree, where the higher the rating the greater their self-efficacy. Factor analysis of responses from the sample revealed three factors: efficacy in using inclusive instruction, efficacy in collaboration and efficacy in dealing with disruptive behaviours. The internal reliability of the scales was: alpha coefficient for the total scale was 0.89; alpha coefficients for the three factors ranged from 0.85 to 0.93 (Sharma et al., 2012). Notwithstanding the problems of interpretation which can arise from this type of scale, as one respondent's "agree" may be another's "strongly agree", and so on, this type of scale is widely used in research (Cohen et al., 2010). Teachers were asked to complete this survey during their own time rather than during the school day to avoid any potential bias in responses. Twelve teachers participated in the pre-intervention questionnaire and eight participated in the post questionnaire, providing eight sets of data to analyse. A fourth subscale was created to determine the association of LS with teacher self-efficacy of teaching mixed-attainment mathematics. This subscale was trialled for reliability in a large, four-form entry primary school in London with 52 teachers in the spring (Time 1) and summer (Time 2) of 2015. Teachers in this school completed the subscale with 20 weeks between Time 1 and Time 2 without intervention (Appendix E). Internal reliability by Cronbach alpha was 0.79 at Time 1 and 0.88 at Time 2. These are both high degrees of reliability, showing the items are related to each at both times. Consistency over time was 0.88.

Table 10
Pupil Maths Assessment Data used in Analysis

PUMA Test Data	Autumn 2015 December 2015	Spring 2016 March 2016	Summer 2016 July 2016
Wave 1 Pupil A	Pre-LS score	Post-LS score	*Not used*
Wave 1 Pupil B	Pre-LS score	Post-LS score	*Not used*
Wave 2 Pupil A	*Not used*	Pre-LS score	Post-LS score
Wave 2 Pupil B	*Not used*	Pre-LS score	Post-LS score

Case pupils were selected as either “advanced” or “struggling” learners in mathematics for the purposes of the Lesson Study based on their 2015 summer test score, as indicated on the Progress in Understanding Mathematics Assessment (RisingStars, 2020). With regard to progress data (see Table 10), for pupils in the spring LS, autumn PUMA scores were collected as a baseline figure. For pupils in the summer LS, spring PUMA scores were collected as the baseline measure. Pupils were defined as “struggling” if they scored below 85 on their previous summer PUMA and defined as “advanced” if the score was above 115. There were five teams in each cycle of study, each focusing on two children per cycle, totalling 20 pupil test scores to analyse. SPSS was used to determine the statistical significance of pupil progress across two key domains: previously high attaining pupils (advanced) compared to previously low attaining pupils (struggling) and all pupils in Wave 1 compared to all pupils in Wave 2. Paired group t-tests were used to make these comparisons. The t-test is considered a robust test given its assumptions and so adequate for relatively small samples (Swinscow, 2021). The spring Lesson Study was completed during February 2016, which is two months post PUMA baseline and one month

prior to the spring PUMA. The summer LS was completed in May, which was two months post PUMA baseline and 1.5 months prior to the summer PUMA.

3.5.2. Qualitative data

Table 11 summarises the quantitative data collection methods used for the research questions.

Table 11
Qualitative Data Sources and Research Questions

Research Questions	Qualitative Data Sources
RQ1: Will initiating a programme of Lesson Study be associated with a positive impact on the climate of a primary school?	Individual Teacher Interviews (5) Pre-post Group Interviews (12)
RQ2: Will initiating a programme of Lesson Study be associated with a positive impact on teacher self-efficacy in implementing inclusive practice?	Individual Teacher Interviews (5) Pre-post Group Interviews (12)
RQ3: What conclusions will the teachers draw about improving the teaching following the lesson study cycle?	Summary posters x 12 Individual Teacher Interviews (5) Pre-post Group Interviews (12)
RQ4: What changes to practice will teachers sustain after engaging in a cycle of Lesson Study?	Individual Teacher Interviews (5) Pre-post Group Interviews (12) Lesson Study Posters (10)
RQ5: How will initiating a programme of lesson study be associated with pupil progress and attainment?	**n/a**

This study used three sources of data: individual teacher interviews (Appendix F) with five teachers from across the school, group interviews (Appendix G) with key stage teams in the school at three points (four key stage teams), and Lesson Study research posters (Appendix H) in both the first and second waves of Lesson Study (10 posters).

Standardised Open-Ended Interviews (Individual and Group)

Group interviews were conducted in tandem with the individual interviews to elicit multiple views within a group context and a larger proportion of teachers from the school that could not commit to individual interviews lasting more than 60 minutes outside of the instructional day. In this study, six teachers participated in the individual interviews, which lasted between 60-90 minutes after school during the summer term in 2016 after school from 3.30-5pm. For the group interviews, groups comprised all teachers in the phase team (EYFS 4 teachers, KS1 5 teachers, LKS2 5 teachers, UKS2 6 teachers) and all teachers in the school participated (20) in their various phase teams (EYFS, KS1, LKS2, UKS2) both in the spring and summer terms of 2016, after school from 3.30-5pm. This study utilised standardised open-ended interviews as outlined by Patton (1980). This type of interview was chosen in order to have respondents answer the same questions for comparison and analysis on specific topics related to the research itself. Additionally, it facilitates the organisation and analysis of the data (Cohen et al., 2010). The individual and group interviews were structured around the research questions themselves, facilitating easier coding of themes when analysing the data. Group interviews included questions about the Lesson Study process itself, whereas individual interviews focused solely on the research questions 1-4. Patton (1980; 1990) comments that a challenge associated with this type of interview is that it provides little flexibility in relating the interview to particular individuals, which was not deemed as a weakness in this case, and that the standardised wording of questions may constrain or limit the authenticity and/or relevance of questions and answers. Individual interviews were used to allow respondents to answer questions without the influence of other group

members and any potential conflict that could arise within the groups that were structured to include team leaders (line managers). Individual interviews can allow people to speak more openly about a topic; however, they can also be difficult for some that are reluctant to speak or lack confidence. Individual interviews often lasted more than 60 minutes, with the research assistant asking all of the questions to participants. However, what was noted upon analysis of the transcribed data (as the researcher did not have access to this data until after the interviews) is that some questions were perceived as repetitive and were skipped over quite quickly, meaning some answers were given in depth and others missed out because respondents felt that they had covered their response in a previous question's answer.

Group interviews were used in order to stimulate a wider expression of views that one may not have considered individually. Disadvantages of group interviews are that some members can dominate the discussion, some can feel pressured to agree or disagree based on the views of the team leader or teaching partners and this can create a reluctance to share (Cohen et al., 2010). Individual interviews were scheduled between the external researcher and teachers themselves, to take place any time after the end of the second wave of LS and the end of the school year with the incentive of a £50 Amazon gift card for their participation in the individual interviews. The individual interviews were structured to explore both the relative high scores of the original climate and self-efficacy surveys, in order to unpick some of the quantitative data, and then structured to understand two perspectives: their perceptions of the school climate and self-efficacy as defined by the quantitative surveys; and to allow them to venture beyond the framework provided by the questionnaires in order to provide

their own insights into each of the research questions. The questions were designed to match the questions they had answered through questionnaires to provide a more nuanced understanding of their responses and changes in response. The group interviews were structured to understand a few domains more clearly: to what extent the aims of the study were met, teachers' perceptions of the LS procedures, how well they worked with their LS teams, teachers' perceptions of the LS process, and the perceived LS outcomes. These were then analysed in relation to the research questions. Group interviews often lasted about 45 minutes, often with phrases like "I agree with teacher A" rather than individual responses from each participant.

As there were a limited number of participants for the individual interviews (5) it was important to have group interviews as well. Individual interviews were conducted outside of school time by an external researcher (see Appendix F), whereas group interviews were conducted during the scheduled "team meeting" time for the phase team using the normal working week and also conducted by an external researcher to the school (see Appendix G). The external researcher was a colleague of the researcher, a former deputy headteacher within the local authority, and had completed a master's degree in education. They were familiar with qualitative research methods and had conducted interviews in their own research in the past. They were selected to conduct the interviews as the researcher for this project was also the deputy headteacher at the time of the research project. It was important to remove any possible conflict that the interviewees might feel responding to their manager, rather than a neutral researcher.

Lesson Study Research Posters

Research posters were created by LS teams after having completed a cycle of Lesson Study, as indicated in the Dudley (2015b) diagram as a “write up / present what you have discovered” summary of the Lesson Study process and outcomes (Appendix H). Teachers used a school-designed template to record their overall findings and posters were published on the school’s website. The school decided upon the design, with guidance from the trainer from Edge Hill University. Research posters are divided into a variety of sections in order to organise the information and findings of the team: group members, class context and unit of work, case pupil age and characteristics, strategy analysis, progress measures and conclusions/professional learning. All of the teams produced a Lesson Study poster at the end of a cycle of study, providing 10 posters to analyse after two cycles of study. Posters were analysed for the professional learning and conclusions reached by the groups to add a layer of depth to supplement interviews. Documents were analysed using Bowen’s (2009) document analysis framework. This involved a three-step process: skimming, reading, and interpreting. Content was analysed related to the central questions of the research, whereby through the first review of the data, meaningful and relevant information was identified and used in connection with wider qualitative themes identified through interview, including any potential information that was opposed to the central themes.

Table 12
Teacher Participation Tracking

Teacher Number	Climate Questionnaires Pre and Post	Self-Efficacy Questionnaires Pre and Post	Interview
Teacher 1	Y	Y	N
Teacher 2	Y	Y	Y
Teacher 3	Y	Y	Y
Teacher 4	Y	Y	N
Teacher 5	Y	Y	Y
Teacher 6	Y	Y	N
Teacher 7	Y	Y	N
Teacher 8	Y	Y	N
Teacher 9	N	N	Y
Teacher 10	N	N	Y

3.6. Data Analysis

As the research has been shaped through the lens of Critical Theory (Horkheimer, 1972a, 1972b), how data was analysed and findings determined must be given attention. While much of the analysis of the data could be viewed through an advocacy lens, giving a literal voice to teachers about the value of alternatives to the high-stakes accountability model (Griffiths, 2009), it can also

be seen through the lens of speaking on behalf of school teachers and leaders across the country that often represent two categories:

a) they are afraid to speak up against the high-stakes accountability approaches for fear of reprisals from their local authority, multi-academy trust, Ofsted, etc and/or

b) want to speak out against the high-stakes approaches but do not know an alternative.

As a small scale study in one school, this brings attention to the position of representation. However, as the case school is somewhat pioneering in the English landscape and the research is focused on the association of LS with wider aims, the data has been analysed with due regard to any dissenting positions and viewpoints to those of the aims of the study. The findings of the study were shaped largely by the research questions themselves, supported by the balance of quantitative and qualitative data. When quantitative data was initially quite strong across rating scale questionnaires, this was purposefully addressed in the interviews with each participant to understand their views.

3.6.1. Quantitative data

Quantitative data collected via questionnaires were initially analysed using SPSS to generate descriptive statistics. However, due to the limited number of participants and the fact that some participants completed the pre-LS questionnaire and did not complete the post questionnaire (left the school, forgot, declined, etc.), inferential statistical analysis could not be used. The low number of possible participants was anticipated in advance of the study, which is why

more qualitative data was collected, supporting or explaining the quantitative picture.

All surveys were completed by teachers online via Google Forms. This data automatically populated a spreadsheet that included a timestamp and the responses to each question. Where necessary, data from the spreadsheet was converted from phrase-based responses (ex: strongly agree) to numeric values (6) using the “find & replace” feature, hierarchically ordered. This means that phrases that included the same word (eg., “strongly agree” and “agree” both contain the word “agree”) were acknowledged and changed from the largest phrase to the smallest to avoid wrongly assigning values. After all of the data was in numeric form, the data was grouped by subscales and aggregated to determine means scores for each subscale, for each teacher, for each time period. Comparisons were made between pre- and post-intervention scores and the outlying data was examined and annotated. The researcher also rank-ordered subscales and specific questions on each questionnaire from the highest scores to the lowest and the greatest change in score to the lowest.

3.6.2. Qualitative data

Table 13
Process of Thematic Analysis

Phase	Description of the Process
1 - Familiarizing yourself with the data	Transcribing the data (if necessary), reading and re-reading the data, noting down initial ideas
2 - Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code
3 - Searching for themes	Collating codes in to potential themes, gathering all data relevant to each potential theme
4 - Reviewing themes	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic map of the analysis
5 - Defining and naming themes	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme
6 - Producing the report	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis

Source: Braun and Clarke, 2006

The qualitative data were analysed drawing on the principles from Braun and Clarke's (2006) thematic analysis. This is a technique to identify, analyse and report patterns within the textual data. This method was selected as it provides a clear framework to analyse the data, is not linked to a certain theory or epistemology, and results in robust and nuanced accounts of the data itself. The epistemology here is both top down and bottom up. From the top, the researcher is able to use the research questions themselves to guide initial themes and codes, deducing from the data relevant extracts. However, this process also allows for an inductive approach, whereby codes and themes are generated from the participants, broadening and expanding upon the frameworks presented in the initial questionnaires. The interviews were recorded by the external researcher and then transcribed by an independent company (Appendix C). In

order to further avoid bias, the researcher used triangulation from multiple sources, including individual interviews, group interviews, and the quantitative data and research posters.

Initially, the data was analysed using Nvivo software by ensuring all files were in Word or PDF format. The data was open coded to categorise key themes, identify patterns and generate the initial codes from the data sets. The codes used from the outset were based on the research questions themselves, as the semi-structured interviews created a framework to organise the interviews into sections. The initial starting nodes were:

Table 14
Initial Nodes

School Climate
Self-Efficacy
Professional Learning
Sustained Changes to Practice

After all of the data had been examined, the first nodes were broken down into broader themes within the nodes. The second set of nodes and themes to emerge were:

Table 15
Second Set of Nodes from Thematic Analysis

Tier 1	Tier 2 Themes	Tier 3
School Climate	Collaborative Working Teacher Led Learning Improved Culture of Relationships High Challenge, Low Threat Re-professionalising Teachers Collective Responsibility Confidence Building Professional Agency Supportive & Caring Development Professional Excitement Productive Disagreement Time to Develop Change in Children	
Self-Efficacy	Supported Self Directed Improvement Perspective on Pupils Encouraged Risk Taking Communication Between Professionals	
Professional Learning	1 Change to Practice 2 Change to Professional Beliefs 3 Change to Pedagogy 4 Change in Children	1.1 Inclusive 1.2 Teacher Led 1.3 Child Centered 1.4 Professional Conversations 1.5 Collective Responsibility 1.6 Free to Innovate 2.1 Collective Responsibility 2.2 Importance of CPD 2.3 Leaders of our own Learning 3.1 CPA 3.2 Child Centered 3.3 Universal Design 3.4 Dialogic
Sustained Changes to Practice	Professional Practice, Pedagogy & Assessment Teacher-ing to Learner-ing Culture of Collaboration Culture of Communication Risk Taking	

At this stage, a review of all themes was done to look for overlap, frequency (the number of references to a particular theme) and their relationship to the research questions themselves. There was overlap between themes and within themes, so further review was necessary to determine the final themes. Additionally, I had the nodes and themes reviewed by both my supervisors and a colleague to moderate the validity of my analysis of the data.

The final themes (Tier 2) were defined and the report was written up as a result of the final themes, as shown in Table 16.

Table 16
Final Nodes, Themes and Definitions from Thematic Analysis

Tier 1 NODE	Tier 2 THEME	Tier 3 Description of Themes
School Climate	Professional Agency & Excitement (62)	Agency & Excitement as the: a. responsibility to develop themselves / each other; b. opportunity to shape instructional programme through practice-based research / make decisions directly impacting instruction; c. confidence to enact / examine different approaches to teaching
	Collaborative Working & Collective Responsibility (42)	Collaborative Working & Collective Responsibility as: a. working in teams to develop instructional practice; b. teaching teams responsible for learners and learning.
	Professional Relationships (39)	Professional Relationships as the: a. shift from informal chats to formal analysis; b. confidence to disagree with adults, regardless of role/position, and safety in saying we are uncertain; c. opportunity to trial / evaluate many ideas / approaches to learning
	Supportive & Caring Development (13)	Supportive & Caring Development as: a. Non-judgemental professional development based on mutual investment b. focus on learners / learning rather than teachers / teaching c. time for development during instructional day and a slowing down of professional learning
Self-Efficacy	Self-Directed Development (34)	Teachers reflecting upon strengths / struggles with classroom practice and self-determining solutions to classroom practice
	New Inclusive Perspective on Pupils (24)	Lesson study providing window into experience of pupil, in turn changing perspective of teacher about behaviour / learning
	Encouraged Risk Taking (12)	Confidence building and excitement to try inclusive strategies in classroom
	Improved Communication Between Stakeholders (9)	More explicit / collaborative approach to talking about learners / learning with parents and other teachers
Improving Teaching	Change to Teacher Practice (113)	Teachers making change to their own practice associated to lesson study, either through own study or in discussion with study groups
	Change to Professional Beliefs (56)	Teachers changing beliefs about effective practice or potential of children they teach associated to lesson study, either through own study or in discussion with other study groups
	Change to Pedagogy (46)	Teachers associating lesson study to a change in way we structure learning in mathematics
	Change in Children (33)	Change in children's attitudes, beliefs or practices in mathematics lesson associated to lesson study
Sustained Changes to Practice	Practice, pedagogy and assessment (29)	Changes teachers made regarding classroom work as teachers, including practice, pedagogy in mathematics and use of assessment
	Teacher & Teaching to Learner & Learning (26)	Shift in the school improvement approach away from teacher / teaching to learners / learning, both individually and as group
	Culture of Collaboration (14)	Improvement of a collaborative professional culture at school
	Culture of Communication (8)	Improvement in professional communication within lesson study teams and between teachers about professional practice, pedagogy and pupil learning
	Instructional Risk-Taking (6)	New culture of instructional risk taking as a means to teacher / school improvement

3.7 Ethics

Ethical approval was gained in December 2015, prior to the commencement of data collection (Appendix B) and participants were all provided with participant

information sheets, which were signed and returned to the researcher (Appendix A). Strict ethical guidelines were followed, including an acknowledgement to the participants regarding their consent, transparency, the right to withdraw from the research at any point, the careful use of incentives, attention to potential harm that could arise from the research, how data would be stored and privacy managed (BERA, 2018).

3.7.1. Role of the researcher

I was the deputy headteacher of the participating school and had line management responsibility for all teaching staff. I removed myself from the data collection process, having hired an external researcher to conduct the focus groups and individual teacher interviews. I gained permission from the headteacher and governing body of the school, received during the termly meeting of the governing body in June 2015.

As a senior leader and line manager of the participants at the school, a number of protocols were put in place to prevent ethical dilemmas from surfacing and impacting upon the research itself. It was decided in advance that I would not pursue normal avenues of follow-up with participants about the study. As an example, four teachers completed the first sets of questionnaires that did not complete the second set. In most research situations, the researcher would have followed up with those participants, sent reminder emails, and so on. To avoid confusing what was their line manager making a work-related request versus what was a researcher asking for support, it was decided that no follow-up would happen. All interviews were held after school hours, as it was important that participants saw it as a voluntary exercise, not being directed by the school in any

way. Often, teachers can feel more obliged to participate if the school gives them time out of class; in the case of this research, interviews were in addition to their normal workload so they felt able to participate only if they wished. I had also made an agreement with the teachers that the data would not be analysed for at least one school year from the time it was given, in order to eliminate any worry about making negative remarks about the LS approach and that being reflected in some way in their performance management process. The school climate scale "teacher-leadership collaboration" was also removed from the claim scale as it directly related to the teachers working relationship with me.

In addition to this, the researcher was also the lead author of the teaching guides to the Singapore Maths products in use at the school during that time and until present day (MathsNoProblem, 2020). While the approach to maths itself was not part of the research process, it was considered in the lead up to the research, disclosed to all school staff, and questions specifically related to the efficacy of the maths programme or approach were avoided. The school and staff were also given LS as a means to reshape or refine the approach to maths itself, which gave license to teachers to make changes to the approach where necessary through close-to-practice research in LS.

3.7.2. Informed consent

The teacher participants were provided with a form that set out the aims and methods of the trial, the voluntary nature of their participation, the confidential and anonymous nature of any data collected and the security of storage of this data (see Appendix A). Teachers were introduced to the research and programme during their school development day focused on their development

priorities. This research was combined with the school's own development plan, so participation in the Lesson Study programme itself was mandatory, whereas the research element was optional.

3.7.3. Anonymity and potential harm

Interview and focus group data was held and used on an anonymous basis, with no mention of names. There was unlikely to be any harm caused by the LS process to those involved as it was a similar process to typical class teaching that the teachers and pupils engage in regularly. It differed from typical teaching in that there was a slower and more in-depth analysis and planning of the teaching, on one hand, and a more focused approach to assessing pupil learning, on the other hand. In order to complete the review and planning meetings and the research lessons, teachers missed out on some of their regular teaching assignments. This could have caused potential progress dips in other subjects; however, this is unlikely as trained and qualified teachers from both inside and outside of the school replaced them for the short time they were out. As this was a concern, steps were taken to ensure that the supply teachers covering the lessons were the same each day for the six-week period, giving them ample time to get to know the children and expectations of the school. All teachers were briefed and prepared to support a more in-depth planning routine for the supply teachers to ensure that there was maximum learning. During that time, teaching assistants were in place to support a smooth and seamless transition for the pupils. The planning time for the Lesson Study model was in addition to their regular planning time.

The data collected through questionnaire, focus group and individual interviews as part of the LS cycles for the reviewing and planning of research lessons was kept securely on the university “U: drive”, and subsequently on a secure Google drive, by the researcher and only used in the Lesson Study process, not for wider teaching or research purposes, including performance management of teachers. All audio recordings and their transcripts were stored on a password-controlled computer within a locked room and deleted after analysis.

The external researcher had limited access to the initial data as the person collecting it, however they did not have access to it after it was submitted to the researcher immediately after the sessions. The sessions all took place at the workplace of the researcher. The LS trainer did not have access to any of the data collected as part of the research.

3.8. Quality of Data and Limitations

A potential bias in the implementation of this study was the researcher’s leadership role within the study school itself. At the time of the study, the researcher was the deputy headteacher of the research school. At the time of writing, the researcher was the school’s headteacher. Attempts were made to mitigate this potential bias and conflict through hiring a research assistant to carry out the interviews and the contracting of a private company to transcribe the data. Not all teachers from the school participated, and some that started the study did not complete it. The researcher did not review the transcribed data until four years after it was created, in order to distance himself from the data and participants. However, participants could have felt compelled to provide more positive/negative responses based on their relationship with the researcher.

Additionally, the school itself was in the process of undergoing substantial changes to the way it operated, with a view to improve the experience for teachers while improving pupil achievement. Lesson Study was a part of that programme. Questions in the interview were specifically constructed to avoid "cross contaminating" the other changes in the school with Lesson Study, asking respondents specifically about the impact Lesson Study had. However, some of the responses to pre questionnaires and interviews could have been affected by the wider changes happening at the school and may have painted a more impactful picture of Lesson Study than one may encounter at another school without a similar broad programme of climate change.

Chapter 4: Results

4.1. Introduction

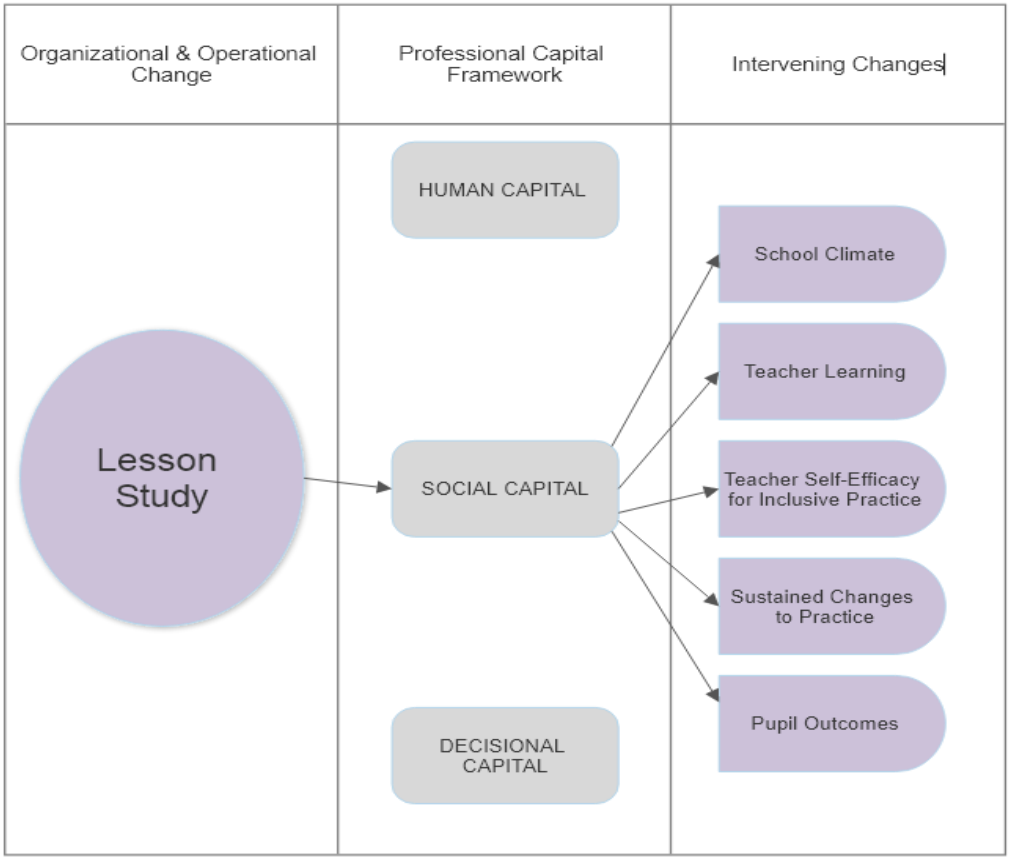


***Figure 5**: LS as SC aligned with Research Questions*

This chapter presents the key findings from all staff participants, generated from the analysis of the questionnaires (both pre and post study), individual and group interviews post study, teacher-made research posters, and observational data from the review and planning meetings in relation to the research questions. It presents the findings by research question, using both qualitative and quantitative findings to answer the questions.

The research questions for this study were:

Table 17
Research Questions

RQ1: Will initiating a programme of Lesson Study be associated with a positive impact on the climate of a primary school?
RQ2: Will initiating a programme of Lesson Study be associated with a positive impact on teacher self-efficacy in implementing inclusive practice?
RQ3: What conclusions did the teachers draw about improving the teaching following the Lesson Study cycle?
RQ4: What changes to practice will teachers sustain after engaging in a wave of Lesson Study?
RQ5: What changes in pupil maths attainment will follow a programme of Lesson Study?

This section will report the results of data analysis related to each of the research questions in the study.

4.2. RQ1: Will initiating a programme of Lesson Study be associated with a positive impact on the climate of a primary school?

4.2.1. Quantitative data: School climate scale

The Kallestad Climate Scale (2010) (as discussed in the methods chapter) was used to examine whether Lesson Study was associated with changes in teachers' perceptions of the school climate. This scale looks at school climate through four

key subscales: collaboration between teachers, an openness of communication, an individual teacher's orientation to change and a teacher's influence over their classroom work.

Table 18 provides the mean scores for each participant's responses to the subscales from the Kallestad Climate Scale (2010) in addition to their overall mean score before and after the initiation of the program of Lesson Study. It shows that the school climate was positive for these teachers prior to the initiation of Lesson Study (mean of 4.91 on 6-point scale).

Table 18
Teacher Responses to Climate Scale Questionnaire

		Teacher 1		Teacher 2		Teacher 3		Teacher 4		Teacher 5		Teacher 6		Teacher 7		Teacher 8		All	
	Numbers in red: mean scores below scale mean for pre-test	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	pre	post	post	pre	**pre**	**post**
Climate	Teacher-Teacher Collaboration	5.29	5.71	5.43	5.86	5.14	5.71	5.57	4.86	4.57	5.86	5.86	5.71	4.86	5.14	5.00	5.14	**5.21**	**5.50**
	Openness in Communication	5.50	6.00	4.50	5.00	3.83	5.50	4.00	4.83	4.67	6.00	4.50	4.83	5.00	5.33	5.33	5.50	**4.67**	**5.37**
	Orientation to Change	4.00	4.75	6.00	5.00	3.75	5.25	4.50	5.25	5.75	6.00	5.25	5.25	5.00	4.75	5.25	5.50	**4.94**	**5.22**
	Influence Over Classroom Work	5.33	6.00	5.33	5.33	5.33	6.00	3.33	5.00	5.66	6.00	4.66	4.00	5.00	3.66	4.00	4.00	**4.83**	**5.00**
	Overall Mean	**5.03**	**5.62**	**5.31**	**5.30**	**4.51**	**5.62**	**4.35**	**4.99**	**5.16**	**5.96**	**5.07**	**4.95**	**4.96**	**4.72**	**4.90**	**5.04**	**4.91**	**5.27**

When exploring the four subscales, there were positive mean changes to each scale following the LS programme. Inferential statistics were not pursued as a result of the small sample size. However, while more teachers showed overall positive change (5 teachers), some showed no change (1 teacher) and for two others there was a negative change (see colour coding in Table 18).

There are two ways to analyse these scores, i) by scale changes across the teachers and ii) by teacher gains/decreases across the four scales.

Considering change for each of the four scales, the most positive change was in the *openness to communication* scale, where all 8 teachers showed positive gains, with the overall mean rising by 0.70 from 4.67 to 5.37. It is evident in this table that the pre-LS scores for these 8 teachers were lower than for the other three scales (mean pretest score of 4.67 compared to overall pre-LS mean score of 4.91).

The scale with next most positive change was the *teacher- teacher collaboration* scale where the mean gain was by 0.29, with 6 of the 8 teachers showing gains and only 2 showing decreases. The *orientation to change* scale had a mean gain of 0.28 with 5 teachers showing gains, 2 decreases and one no change. The fourth scale *influence over classroom work* showed the least gains: 0.17 with only 4 showing gains, with 2 showing no change and 2 showing decreases.

Considering teacher changes across the four scales, only 3 teachers showed consistent gains after LS across all the scales; Teacher 1, Teacher 3 and Teacher 5. Teacher 3 showed the most positive change across the scale by 1.11. This is associated with low baseline scale scores compared to other teachers, as shown by below-scale mean scores for this teacher on three of the four scales. Teacher 5 showed the next most gain following LS with a gain of 0.80 while Teacher 1 showed the next most positive gain following LS, but with only a mean gain of 0.65 overall.

However, Teacher 4 also showed a mean gain across the scales of 0.64, with one scale (teacher-teacher collaboration) showing a notable decrease, while the other three scales showed notable gains from low baselines. Another teacher,

Teacher 9, also showed a mean gain across the scales, but only of 0.14, with one scale showing no change while the other three scales showed smallish gains.

By contrast, only one teacher showed no overall mean change following LS (at one decimal place) representing a mixed pattern of gains on two scales, no change on a third scale and a decrease of the fourth scale.

Finally, there were 2 teachers who showed relatively small mean decreases across the scales, Teachers 6 and 7. For Teacher 6, there were decreases on 2 scales, one no change on another scale and one gain on the fourth scale. For Teacher 7, there were decreases on 2 scales, one a relatively large decrease, and two gains.

4.2.2. Qualitative themes from teacher interviews

When looking at all teachers' pre Lesson Study climate questionnaires, the results came back well above the midpoint, with mean scores above 4.9 on a 6-point scale. This was explored in greater detail during the individual teacher interviews, reflected in the qualitative analysis, as it is difficult to show positive impact on climate when climate was initially rated highly at the school prior to Lesson Study.

Table 19 provides a summary of the four broad qualitative themes relating to the impact on school climate after initiating Lesson Study in a primary school.

Table 19
Qualitative Themes of School Climate and Lesson Study

Themes and Number of References	Description
Professional Agency & Excitement (62)	Agency & Excitement as the: 1. responsibility to develop themselves and each other 2. opportunity to shape the instructional programme through practice-based research and make decisions directly impacting instruction 3. confidence to enact and examine different approaches to teaching
Collaborative Working & Collective Responsibility (42)	Collaborative Working & Collective Responsibility as: 1. working in teams to develop instructional practice 2. teaching teams responsible for learners and learning
Professional Relationships (39)	Professional Relationships as the: 1. a shift from informal chats to formal analysis 2. confidence to both disagree with adults, regardless of role/position, and safety in saying we are uncertain 3. opportunity to trial and evaluate many ideas or approaches to learning
Supportive & Caring Development (13)	Supportive & Caring Development as: 1. non-judgemental professional development based on mutual investment 2. a focus on learners and learning rather than teachers and teaching 3. time for development during the instructional day and a slowing down of professional learning

The most referenced theme from teacher interviews was professional agency and excitement associated with Lesson Study in the school. This broad theme has been broken down into a variety of sub-themes, including improved teacher-led learning, teacher agency and decisional capital, and the excitement to try new things in the classroom.

4.2.2a. School climate theme: Professional Agency and Excitement

Teachers felt that school climate was improved as a result of an **improved opportunity to lead their own professional learning**, both for themselves and with each other. This was clear when one teacher described Lesson Study in this way:

> "It just feels special, and the fact that teachers are kind of trusted to make their own judgements about their learning" (Teacher 2).

They believed that there was a shift in the Lesson Study approach from a top-down culture of pre-planned CPD events determined by management, to teachers making their own choices about their professional learning. In line with collaborative learning, one teacher noted that it provided them a platform to challenge practice that was having a low impact on pupil learning, but teacher to teacher rather than management to teacher. This was supported by the view that they could improve their own practice as professionals, with a good investment of time and resources from management. Neither the headteacher nor the deputy headteacher were involved in the Lesson Study cycles, other than to support the scheduling.

Teachers felt that Lesson Study improved the school climate due to an **increase in teacher agency and ability to make decisions about their work**. However, questionnaires revealed that some teachers felt that Lesson Study improved their control over their work while others did not. This is in line with the reported decreases in teacher school climate scores from the post-LS questionnaires. Through interviews, teachers noted that they were able to assess their own practice and determine how they could improve, indicating a high degree of control. Another teacher noted that Lesson Study allowed them to discuss what was happening in each other's lessons which built upon the collaboration already happening. However, as the focus of the lesson studies was predetermined, school leaders were still in control of the focus of the study. While teachers did comment on the studies being organised and focussed, they felt it was a lengthy and challenging process. One teacher noted that they felt positive that they could

reflect upon and change their teaching methods during Lesson Study and another stated that the difference between Lesson Study and previous CPD practice at the school was that Lesson Study was not led by senior leadership:

> "Cos it is something we've always done: kind of working together on teaching methods. But this as well was a lot, it wasn't led by SLT. So there was the freedom to talk and move things forward, and everybody was equal at the table" (Teacher 9).

They felt agency over the discussion and how things had moved forward, and that all teachers at the table were equal. Another teacher noted how special it felt in Lesson Study for teachers to be trusted to make their own judgements about learning, in addition to being able to assess their own and the impact of other's practice to determine how to improve.

The next interview theme was that Lesson Study gave teachers **an excitement to try new things in their lessons**. Teachers reported feeling revitalised by the process and looked to enact new approaches or strategies learned in the study with their own class. In addition to this, one teacher stated that Lesson Study increased their expectations of all children, bringing an excitement to the process of finding what will work for that child or group of children. The excitement to try new things was linked closely to sharing new ideas to try with other Lesson Study groups. One teacher said that they were always talking with the other groups, wondering both how well the children learnt and what strategies they were using.

> "We speak to each other every day, and we always say, 'How did it go? Did yours get it?' And if the other class hasn't, we might say,

> ‘Well, we used this’, or, ‘We tried this; try it with yours and see if it works’” (Teacher 3).

This created a “buzz” in the staffroom and the teachers’ Planning, Preparation and Assessment room where conversations about learning became exciting because there was so much collaboration to improve and so many new ideas to try out. Additionally, it turned what were everyday conversations – informal and often one senior teacher or leader’s opinion – into more research-based, professional conversations:

> I think we were quite good anyway, at like sharing ideas. Like [Teacher 5] and I were kind of like sharing ideas, but... Yeah, maybe like casual conversation, … So I think we had that climate already. But it’s definitely improved it now. And I think maybe because we’ve all been involved together with the process of Lesson Study, it kind of feels like that it’s research based rather than an opinion, if that makes sense… that gives it more weight really. (Teacher 2)

Another view which emerged from the interview, linked closely with trying new things, was **an excitement to interrogate the effectiveness of instructional practice**. Teachers felt an excitement to try both new ideas but also felt excited to try out new ideas that were “outlandish” and evaluate their impact with one another. This excitement to learn professionally and improve was spoken about by all the teachers interviewed.

The next most referenced theme from teacher interviews was **collaborative working and collective responsibility** associated with Lesson Study in the school. This broad theme has been broken down into a variety of sub-themes,

including improved collaborative working and collective responsibility for pupil outcomes.

4.2.2b. School climate theme: Collaborative Working and Collective Responsibility

Participants were positive about the **improved nature of collaborative working** at the school. In 6 out of 8 school climate questionnaires, this was also shown as an improved score from time 1 (pre) to time 2 (post). Teachers in the interview commented on how Lesson Study provided a framework for discussions about learners and learning. While many noted that there had always been a positive culture of talk in the school, interview discovered that Lesson Study took the informal communication and helped make it more formal and structured. Classroom teaching can be an isolating role, without large amounts of adult interaction during the working day. Teachers felt that Lesson Study enabled them to work more closely with their colleagues in planning and assessing the impact of the lessons they planned together. Teachers were able to articulate that the process of Lesson Study itself was close in pedagogical approach to that which the school wanted for the children:

> I think it's fantastic. It's probably the most beneficial thing that a teacher can do with their time, Lesson Study, because it's, once again, it's non-judgemental, it's collaborative, I mean, it's everything that we want our learning to be for our students, and that's the same sort of learning environment for the teachers. So I think it's fantastic in that way. And it's not very often as a teacher you get a chance to sort of get into the mind of other teachers, or experience their

> teaching process, once again in a non-judgemental way. So I think it's fantastic. (Teacher 5)

Improved collaboration also allowed teachers to see each other's practice in a non-judgemental or threatening way, supporting their own development. The collaboration also allowed them to enter the planning process for the lessons more as equals, where everyone had an opportunity to contribute.

Teachers stated that Lesson Study created a **positive climate of collective responsibility** between teachers in the school related to pupil outcomes. One teacher in Year 5 noted that Lesson Study changed the climate from one where each teacher was solely responsible for the outcomes of their own class to a feeling of collective responsibility from the entire team:

> I think it's improved upon the school climate, in the fact that kind of like the ongoing professional discussions with... especially within Year Five, kind of how the whole team like took ownership of the learning. And yeah, it kind of moved from like one per-... one teacher responsible for the progress of the children to like three of us; and I quite liked that; and it's something I've never really had an opportunity to do before and discuss. (Teacher 10)

Teachers felt that Lesson Study was a great support to the **wellbeing of the children and stated that conversations between adults** improved. In support of wellbeing, the conversations now focussed on how success and struggle in one lesson or year group would support the development in another. Failure was no longer seen as final, but as a step on the journey towards mastery. With regard to conversations, another teacher noted that Lesson Study allowed

teachers to work together in ways that are not usually possible when in a classroom on your own; teachers worked deeply with one another, breaking down a lesson and analysing its merits and downfalls, before solving any problems or improvements together. This feeling of collective responsibility was referred to by one teacher as a "community of learning" which operates diametrically to a "culture of scrutinisation". This community of learning shared responsibility for all of the children, reimagining the idea of "classroom' teachers as a 'school" teachers who are stewards of every child.

The next most referenced theme from teacher interviews was the new **culture of relationships** emerging from Lesson Study in the school. This broad theme has been broken down into a variety of sub-themes, including both the nature of the culture of the relationships and the confidence building within and between adults.

4.2.2c. School climate theme: Culture of Relationships

Teachers stated during interviews that the school climate had improved as a result of a **positive shift in professional relationships**. One teacher noted that previous conversations about pupils in the school were easy to have but rarely purposeful. They believe that Lesson Study changed the culture of professional talk, providing an event that catalysed a new way of talking about pupils in school from one that was unproductive to conversations focussed on moving the learning forward.

> It's more targeted on learning now than it was before. And it's more positive. I think it's easy to talk about your class, or your working relationships, or you know, talk about the children you teach – it's not always purposeful. And I think Lesson Study and that

> experience of sitting - and the purpose of it all is to move things forward – gets us into that habit of helping, and not just sitting talking about our children because we're talking about them, but actually talking about our children to move forward in one way. (Teacher 9)

This is noted to have extended beyond the Lesson Study event itself, changing the nature of sustained professional talk both in Lesson Study and in other, less formal, opportunities for teacher talk (PPA, break/lunch time, after school, professional meetings). Other teachers noted the change in newer teachers' level of comfort in professional talk with more experienced practitioners. They felt that Lesson Study improved relationships between newer teachers and those with more teaching experience. Teachers stated that inexperienced teachers were able to ask experienced teachers questions freely without fear of judgment or frustration as the purpose of the Lesson Study was professional learning.

Teachers felt that Lesson Study **improved their self-confidence** in addition to improving their confidence to speak openly with other teachers.

> "I think everyone's kind of a bit more confident to maybe ask if they're not sure, and I think probably even confident as well to share things before" (Teacher 3).

In one interview, a teacher said that they felt more confident to ask another teacher how their study was going, what they had discovered and felt more comfortable asking for help with their own lessons. Teachers felt that the Lesson Study model gave them the framework to have professional conversations about teaching practice without feeling judged and able to get a helpful response. One

teacher mentioned bravery specifically, stating that Lesson Study involved the courage to try out new things and see what works, which requires the confidence to experiment without fear of reprisal from leadership.

The final theme from teacher interviews was the nature of Lesson Study as a **model of supportive and caring development**. This broad theme has been broken down into a variety of sub-themes, including a high-challenge, low-threat climate, supportive development, and the investment of time for staff development.

4.2.2d. School climate theme: Supportive and Caring Development

Teachers noted the change in climate created by Lesson Study **away from the teacher and the teaching towards the learner and learning**. They felt that there was a challenge in the form of improving practice, but that the focus that was historically on the teacher alone had been shifted towards the impact of the teaching on the learners. One teacher noted that Lesson Study had a positive impact on the climate of the school as it facilitated the move away from managerial scrutiny of a teacher's work (lessons, books, planning) to a new community of learning, led by the teachers themselves:

> "So it really does create like a community of learning rather than just a culture of scrutinisation, I guess, which is just phenomenal" (Teacher 5).

Another teacher noted that Lesson Study allowed them to **challenge each other to improve an individual's practice** without directly commenting on the perceived quality of their practice, rather commenting on the impact their shared

planning had on the learning, leading to improved practice without the feeling of threat or judgment.

Teachers felt that Lesson Study was a **supportive and caring way to develop** as a teacher. This aligns with the high-challenge/low-threat theme articulated above. The focus was felt to be on learners rather than directly on teachers:

> She didn't feel judged: she felt supported. And in watching her do that, I went, 'Oh, God, I wish someone would come in and do this for my...' And in turn, we all felt more invested in one another's children and one another's practice. (Teacher 9)

Another teacher noted that the language of support changes from "you should" to "we should", which is connected to both a supportive improvement approach and collective responsibility for all learners. Teachers felt that Lesson Study helped them improve and was a respectful and caring process for everyone involved. One teacher articulated Lesson Study as "we helped each other" and said that everyone who had their children/class watched felt supported and improved as a result.

The final theme that was drawn from the interview about the association of Lesson Study with positive school climate was that it **provided teachers with adequate time needed to improve and learn**. Lesson Study was built in to the instructional day, requiring no meeting or planning outside of teaching time:

> We had the time to prepare, we had the time to debrief. I think those were the most important parts. 'Cos if you didn't have time to prepare adequately it wouldn't work, and if you didn't have time to debrief it wouldn't work either. (Teacher 10)

One teacher noted that the investment by the school through allocated time and resources “said a lot” about the value the school now placed on teachers fixing or improving their own practice. Another teacher noted that in an already collegial atmosphere, the time provided to teachers to learn was good. In one interview, the teacher was clear that if the time given to prepare and debrief wasn’t given, that “it wouldn’t work”. Teachers unanimously felt that Lesson Study built into the school day (as opposed to activities taking place after school) was a very important feature.

4.3. RQ2: Will initiating a programme of Lesson Study be associated with a positive impact on teacher self-efficacy in implementing inclusive practice?

4.3.1. Quantitative data: Teacher self-efficacy scale

The teacher self-efficacy to implement inclusive practices scale (Sharma et al., 2012) (as discussed in methods chapter) was used to examine whether Lesson Study was associated with changes in teachers’ perceptions of their own self-efficacy in implementing inclusive practices. A subscale was designed by the researcher (as discussed in the methods chapter) to understand teachers perceptions of their own self-efficacy in teaching mixed-attainment mathematics classes. This overall scale looks at teacher self-efficacy through four key subscales: efficacy in managing behaviour, efficacy in collaborating, efficacy to use inclusive instruction, and efficacy to teach mixed-attainment mathematics.

Table 20 provides the mean scores for each participant’s responses to the subscales in addition to their overall mean score before and after the initiation of the program of Lesson Study. What it shows is that teacher self-efficacy was

positive for these teachers prior to the initiation of Lesson Study (mean of 4.79 on the 6-point scale).

Table 20
Teacher Responses to Self-efficacy to Implement Inclusive Practice Scale Questionnaire

Numbers in red: mean scores below scale mean for pre-test		Teacher 1		Teacher 2		Teacher 3		Teacher 4		Teacher 5		Teacher 6		Teacher 7		Teacher 8		All	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Self-efficacy	Efficacy in Managing Behaviour	4.83	5.00	4.67	5.00	5.50	5.50	4.17	4.83	4.33	6.00	5.67	5.67	5.00	4.67	5.00	5.33	4.90	5.25
	Efficacy in Collaborating	4.50	5.17	4.00	4.50	4.50	4.83	4.17	5.00	3.83	5.50	4.17	4.67	5.83	5.17	4.33	5.17	4.42	5.00
	Efficacy to use Inclusive Instruction	4.91	5.27	5.00	5.55	4.45	5.18	4.64	5.36	4.50	5.64	5.00	4.82	5.18	5.09	4.91	5.27	4.82	5.27
	Efficacy to Teach Mixed Attainment Maths	5.00	5.33	5.00	5.83	4.83	5.17	4.67	5.67	4.80	5.83	5.50	4.83	5.33	5.50	5.00	5.33	5.02	5.44
	Overall	4.81	5.19	4.67	5.22	4.82	5.17	4.41	5.22	4.37	5.74	5.08	5.00	5.34	5.11	4.81	5.28	4.79	5.24

When exploring the four subscales, there were positive mean changes to each scale following the LS programme. Inferential statistics were not pursued as a result of the small sample size. However, while more teachers showed overall positive change (6 teachers), two others (teachers 6 and 7) showed negative change (see colour coding in Table 20).

There are two ways to analyse these scores, i) by scale changes across the teachers and ii) by teacher gains/decreases across the four scales.

Considering change for each of the four scales, the most positive change was in the *efficacy in collaborating* scale, where 7 out of 8 teachers showed positive gains, with the overall mean rising by 0.58 from 4.42 to 5.00. It is evident in this table that the pre-LS scores for these 8 teachers were lower than for the other three scales (mean pretest score of 4.42 compared to overall pre-LS mean score of 4.79).

The scale with the next most positive change was the *efficacy to use inclusive instruction* scale where the mean gain was 0.45, with 6 of the 8 teachers showing gains and only 2 showing decreases. The *efficacy to teach mixed-attainment mathematics* scale had a mean gain of 0.42 with 7 teachers showing gains and one showing a decrease. The fourth scale *efficacy in managing behaviour* showed the least gains: 0.35 with only 5 showing gains, with 2 showing no change and 1 showing a decrease.

Considering teacher changes across the four scales, 5 teachers showed consistent gains after LS across all the scales; Teacher 1, Teacher 2, Teacher 4, Teacher 5 and Teacher 8. Teacher 5 showed the most positive change across the scale by 1.37. This is associated with low baseline scale scores compared to other teachers, as shown by the below-scale mean scores for this teacher on each of the four scales. Teacher 4 showed the next biggest gain following LS with a gain of 0.81 while Teacher 8 showed the next most positive gain following LS, but with only a mean gain of 0.41 overall.

However, Teacher 6 showed a neutral change across the scales of -0.08, with one scale (*efficacy in teaching mixed-attainment mathematics*) showing a notable decrease, while the one other showed a notable increase of 0.50, combined with a scale that decreased slightly and one that showed now change.

Finally, there was one teacher, Teacher 7, who showed relatively small mean decreases across the scales. For Teacher 7, there were decreases on three scales, one a relatively large decrease, and only one gain.

4.3.2. Qualitative data: Teacher interview analyses

The following table provides a summary of the qualitative themes relating to the perceived impact on teacher self-efficacy after initiating Lesson Study in a primary school. A thematic analysis of the transcripts of individual teacher interviews and post-lesson review and planning meetings generated four key themes related to a teacher's perspectives on the association of Lesson Study with their own self-efficacy: created self-directed improvement, new inclusive perspective on pupils, encouraged risk-taking and improved communication between stakeholders. The themes are described and explained in Table 21.

Table 21
Summary of the Qualitative Data of Themes Relating to the Association of Lesson Study with Teacher Self-efficacy

Themes & Number of References	Description
Self-Directed Development (34)	Teachers reflecting upon their strengths and struggles with classroom practice and self-determining solutions to classroom practice
New Inclusive Perspective on Pupils (24)	Lesson Study providing a window into the experience of a pupil, in turn changing the perspective of the teacher about their behaviour or learning
Encouraged Risk-Taking (12)	Confidence building and the excitement to try inclusive strategies in the classroom
Improved Communication Between Stakeholders (9)	A more explicit and collaborative approach to talking about learners and learning with parents and other teachers

4.3.2a. Self-efficacy theme: Self-Directed Development

During interviews after the introduction of Lesson Study, teachers were positive about the influence of Lesson Study on their teaching self-efficacy. The first theme that emerged from the interview was the value of **self-directed teacher improvement**. This was articulated in a number of ways, including through collaborating with other teachers and independent reflection and action as a teacher leading to improvement and the transferability of learning to other areas

of instruction. One teacher referred to this process as a way to “refine” themselves:

‘”It’s definitely helped to refine myself as a teacher” (Teacher 5).

Another teacher noted that the improvement to their own practice came through watching a child “switch off” during a research lesson, which they recognised in their own lesson. Lesson Study provided them with the opportunity to challenge themselves to improve without needing to be challenged or think about challenging someone else. One teacher noted that “removing themselves” from the teaching with an opportunity to watch the learning allowed them to reflect on the challenge they were having with how they presented instructions and sequencing learning. They also began to see the deeper connections between the lesson structure and the Concrete, Pictorial, Abstract (CPA) approach. Finally, teachers commented on their own views of how inclusive their practice was prior to Lesson Study and what they learned after engaging in the Lesson Study process. One teacher noted that they already thought their practice was inclusive, but realised quickly how much they could come back and change.

4.3.2b. Self-efficacy theme: New Inclusive Perspective on Pupils

The second theme which emerged from the interviews was the teachers’ **new inclusive perspectives on the pupils** they teach. Teachers commented on how Lesson Study changed their perspectives about what pupils were implicitly communicating with their behaviour, what pupils could achieve with the right accommodations and the impact that strong inclusive practice has on behaviour. One teacher mentioned how it increased their expectations of the children, with a new view after Lesson Study that all of the children are able, but that it was their

task as teachers to determine what approach would allow each child to succeed. This was a shift in thinking from “he doesn’t get it”:

> I guess it’s kind of increased my expectations for the kids, [pause] in terms of they are all able, they’re all able, but it’s finding the ways in which they are able to do it. Does that make sense? Like not just saying, ‘He doesn’t get it’. But really thinking there is a way that you can get it: let’s find out what it is; and not accepting that you can’t do it. (Teacher 3)

Teachers recognised the value of strong instructional practice underpinning the behaviour in lessons, in turn improving their belief in themselves.

4.3.2c. Self-efficacy theme: Encouraged Teacher Risk-Taking

The third theme to emerge from teacher interviews after implementing Lesson Study was **improved teacher risk-taking**. This was linked to an increased confidence teachers felt after experiencing Lesson Study. One teacher noted that Lesson Study was a good opportunity to talk about lessons and strategies with a particular child in mind and be able to share, listen and try out new things. This was complemented by another teacher saying how Lesson Study built up their confidence as a teacher and gave them a new interest in how pupils learn. They felt that Lesson Study showed them clearly how small changes as a teacher could result in a positive impact for the pupils. One teacher noted that their self-efficacy was improved as a result of adult meta-cognition and how they began to regulate their own thoughts as a teacher based on the conversation they were having. This had a positive effect on self-efficacy as it encouraged teachers to try out new approaches based on their colleagues' input:

> I mean we all got the opportunity to try new ways of teaching in response to the Lesson Study in those kind of discussions. And it's kind of given you the confidence now to try something and reflect upon it, whereas maybe before you wouldn't really want to try something in case it failed. But then, it's not the end of the world, is it? As long as you've kind of had that reflecting upon it. (Teacher 10)

4.3.2d. Self-efficacy theme: Improved Communication Between Stakeholders

The final theme that emerged from interviews with teachers after implementing Lesson Study was an **improved communication between stakeholders**, including teacher-teacher, teacher-parent and teacher-SLT. In one interview, a teacher stated that their self-efficacy was improved as a result of the social side of Lesson Study, being able to discuss how learning was presenting in their lesson and what they had learnt about learners and learning. This, in turn, increased their confidence to ask other teachers for advice and support when they needed it. Another teacher noted the impact that Lesson Study had on their conversations with parents. Lesson Study provided them with the lens to discuss the pupil's learning with the parents, demonstrating the connectedness of the school. One teacher made reference to the fact that SLT wasn't leading this process, which allowed everyone at the table to have an equal voice and move the learning forward in lessons with a real freedom to speak and listen without hierarchy.

4.4. RQ3: What conclusions did the teachers draw about improving the teaching following the Lesson Study cycle?

The information gathered about the conclusions teachers have drawn about improving the teaching has come from two main sources, individual teacher interviews and the research posters created post Lesson Study cycles 1 and 2, labelled ‘spring’ and ‘summer’. This question is aimed at differentiating between changes they make during the study, compared to longer term, and sustained changes to practice associated with Lesson Study which RQ4 will examine. Four key themes have been identified, with three key themes being broken down into subthemes, as listed in Table 22. The four key themes are: changes to practice, changes to pedagogy, change to professional beliefs and change in children. The tables 22/23 have been separated according to the responses teachers gave in the interviews and the responses collected from their research posters. These themes are expanded upon below.

Table 22
Summary of the Qualitative Data of Themes relating to the Impact of Lesson Study on Improving Teaching

Themes & Number of References	Description
Change to Teacher Practice (113)	This theme refers to a teacher making a change to their own practice associated with Lesson Study, either through their own study or in discussion with other study groups.
Change to Professional Beliefs (56)	This theme refers to a teacher changing their beliefs about effective practice or the potential of the children they teach associated with Lesson Study, either through their own study or in discussion with other study groups.
Change to Pedagogy (46)	This theme refers to a teacher associating Lesson Study with a change in the way learning is structured in mathematics.
Change in Children (33)	This theme refers to a change in the children’s attitudes, beliefs or practices in a mathematics lesson associated with Lesson Study.

4.4.1a. Improving the teaching theme: Change to Teacher Practice

When teachers were asked about the impact of Lesson Study on their teaching during an interview, the first broad theme to emerge was that there was a **change in teacher practice**, as shown in Table 22. This was then broken down into five subthemes: inclusivity, teacher-led improvement, child-centred approach, collective responsibility for all learners, and an improved professional discourse.

> I developed my maths practice thanks to it, but I also developed the way I taught that child in particular in her English lessons, because I found things about her that were applicable to her as a learner, rather than just her as a mathematician. (Teacher 9)

When teachers spoke about a change to their practice, **inclusivity** had the greatest number of associations. Teachers spoke about the change to their own inclusive strategies for learner subgroups, mentioning both practices they changed to support advanced learners in mathematics and learners that were struggling to grasp concepts. One teacher spoke about pre-prepared tasks for certain pupil groups, allowing them more time to focus on other learners. Additionally, teachers spoke about the **transfer of understanding** of inclusive practice from the Lesson Study in mathematics to their own **practice in another subject**. What they learnt in the study itself was applicable to the learner or group of learners, rather than simply the subject or lesson they were using for the Lesson Study. Teachers also noted that they began to feel comfortable setting tasks that all learners could access through accommodation, rather than modifying the curriculum or task altogether, which had been common at the school:

> If you see a need, why wouldn't you want to try something new to fill that need? And you know, the more you look at children, the more you see: 'Oh, I could do something about that.' So, in taking the time to be more observant about what's going on in my class, I've been able to make changes to fix those things and to benefit individuals or groups. (Teacher 9)

The second subtheme that emerged from teacher interviews in relation to a change in teacher practice was that the **changes and improvements themselves were teacher-led rather than leader-led or imposed**. Teachers spoke about Lesson Study as a "caring" approach to changing their practice. Teachers felt supported through the process and improved their practice as a result of the study. One teacher said "That is what it was: we helped each other." This was in contrast to the school being described as "already collegial" but that Lesson Study gave teachers themselves time to learn and support each other. Another teacher said, "when you are given the opportunity to watch learners in the process of learning and you see something going wrong, you think 'I could do something about that.'" They felt that Lesson Study gave them the opportunity to watch the learning themselves and come up with solutions for individuals and groups of learners. A final idea that emerged was a link between school development around feedback and their own ability to develop that using Lesson Study as a mechanism. Teachers were able to collaborate with each other and see each other use various methods of oral feedback in lessons, which may not have been explicitly a part of the planning sessions:

> I've never really had the opportunity to kind of like sit down for an extended period and focus on one child, or one learner. I think it's

> a good experience, definitely. Like you see things differently from their point of view. It's made me very aware of maybe how I present things in my own class, so kind of like making those links back. (Teacher 10)

The third theme that emerged from teacher interviews in relation to a change in teacher practice was the shift in practice from **teacher centred to one that was child centred**. This shift was discussed in relation to what teachers have typically been asked to study or improve through SLT feedback, attending a course or observing another teacher. In each of those cases, the focus is on the teaching or teacher rather than the learning, the learner and their response to teaching. One teacher noted that "you see things from their point of view" and "it's made me very aware of how I present things to my own class". Another teacher noted the change that occurred across subjects as a result of seeing the child as a learner rather than a child in maths. In one interview, a teacher spoke about how they began thinking about pupil groupings through a new child-centred lens, and rather than grouping them by prior achievement or perceived subject-based ability, they grouped them by gender or the level of comfort they had to converse with another pupil. This child-centred thinking resulted in a greater level of discourse. One teacher said that the change to practice came as a result of "just having an opportunity to see how kids work.":

> I think on the whole it's had a positive impact, because it's allowed people to spend a bit more time doing the things that we... We always did... we always had those conversations; but often they were on the fly as we were passing through. But having time to really look into what's going on in the classroom and to really

> discuss it with one another has built upon the collaboration that was already going on. (Teacher 9)

The fourth theme that emerged from teacher interviews in relation to a change in teacher practice was a newly developed **collective responsibility for all learners** felt by teachers. Historically, teachers saw themselves in isolation from each other when it came to who was responsible for the progress, development and attainment of their class of children. The theme of collective responsibility was characterised during the interviews by a teacher saying that “the whole team took ownership of the learning” and “it moved from like one teacher responsible, to everyone”. Another teacher spoke about the informal conversations about learners and learning that had always been a part of the school becoming more formal and structured, with time provided to “really look at what's going on in a classroom.” One teacher discussed the fact that it was nice to be able to share ideas, listen to one another and try things out. One teacher noted “even now we’re still kind of talking...about effective methods, especially in maths”.

The final theme that emerged from teacher interviews in relation to a change in teacher practice was an **improved professional discourse** about learning and learners. One teacher stated that even after the Lesson Study was over, they still used a similar approach to having conversations about learners and the learning in their classrooms to support each other. Another element that was noted as improved was the fact that nobody was dominant in the conversations during Lesson Study; that everyone was able to discuss their views and have an idea or approach examined through the Lesson Study. Finally, the view that Lesson Study improved discourse was linked to the idea that Lesson Study gave

more weight to strategies and viewpoints as there was a research element to the study, rather than “just people’s opinions”.

4.4.1b. Research posters

The change to teacher practice was also explored through the final research posters that each research team created at the end of a cycle of Lesson Study.

Table 23
Improving the Teaching Theme 1: Research Poster Conclusions

IMPROVING THE TEACHING THEME (research posters): Change to Teacher Practice
● Understanding class dynamics and the effect that particular learners have on each other. ● Focus on shared conversation is important when making sure no one member becomes overly dominant in the conversation. This is also vital in ● gaining formative feedback from all learners. ● Exposure to an “expert learner”, though the use of a teacher modelled task, is crucial when underpinning critical thinking when approaching a problem. ● Where children are seated in the room can have a significant impact on their effort and learning. ● Fraction bars should be the same size as images in Anchor Task to eliminate confusion and consolidate understanding that the whole stays the same size. ● Further encouraging of children to use the ABC (agree, build upon, challenge) method of feedback is needed and this should be continuously expected by the teacher. ● On carpet support: We found that keeping struggling learners on the carpet for reinforcement of whole class learning was a productive activity. It gave these pupils confidence to complete certain workbook tasks independently. ● Sometimes children can find it daunting if there are too many resources on the table, so need the option to go and get the resources they require. ● Giving some children the opportunity to verbalise, and demonstrate the steps required for the independent task in a small group or individually before they moved to the workbooks gave them more confidence to complete the task. ● Prioritising the importance of dialogue and feedback between peers; sharing methods within a group and verbalizing reasoning on behalf of the group.

In analysing the Lesson Study group research posters created after each wave of Lesson Study (spring study and summer study), related to a change in teacher practice, a number of ideas emerged as shown in Table 23. The ideas link to the themes from the interviews, with professional learning related to inclusion and

inclusivity, child-centred thinking and learning, and links to whole school development concepts, such as feedback. The posters themselves indicate that there was learning related to teacher practice that was clear and actioned throughout the study.

4.4.1c. Improving the teaching theme: Change to Professional Beliefs

The second theme that was uncovered during teacher interviews related to improving the teaching was a **change to teacher beliefs** associated with Lesson Study. This theme refers to a teacher changing their beliefs about effective practice or the potential of the children they teach associated with Lesson Study, either through their own study or in discussion with other study groups.

In relation to the first subtheme of this theme, a teacher's changing belief about their own practice, teachers noted that their own **preparation for lessons and learning** was crucial. A new teacher commented that they noticed "how structured and how prepared you have to be for all learning" and really having to think about all possible scenarios with children, anticipating whether or not they would excel or struggle with a concept. Another teacher referred to more motivational aspects of teacher preparation and practice, contemplating when supporting or challenging a pupil would be best versus just leaving them where they are for learning. A strong idea which emerged from interviews with most participants was in relation to how the teachers themselves understood what was being learnt in their own lessons and what indicators they had historically based that understanding on. As an example, a year 6 teacher recalled learning that had taken place between teachers while sharing a larger room for the review and

planning meetings of multiple teams. They said that many of the groups were realising things like:

> I thought she understood... I thought he was getting it, and then I sat and watched for a lesson and then realised, you know, this one wasn't actually talking, or this one wasn't actually... you know, was saying things that... just mimicking somebody else. (Teacher 2)

This narrative allowed the teacher to reflect upon their own year group and study, realising that the indicators that everyone had been using to determine whether pupils understood what was being taught were not sufficient. This was expressed clearly by the teacher, saying "just because somebody looks on the surface like they're with you, actually you have to look a bit closer to see real understanding" (Teacher 2).

In relation to the second of the subthemes, a change in belief about pupils, many teachers made reference to a change, often citing examples of their **assumptions about why pupils behaved or responded in certain ways being challenged** and changed through the process of Lesson Study. One teacher noted that in the very first lesson, they realised that a pupil could do a lot more than they thought and that the teaching also improved in their English lessons as a result of this observation. Another teacher refers to how they grouped pupils at their tables, stating that historically it was based solely on behaviour, but through Lesson Study they came to realise that there are so many other factors at play in table groups that impact upon learning, including gender, character traits and relationships within and between pupils. Another teacher noted their belief about pupil engagement and active participation in lessons, specifically talk. During the

study, the teacher noted that one of the pupils used a mouth miming strategy to appear as if they were talking during designated times, when in reality they were not participating. When another pupil was questioned about how often this happens, they simply stated “every day.”

4.4.1d. Research Posters

The change to teacher beliefs was also explored through the final research posters that each research team created at the end of a cycle of Lesson Study.

Table 24
Improving the Teaching Theme 2: Sample Research Poster Conclusions

IMPROVING THE TEACHING THEME (research posters): Change in Teacher Beliefs
● Not to make assumptions of ability in certain areas of learning if the child is not actively involving themselves in discussions. ● The loudest voice is not necessarily the correct one. Confident voices may give incorrect answers that will steer reserved learners in wrong direction. ● Mental ability to calculate does not reflect understanding of relationships that exist between numbers. ● Overconfidence can over shadow academic abilities. ● Don’t be afraid to keep moving the children’s seats around until you find a layout that fits and benefits all of the children. ● Teaching an anonymous class is very useful as you have little expectations and so are able to adapt your teaching quickly. ● Enrichment tasks can be used to provide time for struggling learners to achieve the initial task whilst deepening the advanced learner’s understanding. ● Children respond to group sizing differently. Some less confident children may respond better to smaller grouping where they are required to participate in the conversation and cannot easily be passive. Others may prefer to be in a larger group where there are more people to share ideas with and they can find a wider range of ideas and challenge.

The examples listed in Table 24 are samples from the research posters generated by the Lesson Study teams after a wave of Lesson Study on the theme of an improvement to teaching through a change in teacher belief. Linked to the interviews of individual teachers, the research posters showed a change in teacher beliefs about pupils and about their own practice. In relation to a change in the teachers' beliefs about pupils, one of the posters made reference to not making assumptions about pupil ability and another said that confidence should not be confused with understanding. These poster statements were also highlighted through interviews. Teachers also noted changes in beliefs about their own practice that were linked to the interviews. One of the posters noted a change to seating and another to the impact of the size of the group in relation to the confidence and success of the learners. These were highlighted through teacher interviews. Additionally, teachers characterised their professional belief changes from Lesson Study in different ways than were captured through interviews. One poster referred to enrichment of learners and how that can be used to provide teaching space for children that struggle to grasp a concept and their new belief that teaching someone else's class was beneficial because they learnt to adapt their teaching quickly as they did not have any preconceived expectation about what they can or cannot do.

4.4.1e. Improving the teaching theme: Change to Teacher Pedagogy

Four subthemes emerged from analysis of the data: universal design for inclusion, the concrete-pictorial-abstract (CPA) approach, dialogic talk, and the facilitative teacher. These came from both interview and research posters.

Exploring the first subtheme, **a universal design for inclusion** as a pedagogical change associated with Lesson Study improving the teaching, teachers discussed their improvement as an understanding that every learner can and should experience challenge and support if the lesson design is strong. One teacher noted that previously, inclusive practice or differentiation was interpreted as solely "simplifying things" for children that struggled and more advanced maths for those that appeared to have understood:

> 'How are we making sure with those struggling learners that we're not just simplifying things, but we are still challenging and enriching?' (Teacher 5).

After completing Lesson Study, teachers noted a shift in their **pedagogical content knowledge**, with one teacher saying that they were no longer just simplifying things for those that struggled but identifying where they could challenge and enrich those children as well, using the same task as all learners. Another teacher talked about using the same "anchor task" for all children but accommodating them with different approaches to achieve the same mathematical concept. Children who struggled the most might use concrete material to discover the solution whereas those that were more confident could be challenged to "think outside the box" more often. However, all children would be working on the same maths problem. As Lesson Study was being used to support teachers in a move away from ability grouping, the views that all children could be taught in the same class at the same time differed from previous working.

The second subtheme related to an improvement in the teaching from a pedagogical perspective was the use of the **concrete, pictorial, abstract** (CPA) approach. This approach was introduced to the school in the autumn term in the year of this study, and Lesson Study was used as a vehicle to support teachers' understanding of the impact that using the CPA approach would have on struggling and advanced learners in a mixed-attainment classroom. The improvement or changes in teaching were primarily seen through the Lesson Study research poster outcomes, where teachers noted that CPA heuristics like bar modelling had become “staples” in lessons now and that the use of resources (concrete materials and pictorial representations) had increased substantially. One teacher noted:

> “Providing a variety of both concrete and pictorial resources is important when underpinning the emergence of abstract principles” (Teacher 5).

Research posters stated that professional conclusions were that concrete resources were essential when teaching, that the use of the CPA approach was important when underpinning the emergence of abstract principles, and that children benefited most when able to self-select the resources they used to solve a problem.

The third subtheme related to an improvement in the teaching from a pedagogical perspective was the **introduction and value of dialogic talk**. This is simply understood as the regular use of dialogue in the classroom, often between pupils facilitated by the use of questioning by the teacher. One teacher noted that the Lesson Study encouraged adults to have more meaningful dialogue and planning therefore encouraged pupils to talk, explain and relay information to each other:

> But are you sure that's going to work? But how do you know it's going to work? What information do you have that tells you it's going to work?' So it's all of those leading questions that keep going on and on and on; but using them across the curriculum. (Teacher 3)

Another teacher said that through Lesson Study, they had the questioning of pupils "nailed". They went on to describe how they could provide support and challenge to pupil groups through questioning, including those that are more advanced and those that struggle, all within the same lesson. Another teacher noted that they were no longer afraid to allow children more time for talk in lessons and that, as a result of Lesson Study, prioritised the importance of dialogue and feedback between peers, allowing them to understand and share each other's approaches to working.

The fourth subtheme related to an improvement in the teaching from a pedagogical perspective was the role of the **teacher as facilitator** rather than instructor. Historically at the school, teaching maths was taught through teacher modelling, shared practice between teacher and pupil, before independent pupil recording. The shift in pedagogical approach associated with Lesson Study was noted by teachers through interview and research posters. During interview, one teacher noted:

> Feel like we, like, we've got it down to a fine art now. 'Cos I can ask questions and then I can drop a question to a higher, like on a sneak, and then just leave them with it; and then come back a bit later. Or I can ask a question of the lower ability table in maths,

> knowing that I've dropped a big hint in there that will leave them thinking for a while, or just lead them back maybe to something that we've done before. (Teacher 2)

Another teacher said that their pedagogical approach had changed through a **new understanding of how learners learn**. They stated that often it is "just that little question" that impacts upon learning. Another teacher said that now they get around the room to listen to conversations between children and they drop in a question to facilitate the learning. This facilitative approach to teaching maths was also noted on research poster conclusions and professional learning. One poster stated that teachers learned that they could use questioning to support the learning of all children. Another said that allowing the children to work in small groups at the tables with minimal teacher input was a new strategy.

The final theme that derived from interviews with teachers and the professional research posters related to improving the teaching was a **change in the children**. The changes in the children were noted differences to their own attitudes or behaviours in lessons as a result of the changes being implemented through research lessons during Lesson Study. During the interview, teachers noted that through the use of specific learner strategies that learners that had previously been disengaged had become successful throughout the lessons. One teacher said that they began to understand the complex social dynamic that was at play in one of their pupils, stating that when one of their advanced learners had completed a task, they would put their head down on their desk. They said that this could be seen as rude, but that the teacher began to see this as disengagement rather than poor behaviour:

> She's not like a kid who'd be like, 'I'm done! I'm done!' She'd be, she'd just like sit back, head on the desk. And it can be seen as – it is rude. But you kind of realise now it is her disengagement; it's not her behaviour. So by introducing that kind of enriched anchor task already prepared for her, yeah, as her confidence grew... No, that's what we found, is you give her a confidence boost early in the lesson, and it would mean that she works better for the rest of it. So like the early confidence boost, like the early... that she succeeded early in the lesson kind of improved the whole lesson. (Teacher 2)

When the teachers enacted a new type of opening anchor task for this pupil they realised that was what she needed to sustain engagement throughout the entire lesson. This teacher was also able to see the same disengagement in other children in the class and transferred that professional learning to others. Another teacher noted the change in their children's self-regulation and initiative. They saw the children in their class become excited to show a variety of ways of knowing and that it became standard practice for children to do this by asking for further resources. In the second round of Lesson Study, one of the teachers noted through an interview that one of their struggling learners showed improved learning through the enactment of speaking frames. They felt that the child improved as a result of being given the opportunity to share their thinking in an organised way, stating that they now felt that the pupil always had the thinking or answers in their head, but struggled with a way to share it orally. Visitors to the school to see mathematics in action told one teacher that they were impressed with how the children talk to each other, communicate well and never leave any

learner behind. On the research posters, professional learning and conclusions listed a change in the children as well. One poster noted that through the Lesson Study, that their advanced learners were introduced to new methods of calculation and became more open to different strategies to use as a result.

4.5. RQ4: What changes to practice will teachers sustain after engaging in a wave of Lesson Study?

The information gathered about the conclusions teachers have drawn about what changes teachers will adopt in the longer term has come from two main sources, both individual teacher interviews and the research posters created post Lesson Study cycles 1 and 2, labelled “spring” and “summer”. This question is aimed at differentiating between changes they make during the study, which was explored in RQ3, compared to longer-term sustained changes to practice associated with Lesson Study which we are now examining. Five key themes have been identified and listed in Table 16. These key themes are: Change to professional practice; pedagogy and assessment; change in focus from teachers and teaching to learners and learning; an improved culture of collaboration; an improved culture of communication; and increased instructional risk-taking. These themes are expanded upon below:

Table 25
Summary of the Qualitative Data of Themes relating to the Association of Lesson Study with Sustained Changes to Practice for Teachers

Themes & Number of References	Description
Practice, pedagogy and assessment (29)	This theme refers to the changes teachers made in association with Lesson Study regarding their classroom work as teachers, including their practice, pedagogy in mathematics and their use of assessment.
Teacher & Teaching to Learner & Learning (26)	This theme refers to the shift associated with Lesson Study in the school's improvement approach away from the teacher and teaching to the learners and their learning, both individually and as a group.
Culture of Collaboration (14)	This theme refers to the improvement of a collaborative professional culture at the school associated with Lesson Study.
Culture of Communication (8)	This theme refers to the association of Lesson Study with an improvement in professional communication within Lesson Study teams and between teachers about professional practice, pedagogy and pupil learning.
Instructional Risk-Taking (6)	This theme refers to teachers associating Lesson Study with a new culture of instructional risk-taking as a means to teacher and school improvement.

4.5.1a. Sustained changes to practice theme: Change to Practice, Pedagogy and Assessment

The first theme derived from interviews with teachers regarding sustained changes to practice associated with Lesson Study was a **change to their practice, pedagogy and assessment methods.** This is sampled in Table 16. The waves of Lesson Study examined the impact of both new pedagogical models in mathematics and the removal of ability grouping of pupils. Therefore, Lesson Study on its own did not initiate the changes; however, teachers felt that Lesson Study acted as a metric that allowed the initiated changes to be refined,

sustained and reflected upon, ultimately leading to longer-term changes to practice. This was characterised by one teacher, who said that Lesson Study changed the way they teach maths; that it provided them with an opportunity to remove themselves as the teacher and just focus on the learners. Another teacher said that Lesson Study allowed them to make changes to their practice that went beyond the subject that was being researched. In their case, they made changes to the way they taught English as a result of the research lessons in mathematics:

> We took what we learned from the Lesson Study in maths and applied that in English with the kind of exploratory approach…having a Lesson Study and looking at the kids in depth definitely helped us across the board with other subjects, for sure. (Teacher 10)

This teacher also commented on the value Lesson Study has had on the work they are doing with both individuals and groups of children due to the fact that they had been given the opportunity to observe learning. Another teacher talked about how Lesson Study changed their expectations of themselves through designing lessons that were more engaging for all pupils as a result of the two waves of study and what they saw happening in their lessons. One teacher noted that they had made changes to their seating arrangement as a result of the study, now having a deeper understanding of the social dynamics at play in their lessons. They said that they were now looking for pupils who were not understanding rather than taking their word for it through an assessment for learning activity like “thumbs up if you understand”. Finally, one teacher noted a change across the whole school that they had seen:

> I think all the teachers are getting much better at crafting questions to allow children to be central to their own learning, and to come up with their own understanding of what's going on, not just being told. And I think across the board, across the school you're seeing that. It's quite a strong point. (Teacher 5)

4.5.1b. Sustained changes to practice theme: Teachers and Teaching to Learners and Learning

The second theme derived from the interview related to a sustained change to practice was a shift in school improvement away from **teachers and teaching to learners and learning**. While this could be explored from a management and leadership perspective, this theme relates to the shift that teachers felt within and between themselves as practitioners, as arising from the introduction of Lesson Study. One teacher noted that the way they present instructions to the children has changed as a result of being able to remove themselves from the scenario and really just focus on the learners and what they need. Another teacher noted that although they felt that discussing learners was always something that they had done, Lesson Study changed the focus from simply discussing children in relation to the teaching to discussing children with a focus on moving them forward:

> I think I feel like that's something that we have always done. But I think it's more targeted on learning now than it was before. And it's more positive. And I think Lesson Study and that experience of sitting - and the purpose of it all is to move things forward – gets us into that habit of helping, and not just sitting talking about our

> children because we're talking about them, but actually talking about our children to move forward in one way. (Teacher 3)

One teacher said that their focus on learners had become so important that they would begin to watch the children when the children themselves did not realise or did not believe they were being watched. They said that this was powerful for them because they were able to notice "the little things" that are not easy to see when you are teaching. They believed that making small changes to fit with what they had seen in those observations improved their practice as a result of knowing the children better. Another teacher noted that the Lesson Study really focussed on the children's learning and shifted their thinking from what we thought the children needed to what they actually needed based on observation.

4.5.1c. Sustained changes to practice theme: Culture of Collaboration

The third theme that derived from the interview related to a sustained change to practice was about a **new culture of collaboration between teachers**. One teacher described Lesson Study as impactful due to the nature of support that was provided to teachers, by teachers. They said that it was "very special" to know that people are helping you. "And that is what we did: we helped each other." Another teacher said how revitalised they felt after completing waves of Lesson Study. They said that they were able, after working with colleagues in the study, to come back to their own classrooms and implement changes straightaway. They felt that the collaboration was meaningful as they saw the strategies they enacted "pay off" straightaway. They saw that collaboration between adults led to adult learning and pupil learning. Based on the organisational structures in the school, not all teachers that taught the same year

group had planning or preparation time together. One teacher noted that Lesson Study allowed them to get to know each other and the children they teach.

> I think it really helped quite a bit to get to know them, and for them to get to know me, because we had blocks of time to sit down together and talk professionally about the kids, and about what they're learning. And I didn't really think about it at the time, but now you mention it, yeah, because I mean, otherwise I wouldn't have. (Teacher 10)

They felt that Lesson Study gave them the opportunity to sit down and talk with the other teachers in the team. Another teacher stated that the value of the discussions between teachers continued after the Lesson Study. They said that they are now always going into each other's classrooms and asking how a particular lesson went, whether or not all of the children have understood the concepts, and then share strategies between themselves for ideas and approaches that work outside of the formal Lesson Study times. A final comment related to sustained changes to practice and a culture of collaboration that were taken from an interview with a teacher was that the relationship of the culture of collaboration they wanted for their children in lessons was the same culture that had been created for our teachers. They said:

> It's probably the most beneficial thing that a teacher can do with their time, Lesson Study, because it's, once again, it's non-judgemental, it's collaborative, I mean, it's everything that we want our learning to be for our students, and that's the same sort of learning environment for the teachers. (Teacher 5)

4.5.1d. Sustained Changes to Practice Theme: Culture of Communication

The fourth theme derived from the interview related to a sustained change to practice was about a **new culture of communication**. While this is linked to collaboration, it is differentiated by the sustained change to how communication between adults changed. One teacher noted that communication had improved as a result of Lesson Study. They said that being involved together in the process of Lesson Study shifted the weight of conversations from opinion to research that was action- and practice-based.

> It's definitely improved it now. And I think maybe because we've all been involved together with the process of Lesson Study, it kind of feels like that it's research based rather than an opinion, if that makes sense. So it's kind of, that gives it more weight really.' (Teacher 2)

Another teacher said that they were still talking about effective methods in teaching mathematics, which changed the typical dynamic of the team. One teacher noted the shift in conversations from informal and less informed to more formal and organised conversations that were informed in the way they helped each other. This is similar to the idea that the conversations shifted from opinion to research. Finally, a teacher noted that Lesson Study shifted the conversations towards learners and learning which also allowed them to be more positive.

4.5.1e. Sustained changes to practice theme: Instructional Risk-Taking

The fifth and final theme from the interview related to a sustained change to practice was about **instructional risk-taking**. This theme is related to the idea that after Lesson Study, teachers felt they were able to innovate and take instructional risks which had not always been the case at the school. One teacher stated it quite clearly:

> And it's kind of given you the confidence now to try something and reflect upon it, whereas maybe before you wouldn't really want to try something in case it failed. But then, it's not the end of the world, is it? As long as you've kind of had that reflecting upon it. (Teacher 3)

Another teacher talked about their decision to allow children to use notebooks and whiteboards throughout the whole lesson (which were previously not standard practice) and were excited about how successful they were. Another teacher talked about the impact that Lesson Study had on their seating plans and approach, which had typically been solely organised based on perceived pupil ability groupings.

4.6. RQ5: What changes in pupil maths scores will follow a programme of Lesson Study?

In order to explore whether Lesson Study was associated with pupil progress and attainment, standardised tests in mathematics were used prior to the enactment of Lesson Study with the case pupils and after the wave of Lesson Study was completed. The test that was used in the study was the Progress in Understanding Mathematics Assessment (PUMA). This was the system already in place at the school involved in the study.

The pupils are divided between two pupil groups: those who were previously high attaining and those that were previously low attaining, based on their end of year standardised score in mathematics from the previous year. Prior high-attaining pupils had standardised scores in the summer term of the previous year above 115. Prior low-attaining pupils had standardised scores below 85 in the summer term of the previous year. In this study, there were two waves of Lesson Study, one completed in the spring of 2016 and the other in the summer of 2016. For pupils in Wave 1, the pre-Lesson Study standardised test was completed in the autumn term and their post-Lesson Study standardised test was administered at the end of the spring. For pupils in Wave 2, the pre-Lesson Study standardised test was completed in the spring term and the post-Lesson Study standardised assessment was administered at the end of the summer term. This means that some pupils may have higher pre-LS scores than categorised above, as their summer score used to categorise them would have met the criteria, but their pre-LS test may have exceeded or not met the range (Ex: Wave 1, Pupil 2 had a summer score of below 100, but a pre-LS score of 100, categorising them as a low-attaining pupil).

These attainment score changes will be analysed by i) Wave 1 versus Wave 2 and ii) low versus high prior attainers.

4.6.1. Wave 1 versus Wave 2

Table 26
Pupil Test Score Changes for Wave 1 versus Wave 2 of LS

	Wave 1				Wave 2		
Pupil	**Pre-LS**	**Post-LS**	**change**	**Pupil**	**Pre-LS**	**Post-LS**	**change**
1	127	117	-10	9	88	99	+11
2	100	98	-2	10	93	116	+13
3	93	98	+5	11	108	119	+11
4	109	112	+3	12	77	97	+20
5	82	83	+1	13	110	120	+10
6	114	112	-2	14	82	101	+19
7	116	122	+6	15	75	77	+2
8	124	127	+3	16	87	87	0
Mean	108.1	108.6	+0.5	Mean	90	102	+12.0
SD	15.5	14.6	5.2	SD	13.1	15.6	7.1

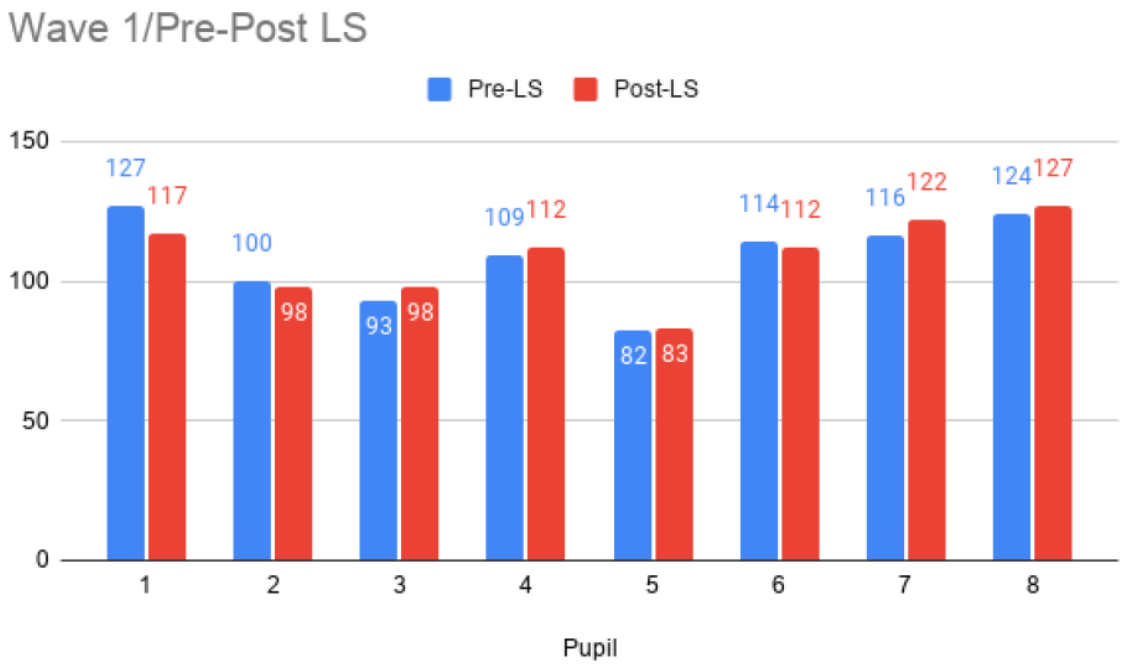


***Figure 6**: Wave 1 Pre/Post-LS Pupil Test Results*

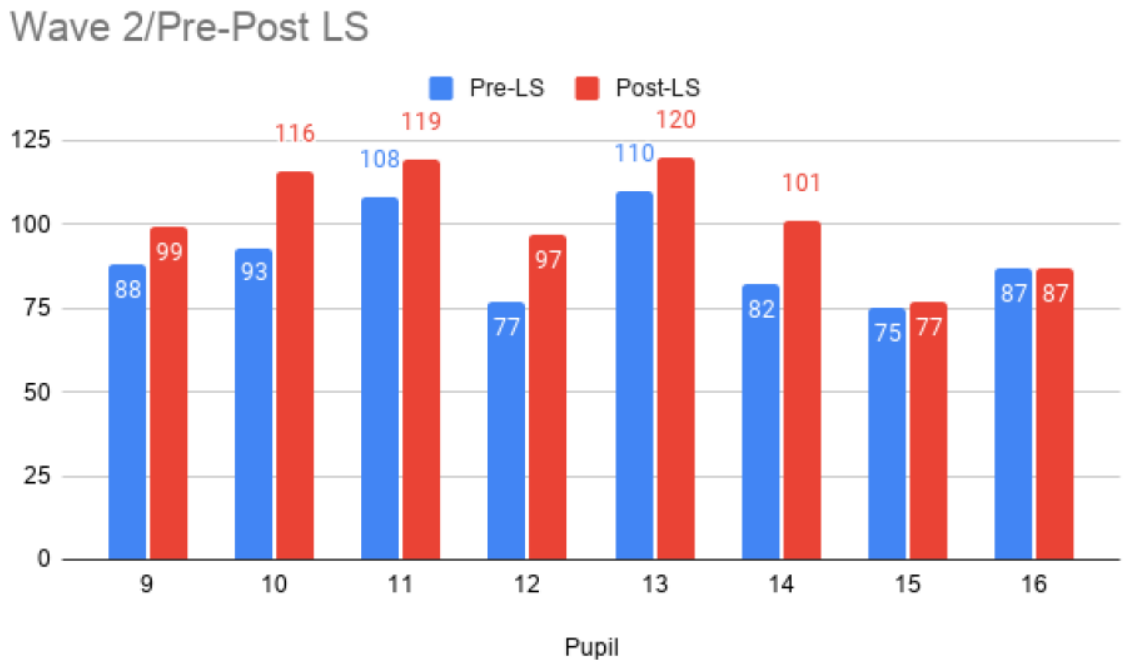


***Figure 7**:* Wave 2 Pre/Post-LS Pupil Test Results

In Wave 1, 5 of the 8 pupils showed a positive point score change and 3 showed a decrease in score from their pre Lesson Study test scores. In the first wave of study, pupil 1 scored the highest possible score on the pre-LS test with a decrease of 10 points on the post-LS test. The pre-LS scores in Wave 1 were 18 points higher, with one group choosing to study two high prior attainers in Wave 1 and two low prior attainers in Wave 2. All other groups had one high prior attainer and one low prior attainer in each study.

In the second wave, 7 of 8 pupils showed a positive point score change from their pre Lesson Study scores, with 1 pupil showing no change. In Wave 2, the pupil with no change in score scored the lowest possible score in both tests. The pre-LS scores in the second wave were much lower, with the mean score post-LS lower than the pre-LS mean score in Wave 1.

There was hardly any mean change in Wave 1 maths scores: 108.1 to 108.6 (see Table 26), so no statistical testing was done. However, the mean Wave 2 gain from before to after LS was 12.0. which was a statistically significant gain (using a paired group t-test: (t= 3.97, df=7, P<0.005).

It is important to note at this point that as the school had no previous experience with LS, Wave 1 of the study was a combination of focus on the processes of LS itself and on making improvements to the teaching using Singapore maths, with more emphasis initially on simply "how to do" LS. This could explain the difference between waves.

4.6.2. High versus low prior attainers

Table 27
Pupil Test Score Changes for Prior Low versus High Attainers

	High Prior Attainers			Low Prior Attainers		
	Pre-LS	Post-LS	Change	Pre-LS	Post-LS	Change
1	127	117	-10	100	98	-2
2	100	98	-2	93	116	16
3	114	112	-2	82	83	1
4	116	122	6	88	99	11
5	124	127	3	77	97	20
6	109	112	3	82	101	19
7	108	119	11	75	77	2
8	110	120	10	87	87	0
Mean	113.5	115.9	2.4	85.5	94.8	8.4
SD	8.8	8.7	6.9	-6.8	12.2	9.4

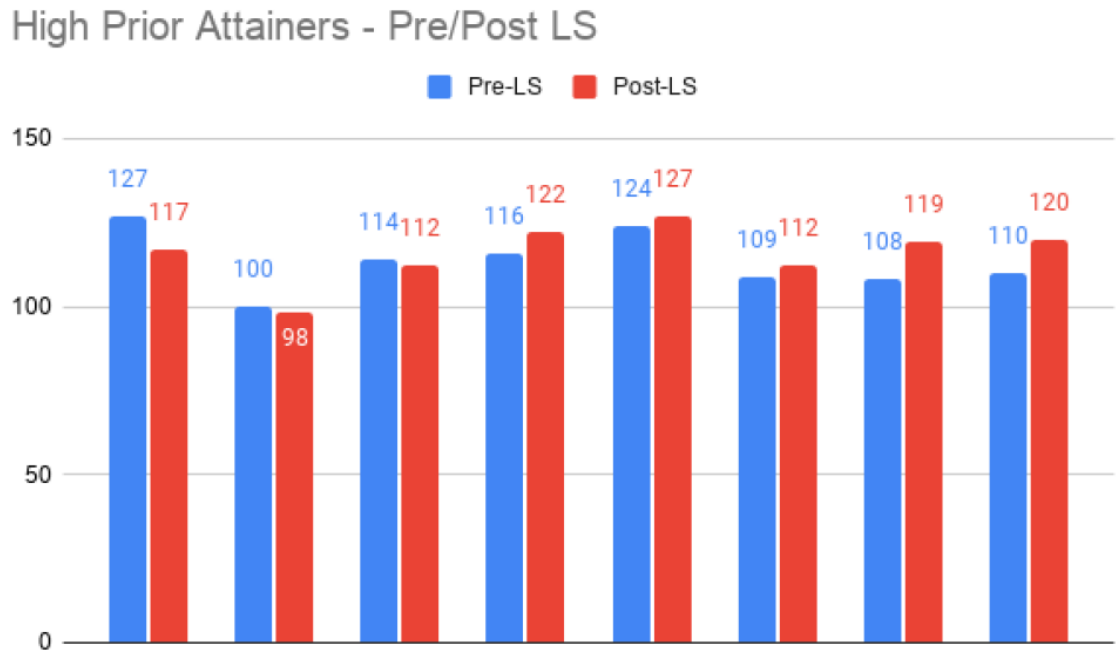


***Figure 8**: High Prior Attainers Pre- and Post-LS Test Scores*

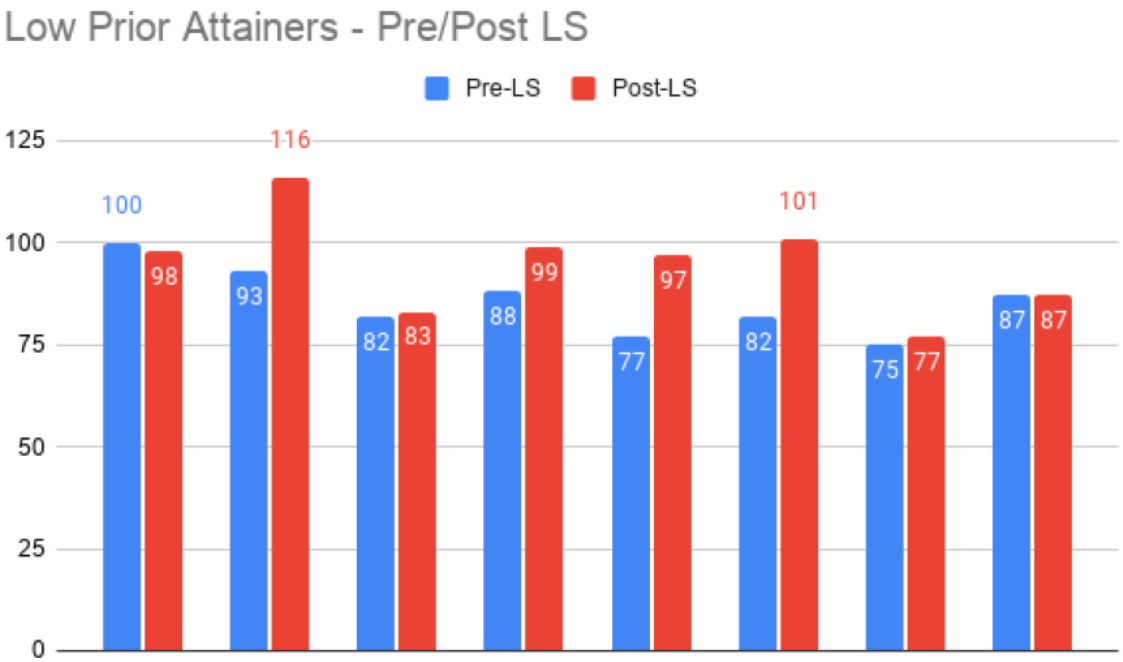


***Figure 9*: Low Prior Attainers Pre and Post Test Scores**

In the high prior attainers group, 5 pupils showed positive gains on the pre- to post-LS tests. However, 3 showed decreases in their test scores. In the low prior

attainment group, only 1 pupil showed a decrease in the standardised test score from pre- to post-LS tests, and 1 showed no gain or loss. However, 6 pupils showed positive gains, with 3 pupils showing a test score improvement of more than 15 points.

When comparing high prior attainers' standardised test scores pre- and post-LS, the mean score change was 2.4 which was not statistically significant, using a paired t-test ($t=0.97$, $df=7$, $p>0.05$). By contrast, the mean gain for low prior scorers was 8.4, which was statistically significant using a paired t-test ($t=2.33$, $df=7$, $p<0.05$). This shows that the size of the difference for low prior scorers compared to the overall variation in the sample data was significant, as low prior scorers showed greater gains. The score for high prior attainers is less than 1, showing little difference to the overall variation in the sample. LS, therefore, had a greater impact upon low prior attainers in this project than high prior attainers.

Chapter 5: Discussion

In the literature review, the overall theoretical framework of professional capital was presented, through which LS could be viewed as a model of SC (see Table 28).

Table 28
Professional Capital Theory including LS

Professional Capital Theory PC = f(HC, SC, DC)	Human Capital	Social Capital	Decisional Capital
The development of Professional Capital is the function of three distinct types of capital in a school or school system: human capital, social capital and decisional capital.	› attracting excellent teachers › develop capacity of groups, teams, communities of teachers › development over time › make teaching desirable	› teachers working in teams with a specific focus on learners and learning › organized and intentional › shared responsibility for learners and learning Lesson Study	› informed agency to make instructional decisions impacting upon learners and learning › competence, insight, judgement › collective decision making

Source: A.Hargreaves and Fullan, 2012

This section will discuss the results from the initial study, using professional capital theory as a framework to categorise the results, ultimately claiming that LS catalysed professional capital from three distinct steps to a harmonious and synergistic sum, greater than its individual parts.

5.1. Introduction

For the last decade, education reforms have been a top priority of the Conservative government (DfE, 2010a, 2016). In their 2010 White Paper on

education, the government opened by stating that no education system can be better than the quality of its teachers. However, nearly a decade later and after successive Conservative governments and a number of reforms with a heavy emphasis on external accountability, teacher observation, monitoring, scrutiny and pay linked to performance, teachers are exiting the profession at record rates (DfE, 2013, 2018; Education, 2013). It is in this particular domain where this study took shape: while LS has been shown to be a great tool for teacher development, it might also be supportive of teachers staying in teaching. While it is certain that teachers are at the heart of all successful schools and systems, the climate of leadership and management practices in relationship to those teachers is possibly even more important (Leithwood et al., 2006; Leithwood et al., 2019; Silins et al., 2002).

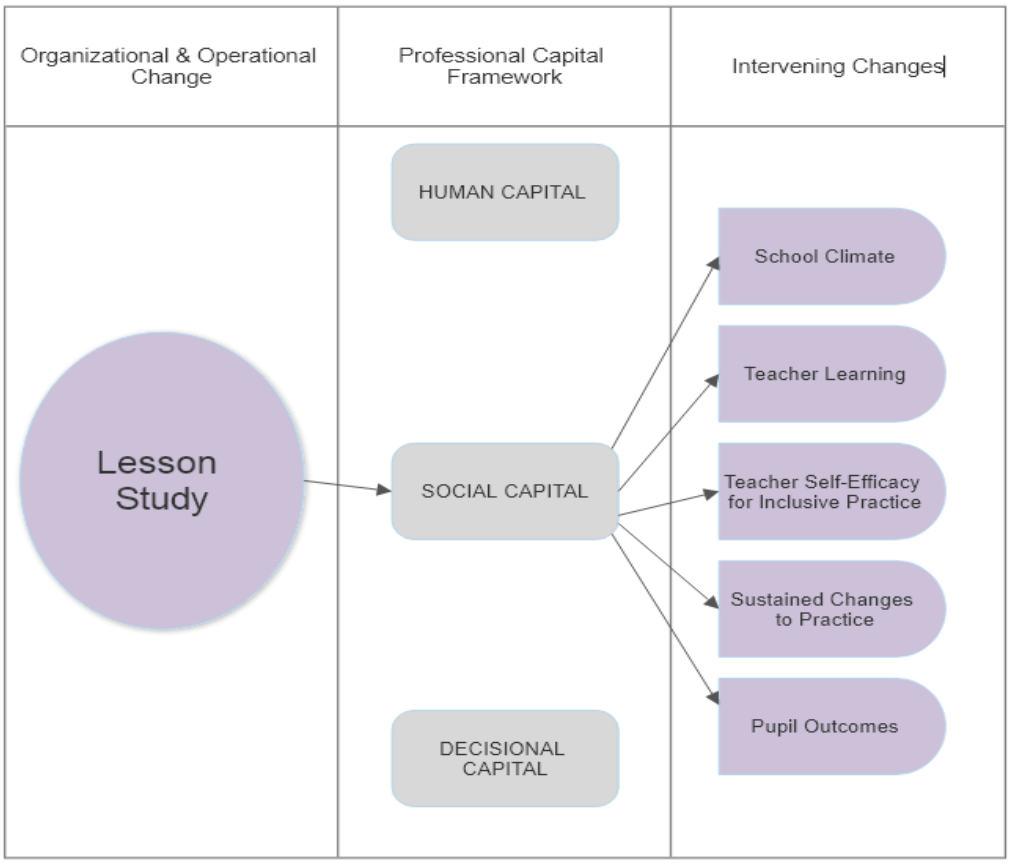
In their paper, Leithwood et al. (2006) make seven claims about successful school leadership. Their first claim is that school leadership is second only to classroom teaching as an influence on pupil achievement. However, as indicated in the literature review, Leithwood et al. (2019) revisit these claims almost a decade later to challenge their own findings from the first paper. In the follow-up paper, they redefine their first claim as follows:

> "School leadership has a significant effect on features of the school organisation which positively influences the quality of teaching and learning" Leithwood et al. (2019, p. 2).

This is relevant as it speaks to the position that school leaders have a responsibility and influence over teacher retention. Leaders create the kind of climate and culture that can positively or negatively influence whether or not

teachers remain in teaching. In the NAHT report on school improvement (2020). Sir Tim Brighthouse says, “If the teacher makes the weather, the school creates the climate,” (NAHT, 2020, p.22). The heart of this study was determining whether PC Theory, examining LS as a form of SC, was associated with the creation of a more positive school climate – a key feature of any school - before it looked at the impact on teacher self-efficacy and the potential shorter- and longer-term changes to teacher practice and pupil outcomes. This is shown in Table 29 (and throughout the paper).

Table 29
LS as SC aligned with RQs



Once LS had been established as a positive influence on school climate, the next aim was to explore if participation in LS would also improve a teacher’s sense of

self-efficacy to implement inclusive practices. Previous research has shown that LS does influence teacher learning and this study now connects LS to a positive school climate; however, if teachers do not believe that they can impact upon pupil achievement with that new learning, the value of the learning through LS could be mitigated. This is at the heart of the study of self-efficacy. This study shows both quantitatively and qualitatively that LS does have a positive association with teacher self-efficacy, supporting recent quantitative work (Schipper et al., 2018, 2020) and adding to the field new literature; it is the voice of classroom teachers, from a qualitative standpoint.

Lesson Study was enacted at an inner London primary school to achieve the following aims: 1. To improve school culture/climate through the introduction of Lesson Study as professional learning and development; 2. To improve teacher self-efficacy in teaching mixed-ability classes in mathematics and 3. To interrogate current teaching strategies being used with struggling and advanced learners in primary mathematics with regard to pupil progress in a lesson. In order to examine whether LS met these aims, the study posed five research questions, explored below.

What emerged over the course of the research project was the view that LS, as a form of SC, improved the other factors of PC, including the human and decisional elements, ultimately leading to an improved school (as shown in Figure 10).

This chapter will present a summary of the research study findings as guided by the research questions and theoretical framework (Figure 10), with links to the current literature while examining the new knowledge and contributions that this research study makes to the field of LS. The research study will be evaluated for its strengths and weaknesses before discussing the significance and implications of this study for policy and practice in English education.

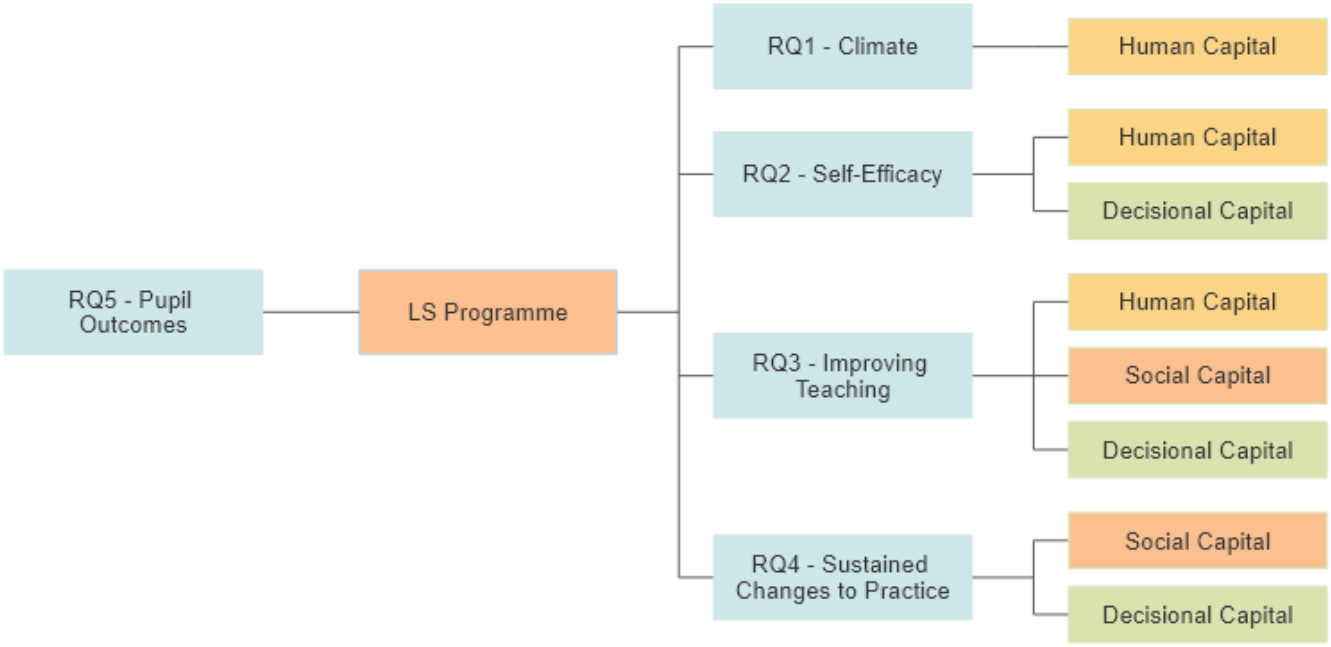


***Figure 10**: Qualitative findings linked to theoretical framework*

5.2. Summary of Findings and Connections to the Literature

This section will discuss the results of the study organised in terms of the research questions, theoretical framework and the connections to the prior research literature.

5.2.1. RQ1: Will initiating a programme of Lesson Study be associated with a positive impact on the climate of a primary school?

Following on from the work of Kallestad (2010), the term “positive school climate” is defined as one where teachers: a) feel empowered to collaborate with leaders and each other; b) feel that leaders are concerned about their wellbeing; c) feel communication is open and they have a positive orientation to change; d) are keen to try out new ways of teaching; and e) have a great deal of influence over their classroom work.

5.2.1a. Quantitative data

The overall mean increase from pre- to post-LS and the individual subscale mean score increases over the same period show that participating in LS was associated overall with teachers reporting a more positive school climate.

The Kallestad Climate Scale (2010) looks at school climate through four key subscales: collaboration between teachers, an openness of communication, an individual teacher’s orientation to change and a teacher’s influence over their classroom work.

Teachers’ pre-LS overall mean score was high, 4.91 on a 6-point scale, well above the midpoint. This indicated that teachers’ perceptions of school climate were already high prior to the enactment of LS at the school. When reviewing the quantitative data, there was an overall mean score change between the pre- and post-LS questionnaires of about a third of a scale point (from 4.91 to 5.27, an increase of 0.36). While this does support LS’s positive association with a positive school climate (Schipper et al., 2020), it also shows that LS has an association with a positive school climate where the school climate was already very good. This quantitative analysis is part of a limited body of research

(Schipper et al., 2018, 2020), adding to the field of literature on school climate and LS. However, it is also important to note as this research does not conclude that LS, on its own or in a school with low climate scores, would have the same association with school climate. This was explored further through teacher interviews.

When examining each subscale, every teacher reported an increase in their mean score for **openness in communication**. This subscale showed the largest mean increase of the four subscales of about two-thirds of a scale point (from 4.67 to 5.37, an overall gain of 0.70). As LS is a highly dialogic and communicative approach to teacher collaboration and teacher learning (Dudley, 2015a; Lewis et al., 2019), it is not surprising that teachers felt this aspect of school climate was improved. When exploring the associations of LS through teacher interviews, teachers made mention of previous, informal talk about lessons, planning and pupils. However, they noted that LS improved the quality of the interactions they had about pupils and pupil learning, with discussions shifting from informal to formal. During teacher interviews, teachers did discuss widely the intervening changes they had made to their teaching as a result of LS and how LS supported the implementation of the new pedagogical approach to mathematics, using a Singaporean mathematics series. Intervening changes to teachers practice and pedagogy is a well-documented benefit of LS (Dudley, 2013, 2015a; Dudley et al., 2019; Lewis et al., 2009, 2011, 2012; Ylonen & Norwich, 2015).

Of the 8 teachers, 5 showed mean score increases in their overall individual mean climate scale scores, 1 teacher had an unchanged score and 2 showed small decreases in score. When examining the 2 teachers that showed overall mean

score decreases, it should be noted that Teacher 6 was a Newly Qualified Teacher (NQT) and Teacher 7 left the school at the end of the academic year related to capability issues. However, the questionnaire was only one indicator of the impact of LS on school climate.

5.2.1b. Qualitative data

Table 30
RQ1 links to PC Theory

Research Questions	Professional Capital Element	Intervening Changes
RQ1: Will initiating a programme of Lesson Study be associated with a positive impact on the **climate** of a primary school?	**Human Capital**	★ Professional Agency & Excitement ★ Collaborative Working & Collective Responsibility ★ Professional Relationships ★ Supportive & Caring Development

When comparing the responses that teachers gave during the interview, both individually and in teams, what was seen was an expansion of the working definition of positive school climate and confirmation of the mean score change associated with LS in the questionnaires.

The qualitative data showed that LS had a strong reported influence on the climate of the school. The data collected was clearly and strongly positive about the influence that LS had on the teachers and school, organised into four broad themes: a) professional agency and excitement; b) collaborative working and collective responsibility; c) professional relationships; and, d) supportive and caring development.

During the interview, teachers made the most reference to professional agency and excitement as a result of LS. This was significant as it is the most referenced theme in this study from the qualitative analysis related to school climate, but is

not yet a factor considered about school climate on the quantitative scales. This could expand the working definition of positive school climate and adds to the body of literature about the impact of LS. While this was an unexpected association with LS and school climate, there is a growing body of research linking teacher self-directed development and teacher agency in their development to teacher satisfaction and teacher learning, indirectly linked to overall school climate (Campbell et al., 2018; Lieberman et al., 2015, 2016).

Teachers described the school climate as having improved directly as a result of being given the responsibility to develop themselves and their colleagues through a low-stakes approach that was professionally challenging. This suggests that teacher agency in professional development is a positive climate indicator, which was not covered by the scale used in the quantitative analysis. In addition to this, teachers further described the link between agency and excitement through the lens of shaping the instructional programme, which seemed to differ slightly from the quantitative results, where teachers smallest gain in overall mean score was on the influence over classroom work subscale. This suggests that teachers did feel a stronger sense of agency over their classroom work through shaping the instructional programme, as indicated through interviews, than was measured on the Kallestad scale.

Finally, teachers discussed professional excitement when describing how the agency in LS provided them with the confidence to try out new and different ways of teaching. Again, this seems to suggest that the quantitative subscales were unable to account for this. What was not possible to capture through questionnaire measure was the transition teachers felt from influence to agency. These findings further very recent work examining the link between LS and school

climate (Fox & Poultney, 2020; Khokhotva & Albizuri, 2020; Schipper et al., 2020) and make a new contribution to the LS field from a qualitative standpoint .

Teachers were also very positive about how LS contributed to an improved climate of collaborative working and collective responsibility. This is supported in the literature (Lewis et al., 2009, 2019; Puchner & Taylor, 2006). The teachers said that LS provided a clear framework for collaborative work to develop instructional practice, which is consistent with the scale changes showing an increase in feeling empowered to collaborate. However, with regards to the climate scale, teachers felt that LS created the view that every teacher is collectively responsible for every learner. This is also supported in the literature (Dudley, 2015a; Lewis et al., 2009; Ylonen & Norwich, 2015) This was in contrast to a previous kind of school climate where each teacher was individually responsible for the attainment and progress of their class and held accountable for pupil data on standardised tests. While collaboration and communication are measured on the climate scale and there has been recent research about climate implications due to a change in educational beliefs of teachers, the development of a climate of collective responsibility is not measured and supports a new element to both LS and school climate indicators (Alwadi, Mohamed, & Wilson, 2020; Cravens & Drake, 2017; Fox & Poultney, 2020; Khokhotva & Albizuri, 2020). This is an area which requires further exploration.

Teachers were positive about the impact that LS had on the professional relationships within the school. LS supported teachers to have more informed and formal discussions about pupil learning and gave them the confidence and framework to disagree with other adults about instructional decisions in a safe space, regardless of their role or years of experience. These “norms” were also

found in the literature (Alwadi et al., 2020; Canonigo, 2016; Lewis et al., 2009). Teachers also felt that LS contributed to their level of comfort to say that they were uncertain about how to go about solving a challenge related to learning. This is notable as it shows a development in the teachers' openness to communication, and also aligns with the climate survey. This improvement and intervening change to a teacher's sense of professional community has been documented in previous studies (Dudley, 2015a; Lewis et al., 2009, 2012, 2019). It also shows that although teachers reported high levels of openness in communication prior to LS, this fear of being uncertain was accepted as normal.

Finally, teachers commented on LS's approach to teacher development. This was characterised as a supportive and caring development, with teachers saying that LS was a good way to support the development of themselves and each other in a non-judgmental manner, rooted in mutual investment. This is an addition to the literature in LS, supported by recent research about the use of non-coercive measures to engage teachers in LS (Canonigo, 2016). Teachers believed that LS changed the focus of classroom visits from one that was narrowly focused on the teacher and teaching to one where everyone was now focused on the learner and learning. This finding is also a new commentary in the literature. Teachers noted LS was a catalyst for a shift from "performance management" to "professional growth and development" as the school's system for school and teacher improvement. Teachers felt that LS helped shape the view that all teachers were improving teachers and all learners were improving learners rather than being a judgment of inadequate, requiring improvement, good or outstanding. These findings are quite unique to England's educational

landscape, but present new learning in relation to the intervening changes of enacting a programme of LS.

5.2.2. RQ2: Will initiating a programme of Lesson Study be associated with a positive impact on teacher self-efficacy in implementing inclusive practice?

Using the work of Guskey and Passaro (1994), this study defined teacher self-efficacy (TSE) as a teacher's belief or conviction that they can influence how well pupils learn, including those that may be challenging or unmotivated.

5.2.2a. Quantitative data

The Teacher Efficacy for Inclusive Practice scale (TEIP) (Sharma et al., 2012) was used to examine whether Lesson Study was associated with changes in teachers' perceptions of their own self-efficacy in implementing inclusive practices. This scale looks at self-efficacy through four key subscales: efficacy in managing behaviour, efficacy in collaborating, efficacy to use inclusive instruction, and efficacy to teach mixed-attainment mathematics.

The overall mean increase from pre to post-LS and the individual subscale mean score increases for every subscale over the same period show that LS was associated with the increases in teacher-self efficacy in implementing inclusive practices.

Teachers' pre-LS overall mean score was high, 4.79 on the 6-point scale, well above the midpoint. This indicates that teachers' perceptions of self-efficacy for implementing inclusive practices were already high prior to the enactment of LS at the school. While this does show LS had a positive association with improving

teacher self-efficacy, it also shows that LS has an association with improving teacher self-efficacy where the school climate and teacher self-efficacy were already perceived to be very good. This is also important to note as this research does not indicate that LS, on its own or in a school with low self-efficacy scores, has the same association with teacher self-efficacy. This was explored further through teacher interviews. When reviewing the quantitative data, there was an overall mean score change between the pre- and post-LS questionnaires of about half a scale point (from 4.79 to 5.24, an increase of 0.45). This reflected 6 of the 8 teachers with mean score increases to their overall individual mean scores, while one teacher had an unchanged score and another showed a small decrease in score. There have been very limited studies exploring the associations of LS with teacher self-efficacy (Schipper et al., 2018, 2020; Sibbald, 2009), and none on exploring teacher self-efficacy in implementing inclusive practices.

When examining each subscale, the subscale that showed the largest mean increase was **efficacy in collaborating** with an increase of just over half a scale point (from 4.42 to 5.00, an overall gain of 0.58). This aligns with teacher interviews, where teachers discussed their improved view of collaboration as a measure of self-efficacy. Formal collaboration to improve pupil outcomes was new to the school at the time of the study, whereas managing behaviour and using inclusive instruction were expectations at the school prior to the LS programme. **Efficacy in teaching mixed-attainment maths** also had a large gain between pre- and post-LS questionnaires, of nearly half a scale point (from 5.02 to 5.44). The relationship between LS and teaching mixed-attainment maths classes as a new feature of the school's approach to learning and teaching has

not been researched and therefore, this is a contribution to the literature. The smallest increase to the mean score of a subscale between the pre and post questionnaires was for **efficacy in managing behaviour**. This is consistent with the school being known for its happy environment and strong relationships (Lightfoot, 2016; McGalliard, 2018; Watson, 2018). However, the questionnaire was only one indicator of the impact of LS on teacher self-efficacy.

5.2.2b. Qualitative data

Table 31
RQ2 links to PC Theory

Research Questions	Professional Capital Element	Intervening Change
RQ2: Will initiating a programme of Lesson Study be associated with a positive impact on teacher **self-efficacy** in implementing inclusive practice?	**Human Capital**	★ Encouraged Risk-Taking
	Decisional Capital	★ Self-Directed Development ★ New Inclusive Perspective on Pupils ★ Improved Communication Between Stakeholders

When comparing the responses teachers gave during the interviews, both individually and in team groups, what was seen was an expansion of the working definition of teacher self-efficacy and confirmation of the mean score change associated with LS in the questionnaires.

The qualitative data collected showed that LS had a strong influence on the development of teacher self-efficacy in implementing inclusive practices. The data collected was overwhelmingly positive about the influence that LS had on the teachers and school, organised into four broad themes: a) self-directed development; b) new inclusive perspective on pupils; c) encouraged risk-taking;

and d) improved communication between stakeholders. Self-efficacy in implementing inclusive practices relationship to LS had not been studied before.

During the interview, teachers made the most reference to the view that their self-efficacy was improved as a result of having greater agency over their own development **(self-directed development)** as a result of LS. This is significant as it is not measured by the self-efficacy scale used in this study, and broadens the metric one could use to support, develop or improve a teacher's self-efficacy. Providing teachers in a positive school climate with the opportunity to reflect upon their practice and collaboratively determine solutions in partnership with other teachers was indicated as a factor that contributed to an overall improvement in the teacher's self-efficacy. All of the teachers noted that the opportunity to reflect upon their practice and its impact on learners and learning, with the decisional capital to then enact changes in instruction to improve pupil outcomes, increased their own efficacy to implement inclusive practices.

As self-efficacy appeared to be positive at the study school prior to LS, it was also positive to see how LS changed teachers' perception of what inclusive practice was and the confidence it gave teachers to change their practice. Intervening changes in teachers' concepts was shown in studies related to LS and children with MLD (Ylonen & Norwich, 2012, 2015). Schipper et al. (2020) quantitatively examined the association of LS with professional school culture and teacher self-efficacy (Schipper et al., 2018, 2020). In their 2020 study, Schipper et al. used a quasi-experimental design to analyse how participating in LS influences teachers' perceptions of professional school culture and conditions in their schools, as well as teacher self-efficacy. They found significant between-group differences in terms of efficacy in student engagement and significant within-group differences

in the intervention group in terms of teacher autonomy and support from the school department leader as well as all teacher self-efficacy. There are a small number of other studies that examine the interaction between LS and school climate, but only one of these studies examines school climate/culture as a main focus of the study (Alwadi et al., 2020; Canonigo, 2016; Gero, 2015; Khokhotva & Albizuri, 2020).

Teachers were also positive about how LS contributed to a new inclusive perspective on the pupils themselves. This is also significant as it was not covered by a specific measure of a teacher's self-efficacy in the quantitative questionnaire. This supports findings in the literature on LS as it relates to children with special educational needs (Ylonen & Norwich, 2012, 2015). Teachers in this study perceived the opportunity to examine pupils' attitudes and behaviours to learning, ultimately providing them with a new sense of inclusion, and so positively influenced their self-efficacy. As the school had set children in "ability groups" prior to the academic year of the LS, there had been a belief that some children were smarter than others and that a child's ability to learn was limited; not all children could achieve. LS helped them understand that all of the children were able and it was the role of the teacher to find out how to support them in understanding. This is a notable shift in teacher self-efficacy; moving from the belief that children have fixed capacity to the belief that all children can achieve (Hart, 1998; 2004; Swann, Peacock, Hart, & Drummond, 2012). While there is limited research in this area associated with LS (Ylonen & Norwich, 2012, 2015), there is evidence of teachers changing their beliefs about the ability of SEND pupils after participating in LS.

The next theme of teacher self-efficacy in implementing inclusive practices which emerged through interviews was encouraging instructional risk-taking. This is particularly interesting in the context of English primary schools, where many teachers feel micromanaged and unable to try out new things (NEU, 2019). This study would suggest that the opportunity to take instructional risks improved the self-efficacy of teachers. Teachers felt that LS provided them with an environment to trial approaches and strategies they had not previously felt comfortable trying in a monitoring and scrutiny culture. The feeling that risk-taking was encouraged through LS provided them with greater self-efficacy as they immediately saw new strategies working or not in their classrooms.

Finally, teachers felt that LS was associated with better communication between professionals at all levels within the school. As a result of the improved communications, teachers felt that their ability to impact upon pupil learning, including those with special educational needs, was improved. Teachers also made reference to the confidence they developed through LS in communicating with parents about their child's learning needs and strengths, which in turn supported pupil achievement.

There are only a limited number of recent sources exploring the association of LS and teacher self-efficacy. This study would support the most recent paper (Schipper et al., 2020), associating LS with a positive impact upon school climate and teacher self-efficacy. However, this study differs in a number of ways (some recommended by Schipper et al. as directions for further study): a) this study employs a mixed-methods approach, including qualitative study; b) this study is smaller scale and focused in a primary school, working with teacher participants

from one school; c) the researcher is a participant researcher, not completely detached from the study itself.

5.2.3. What conclusions did the teachers draw about improving their teaching following the Lesson Study cycle?

Table 32
RQ3 links to PC Theory

Research Questions	Professional Capital Element	Intervening Changes to School Climate, Teacher Learning, TSE
RQ3: What conclusions will the teachers draw about **improving the teaching** following the Lesson Study cycle?	**Human Capital**	★ Changes to Teacher Practice
	Social Capital	★ Change to Professional Beliefs
	Decisional Capital	★ Change to Pedagogy ★ Change in Children

The four key themes identified as intervening changes to the teaching were: changes to practice, changes to pedagogy, change to professional beliefs and change in children.

The most frequent theme about teaching change was about inclusivity. Teachers were focussed in the LS on two subgroups: advanced and struggling learners in mathematics. The extended focus on individual pupils provided the teachers with a new opportunity to examine the impact of their teaching on struggling and advanced learners. Typical differentiation within those sub groups often was task based, giving “easier” work to struggling pupils and “harder” work for advanced pupils. Through LS, teachers were able to see their own role in the success of pupil groups, often characterised by better teacher questioning or differentiated resources rather than by simply providing the children with different tasks. This was also interesting when compared with the improvement in pupils’ outcomes

for those who were previously low attaining (struggling learners), whereby after two waves of LS, those pupils made greater gains in standardised test scores, although not statistically significant. The next most frequent theme came from a feeling that they were empowered to make changes rather than directed to make changes. This specific finding has not been identified before. Although there have been studies that link intervening changes in teacher practice as a result of LS (Dudley et al., 2019; Lewis et al., 2009; Ylonen & Norwich, 2012, 2015), teachers identifying a shift from directed change to empowering change is a new finding, possibly linked to the English educational landscape.

Ultimately, teachers felt that this change was powerful because it gave them ownership over improving practice and consequently supported them in making changes they believed in. This is significant as it speaks to measures of the school climate, where teachers referenced agency as improving the school's already positive climate. While LS was shown to be associated with an improved school climate, there is a link here between the same agency expressed as a measure of school climate and a teacher's change to their instructional practice. Here the teachers have said that being empowered to make changes – having the agency to make changes – also supported them in making changes to their practice. While some of the literature suggests that teachers need more stringent performance management, monitoring and scrutiny to make instructional changes and improvements (Davies & Lim, 2008; DfE, 2010b; Freedman & Lipson, 2008; Freedman et al., 2008), teachers in this study associated changes in practice with empowerment and agency rather than direction and supervision. This is supported in the literature and reports published in Ontario, Canada when examining the Teacher Learning and Leadership Program (TLLP) (Campbell et

al., 2018; Lieberman et al., 2015; 2016). One teacher noted that LS changed the mind-set of teachers, stating that the entire team took ownership of the learning. They worked together to solve instructional challenges, using each other's strengths to improve the outcomes for all children. They subsequently learned from each other's strengths to support the development of their own perceived areas of weakness as teachers. This aligns well with current literature on LS (Cheung & Wong, 2014; Dudley et al., 2019).

Teachers also indicated changes in teacher practice that involved specific teaching strategies, such as encouraging talk, limiting resources, and aligning resources on the tables with the ones the children were seeing in their textbooks. Teachers also noted changes to the way they gave pupils feedback about their work, such as encouraging children to use a talking framework (ABC approach) when providing peer-to-peer feedback. These types of operational changes to practice are well researched (Leavy & Hourigan, 2016; Lewis et al., 2019; Lewis et al., 2009; Mihajlovic, 2019; Takahashi & McDougal, 2016).

Teachers discussed how their beliefs about effective practice and the potential of the children they teach were positively changed as a result of engaging in LS. The change to effective practice impacted the teachers in different ways. An NQT discussed how engaging in LS made them acutely aware of how important it was to have a structure in place for their lessons. This near pre-service learning has been supported through study of teachers on teacher education courses, which is not far removed from being a newly qualified teacher (Mihajlovic, 2019). More experienced teachers began to reflect on differentiation through the lens of support and challenge during lessons. Many of the teachers reflected on the indicators they had historically used to determine whether a pupil understood the

content of the lesson, remarking that they thought a pupil had been learning when they had not. Intervening changes in teacher knowledge and beliefs is a well-documented element of LS (Cheung & Wong, 2014; Dudley et al., 2019; Lewis et al., 2009, 2011, 2012). This reflective change in teacher beliefs about what constitutes learning is significant and aligns with the change in outcomes for prior low-attaining pupils. There is an evidence base to suggest that teachers have lower expectations, ask simple questions, and have implicit bias when working with ability labelled groups (Hart, 1998; Hart et al., 2004; Swann et al., 2012). LS supported teachers in changing their beliefs about the pupils themselves. Teachers discussed the value of LS in changing their understanding of why some children were behaving the way they did during lessons, citing examples about pupil engagement and pupil groupings during lessons.

Teachers recorded conclusions about their professional learning related to “not making assumptions” about pupils’ engagement or learning behaviours and their perceived meanings. One of the research posters noted the value of teaching a group of children that was not your class, as it allowed you to adapt quickly without any preconceived notions about what they can or cannot do. This theme has implications for how to support and develop teacher growth across their careers, when teaching is often done in isolation and professional development often takes the form of off-site courses or expert-led courses. Teachers stating that working with children in other classes and settings improved their teaching also suggests that engaging in LS in another setting could be equally beneficial to a teacher’s development. This would be a point for further research in the field.

The next theme about changes to practice attributed to LS involved changes to teacher pedagogy. The most referenced subtheme was the adoption of a

universal design (Rao, Ok, & Bryant, 2014) for inclusion and supporting change in pedagogical content knowledge (PCK). This emerged from the view that LS supported the idea that every learner should experience both challenge and support in lessons, rather than the previous belief that teaching was good if it simplified things for less able learners. This initial belief is connected with research about the low expectations of teachers when supporting pupils with ability labels or in ability groupings (Hart, 1998; Hart et al., 2004; Swann et al., 2012). This was also referenced as a shift in their PCK, where teachers talked about conceptual variation in solving problems and the use of concrete materials in supporting relational understanding. This differed from previous working in the school, where maths tasks were merely simplified for children or made slightly harder. Changes to teacher pedagogy have been supported in a wide range of studies (Cheung & Wong, 2014; Lewis et al., 2009, 2012).

Teachers' next referenced change to pedagogy was in the discovery and adoption of the CPA approach, whereby mathematical concepts are always introduced using concrete materials, followed by pictorial representations, only then to be presented with the more abstract approach. This change to practice was heavily referenced on the final research posters where teachers identified their own professional learning as a result of the LS. This change is unsurprising as one of the outcome aims of the LS at the school was the adoption of the Singaporean style of mathematics across the school. LS was being used to impact upon school climate, teacher self-efficacy, and as a teacher development tool – however, outside the reaches of this research project, it was being used as a delivery model for the new approach to mathematics. This type of intervening

change to practice and pedagogy in mathematics is known in the research (Lewis et al., 2009, 2019; Lewis & Perry, 2017).

Teachers also identified dialogic talk (Diez-Palomar & Olive, 2015; Mercer, 2003; Maria Vrikki, 2019) as a pedagogical shift throughout LS. This is the regular use of dialogue in the classroom, often between pupils and facilitated by the teacher. Teachers felt that they developed their questioning techniques in order to encourage dialogue during the lessons. One of the teachers noted that as a result of LS, they were no longer afraid to let the pupil talk time increase within their lessons. This is another feature of the school's approach to mathematics. The final theme referenced by teachers was that teachers felt that LS in mathematics supported their change from instructor to facilitator. This was evidenced through teachers commenting that they had gone from a three-part lesson (model, shared, independent) to one in which they would present a problem to all children, ask them questions related to the problem, and give them more time to work collaboratively to solve the problem. It also involved less teacher input than modelling. While there have been a number of studies exploring the association of LS on mathematics (Diez-Palomar & Olive, 2015; Lewis et al., 2009, 2019; Lewis & Perry, 2017; Mihajlovic, 2019; Sibbald, 2009; Takahashi & McDougal, 2016), this study is unique in that it explores teachers' adaptive changes to instruction, which has relatively little study (Schipper et al., 2017).

What is most interesting about these themes described by teachers is related to the design of LS itself. LS is, by design, a process that involves principles of universal design (Rao et al., 2014). Through engaging in this process, teachers have subsequently discovered similar traits to universal design in effective

teaching and learning, whereby all pupils can fully participate and contribute; prompting healthy interactions between pupils, and between pupils and the teacher; and finally shifting themselves as teacher from the front of the room to the side of the pupils, in order to support learning more individually rather than a "one-size-fits-all" approach to instruction, as seen in a universal design model (Rao et al., 2014). In order for teachers to engage pupils in meaningful learning opportunities as they discovered through research lessons, the teachers themselves needed to be immersed in professional development where they were able to experience those same opportunities as professionals (Rincon-Gallardo, 2019; 2020; Rincon-Gallardo & Fullan, 2016).

5.2.4. RQ4: What changes to practice will teachers sustain after engaging in a wave of Lesson Study?

Table 33
RQ4 links to PC Theory

Research Questions	Professional Capital Element	Intervening Changes to School Climate, Teacher Learning, TSE
RQ4: What changes to practice will teachers **sustain** after engaging in a cycle of Lesson Study?	**Social Capital**	★ Teachers & Teaching to Learners & Learning ★ Culture of Collaboration ★ Culture of Communication
	Decisional Capital	★ Practice, Pedagogy & Assessment ★ Instructional Risk-Taking

Five key themes have been identified: Change to professional practice, pedagogy and assessment, change in focus from teachers and teaching to learners and learning, an improved culture of collaboration, an improved culture of communication, and increased instructional risk-taking.

In developing a theoretical framework for LS, intervening changes to pedagogy, practice and assessment from engaging in LS have been widely supported in the

literature (Cheung & Wong, 2014; Dudley, 2015a; 2019; Lewis et al., 2009, 2019). The waves of Lesson Study examined the impact of both new pedagogical models in mathematics and the removal of ability grouping of pupils. Therefore, Lesson Study on its own did not initiate the changes; however, teachers felt that Lesson Study acted as a mechanism that allowed the initiated changes to be refined, sustained and reflected upon, ultimately leading to longer-term changes to practice. With regard to teachers sustaining these changes, the initiation of the new mathematics approach at the school was expected to be a sustained change, which could explain the high numbers of references to this theme.

The alignment between a perceived positive school climate and a strong sense of teacher self-efficacy both before and after initiating LS must be reintroduced here. Sustained teacher learning is correlated with a teacher's perception of the school's climate and their own self-efficacy (Anderson, 1982; Donohoo, 2017; Klassen & Tze, 2014; MacNeil et al., 2009; Mihajlovic, 2019; Schipper et al., 2018; Tagiuri, 1968; Zee & Koomen, 2016). If a teacher perceives that the school climate is negative, they are less likely to stay in the school or profession. If they are less likely to stay in the school or profession, their commitment to professional learning is lower and their ability to sustain professional learning gets lost when they leave. Much of the LS research completed follows a common theoretical framework: introduce Lesson Study as a collaborative, social process of improving teaching; then intervening changes emerge, and ultimately those intervening changes lead to improved pupil outcomes. However, in educational jurisdictions like England where teacher retention and morale is low, sustained changes must be supported by a positive school climate and strong teacher self-efficacy in order to be meaningful to the teachers, school and children.

5.2.5. RQ5: What changes in pupil maths attainment will follow a programme of Lesson Study?

In the second wave, 7 of 8 pupils showed a maths score change from their pre Lesson Study scores, with 1 pupil showing no change. In Wave 2, the pupil with no change in score scored the lowest possible score in both tests. The pre-LS scores in the second wave were much lower, with the mean score post-LS lower than the pre-LS mean score in Wave 1. This is likely due to the fact that in the study, one of the teams decided to have two advanced learners in the first wave and two struggling learners in the second wave, unbalancing the ratio of previously high-attaining pupils to previously low-attaining pupils in both waves of study. However, the mean Wave 2 gain is greater than the mean Wave 1 gain, which was statistically significant.

When comparing high prior attainers standardised test scores pre- and post-LS to that of low prior attainers, the mean score change for low prior attainers was greater, but given the sample size this was not statistically significant.

In addition to this, a higher Wave 2 gain for pupils could be reflective of the fact that teachers had more experience with LS and spent more time focused on planning and pupils for the lessons than they did on the actual process of LS. A major focus in the first wave was the process of LS itself. Gains in mathematics have been seen in controlled trials in studies completed in the United States (Lewis & Perry, 2017).

A key element of LS is that by design, it embodies the conditions for professional learning that we want for our pupils. A substantial piece of learning uncovered throughout this project was that leaders supported an approach through LS that

teachers were aiming to achieve for their pupils. It is challenging for a teacher to meaningfully enact “mixed ability” collaboration in their classroom between pupils if they have never meaningfully been able to collaborate themselves. It is difficult for a teacher to develop a dialogic classroom if they have never been given an opportunity to engage in meaningful dialogue themselves as professionals. This research supports a view that all children should be seen as continuously improving, not just as “high” or “low” ability. This will be explored further in the epilogue.

5.3. Evaluation of the Study

5.3.1. Strengths

The study was organised and executed within the constraints of the school, where communication, feedback and support could be managed immediately for participants in the study. The study employed both quantitative data through systematic questionnaires and qualitative data collected through individual and group interviews in addition to teacher research posters post-study. Interviews were conducted by an external research assistant and interviewees were kept anonymous to the researcher in order to deal with any potential bias had the researcher conducted the interviews as a deputy headteacher at the school. This data was supported by the use of pupil achievement data. Being a participant researcher as the deputy headteacher of the school allowed the programme to be implemented without any financial or engagement drawback, as LS was part of the school development plan.

5.3.2. Limitations

This was a small-scale study, taking place in one primary school with a limited number of participants. Some of the teachers who completed the pre questionnaires did not complete the post questionnaires and some of the participants who initially agreed to be part of the interview process subsequently opted out. These were due to a variety of circumstances, namely that two teachers left the school prior to the completion of the study and two other teachers were unable to find a time that suited them outside of working hours. As a senior leader in the school, the researcher was unable to follow-up as easily with the participants due to the potential conflict of interest. In addition to this, no lesson observation was completed as part of this research project. While this could have been completed by the research assistant, it was omitted for a number of reasons: a) prior to the research project, teachers at the school identified lesson observation as an approach that impacted negatively on themselves and the overall school climate; b) as part of the school's development plan, lesson observations as a form of teacher monitoring were being phased out; c) LS was explained to the staff as an opportunity to improve themselves and the learning without the involvement of school management and it was felt that this could confuse the messaging, and d) it was outside of the budget of this project to hire the research assistant for the hours necessary to conduct observations, had they been appropriate.

The study used a pre-post LS intervention evaluation design with no use of a practice as the usual control condition. In subsequent research, the school-wide introduction of LS across classes could have been staggered to use classes on the waiting list as control groups. The study could also have been improved by organizing an external party to support the follow-up with participants that chose

to opt out of the post questionnaires and the interviews. Further work could have been done between the questionnaires and the interviews to analyse the initial high ratings on the questionnaires more deeply, and perhaps understand individual questions and subscales to a greater extent. The interviews were well planned, but could have linked more directly to the questionnaires themselves. Additionally, there were no observations of the research lessons themselves (as this could have been misinterpreted as an external accountability measure) so exploring the details of when and how changes happened is not part of the study. Follow-up interviews at a later date (one academic year later) would have allowed the researcher to investigate some of the longer-term changes that were initiated as a result of LS, both with respect to school climate and teacher self-efficacy. As the current headteacher of the school, my view is that LS has had a substantial long-term impact upon the school and teachers, yet there is no empirical evidence base to back up this claim, although it is explored through public documentation at the school at the end of the paper.

5.4. Contribution to Knowledge and Significance

The research in this project is significant as it challenges the current educational and leadership practices associated with improving schools and teachers in England. The current theory often suggests that we identify performance issues within schools or people and take action to improve the school or person, resulting in the desired outcomes. However, this theory fails to account for the consequences of the actions used to create the intervening changes: low morale, poor teacher retention, negative school climate, low self-efficacy. Ultimately, the current actions being used to improve the system are impairing it. From professional capital theory (A.Hargreaves & Fullan, 2012), developing human

capital, social capital and decisional capital are requisite in supporting the growth of the entire school or system. This research project has shown that LS can be used as a model of social capital, inside a larger programme of changes using professional capital theory, supporting the development of each element of professional capital and ultimately improving the school. Furthering this work, lessons from the Global South have shown us that if we want deep and liberating learning experiences for our children, we must place our teachers in those same learning conditions first – and that leaders must be creating those conditions in their schools (Fullan et al., 2015; D. H. Hargreaves, 2012; Leithwood et al., 2019; Rincon-Gallardo, 2019, 2020).

The research undertaken in this project is significant as it supports and furthers the work in the field of LS and professional capital. This research contends that LS is both a vehicle for teacher development and pupil achievement, but adds to the field that LS is a mechanism that can be used to positively improve the climate in a primary school, making it a more desirable place to work, and improving the self-efficacy of teachers in implementing inclusive practices. There is currently limited research in the area of LS and school climate (Alwadi et al., 2020; Khokhotva & Albizuri, 2020; Mewald & Murwald-Scheifinger, 2019; Schipper et al., 2020) and teacher self-efficacy (Puchner & Taylor, 2006; Schipper et al., 2018, 2020; Sibbald, 2009), and little research that involves qualitative data from teachers. In addition to this, this study adds content to the body of knowledge about school climate and teacher self-efficacy beyond the realm of LS, which could be used in designing quantitative tools to measure climate and efficacy in other settings. When looking at school climate findings, namely, the relationship between self-directed learning, teacher agency, collective responsibility and

supportive and caring development opportunities, and the concept of school climate itself, this study has shown that the climate definition used and the climate scale itself were limited and that new domains of climate could be explored. When looking at self-efficacy findings, the relationship between self-directed teacher development and teacher self-efficacy have been illustrated and could be explored.

The research has implications for both policy and practice in the current educational climate in England. Many policies at the national level aimed at addressing teacher recruitment and retention involve “well-being” initiatives that often try to address surface-level complaints felt by teachers. In practice, this research is aimed at school leaders looking to challenge the monitoring and scrutiny cultures that exist in school, which only contribute to the poor climate felt by many teachers. The implication from this research is that LS can be used as a mechanism to support the development of teachers while simultaneously having some potential for improving the school climate and pupil results, if school climate and the human capital measures are already positive and/or changing.

A key element of LS is that by design, LS embodies the same principles and opportunities for professional learning that we want for our pupils. It is difficult for a teacher to develop a dialogic classroom if they have never been given an opportunity to engage in meaningful dialogue themselves as professionals. This research supports a view that all children should be seen as continuously improving, not just as “high” or “low” ability; it supports the view that teachers should be seen as continuously improving teachers, not just as outstanding or inadequate; and that all schools should be seen as continuously improving schools - not good or bad – when placed in the right conditions for growth. The

implication here is that further research and policy is needed in England to support the move away from one-off judgements of teachers and schools towards a continuously improving system, for all teachers and all schools. This is where climate improves, self-efficacy soars, teacher learning becomes sustainable, and pupil learning is powerful.

Further research should be pursued about the elements that allow effective LS to be sustained in schools and the factors that support or dissuade leaders from adopting Lesson Study. As suggested above, an analysis of current school climate and self-efficacy scales could be undertaken to further develop the coverage of school climate and teacher self-efficacy measures. Also, subsequent study could also examine the potential effects of participating in LS and teacher retention. Additionally, controlled trials investigating the impact of LS on school climate and teacher self-efficacy in a variety of settings with a variety of different school climate starting points would improve upon this research.

The conclusions of this small-scale study, the combining of the qualitative and quantitative analyses in this paper, when seen alongside recent work (Alwadi et al., 2020; Khokhotva & Albizuri, 2020; Schipper et al., 2018; Schipper et al., 2020) provide a strong argument for the positive association of LS with developing both school climate and teacher self-efficacy in implementing inclusive practices. The preceding work, positioning LS as a vehicle for teacher development (Cheung & Wong, 2014; Dudley, 2015a; Dudley et al., 2019; Lewis et al., 2006, 2009, 2012), is both confirmed in this study and furthered through qualitative analysis in a primary school setting in England. However, it indicates a need to add to the theoretical model developed by Lewis et al. (2009) that takes account of school

climate and teacher factors. This relates in the wider context of English primary schools to low staff morale, difficulty recruiting teachers and a retention problem, which can be understood in terms of the literature about school and system improvement (Brown et al., 2016; Droese, 2010; Fullan, 2000; A. Hargreaves & Fullan, 2012; Kitising et al., 2016; Levin et al., 2008; Rincon-Gallardo, 2019, 2020; Sahlberg, 2012a, 2012b, 2015, 2018; Shirley, 2016; Young, Cavanagh, & Maloney, 2018). These suggest that school and system improvement requires forms of collaboration, trust, ongoing teacher support and development, learning communities and professional agency. This study aimed to examine LS as a mechanism to support the growth and development of teachers in a learning community, providing them with the professional knowledge and expertise required to make decisions about teaching, ultimately intended to support the development of a positive school climate and high degree of self-efficacy within the teachers. This study also recognised that in the English primary school context, supporting the growth and development of teachers had to be done alongside the emergence of a school climate and culture that teachers wanted to work in, so that the professional learning stayed within the school.

Another unique feature of this research is the combination of both non-participant and participant-based research. While the participation in this research on behalf of the participants was optional, and all interviews and data were collected by a third-party, nevertheless, being the deputy headteacher (and now headteacher) in the school played a role in the development of the LS and its sustainability at the school. The conditions of the school itself were important in establishing sustainable LS (Dudley et al., 2019; Hannay, 2017c) and as a participant researcher, it was possible to respond to the needs of the teachers and school in

real-time. It was also possible to be employing other human, social and decisional capital mechanisms alongside LS during and after the period of the research study. It is assumed that this is essential in any school as LS is not a panacea or one-stop shop. It must be used in conjunction with a variety of intentional strategies to enhance the professional capital of a school and must be in alignment with other initiated (or stopped) activities aimed at improving the overall climate. Furthermore, it must align with the wider aims of the school, such as the pedagogical approach in the classrooms. In short, as a participant researcher, it was possible to influence the smooth running (or not) of LS at the school and support the conditions believed necessary to sustain and embed LS for years to come.

What this study found was that LS was positively associated with the development of the school climate and teacher self-efficacy in implementing inclusive practice. There was also a positive association between LS and the achievement of pupils who were low achieving prior to the enactment of LS. This research project was able to confirm some of the findings of previous research (Lewis & Perry, 2017; Lewis et al., 2009), showing that LS produces intervening changes in teachers' knowledge and beliefs; teachers' professional community; and teaching-learning resources, and confirmed findings (Schipper et al., 2018, 2020) about intervening changes to a school's professional climate and teacher self-efficacy. However, this study contributes further to current knowledge related to LS, school climate and teacher self-efficacy in implementing inclusive practice, showing that LS is associated with developing a positive school climate and teacher self-efficacy. Using a mixed-methods approach, this study presented quantitative and qualitative data consistent with LS creating the kind of conditions

requisite for teachers to believe in their own capacity to impact upon pupil achievement and the conditions under which teachers perceive the climate of the school to be positive.

5.5. Conclusion

For the last decade in England, education reforms have been a top priority of the Conservative government. In their 2010 White Paper on education the government opened by stating that no education system can be better than the quality of its teachers. However, nearly a decade later and after successive Conservative governments and a number of reforms with a heavy emphasis on external accountability, teacher observation, monitoring, scrutiny and pay linked to performance, teachers are exiting the profession at record rates (DfE, 2013, 2018; Education, 2013).

At the heart of this study was determining whether LS, under the lens of professional capital theory, was associated with the development of a positive school climate (human capital) before it looked at the impact on potential shorter- and longer-term changes to teacher practice and pupil outcomes, where PC=f(HC, SC, DC). This study showed that LS is associated with creating a more positive school climate and expanded beyond the terms of the climate scale itself, adding possible new dimensions to defining and measuring school climate in future.

Lesson Study is a potentially powerful programme to support the growth and development of teachers under appropriate conditions and also improve pupil outcomes. It is also a vehicle to shift the climate of a school and develop the self-

efficacy of professional teachers. Over the course of the project, and in the five or so years since the end of the research project, teachers in the school have continued to participate in LS as a regular entitlement to professional development and a trusted way of refining and revising the school's instructional programme to meet the needs of its pupils. Staff at the school have supported a number of other schools in implementing LS both locally, nationally, and internationally. There is almost no teacher turnover at the school, and nearly all of the teachers that participated in the initial study back in 2015/16 are still at the school today. The school has been visited by Ofsted twice since this research project and has been graded Outstanding in every category, with specific mention of the way that teachers are continuously inspired to reflect and develop, and inspire that in their pupils and in other professionals (Ofsted, 2019b). However, more than all of that, as a tool to improve the climate of the school, LS has done what it set out to do. It improved the climate and the self-efficacy of the teachers. Pupil results have never been better. More than that, LS shifted the everyday climate so it became the culture – not simply that which we do but it has become who we are.

INT:	Okay. Now whole school enjoyment: what impact do you feel that lesson study has had on your enjoyment of working at this school?
RES:	I love working at this school!
INT:	That's what most people have said, yeah.
RES:	[Laughs]. It's...
INT:	Or all, not most.

***Figure 11**: "Love this school" Quote from Interview*

5.6 - A New Aim: Changes Over Time

As a part-time researcher, the research project includes a ‘snapshot’ in time of the study school in what were changes that took place in the lead up to LS in the 2012-2015 school years, in addition to the picture of the association of LS with professional capital theory during the 2015/16 school year. An obvious question that has emerged from the research over time which is worth pursuing is: what do things look like today, in 2020/21? As the changes discussed in this thesis were the work of many years, both in the study itself and the lead up to the study, what changes have taken place since the study that align or are incongruent with the theory of change and what role does LS play in the school today? It is the belief of the researcher and underpinning view of professional capital theory that concepts like school climate take time to develop and approaches like LS should not be seen as a “quick fix” but rather as part of a more complex system of change. LS itself takes time to develop and comment on its use in the study school in 2021 is important to note, as reflections on LS in 2015/16 suggest that it has changed considerably.

Epilogue: Five Years Later

Since the original research concluded, LS and a culture of professional trust, agency, reflection and research have become deeply embedded across the school – this is professional capital in action. While LS on its own was not responsible for the shift in the school, it did play a pivotal role in the initial stages of the school's development, harnessing the power of human capital initiatives already started, initiating more formal social capital with the aim of creating greater decisional capital at the school over time. The staged and sequential approach initially taken, as informed by professional capital theory (A. Hargreaves & Fullan, 2012), while necessary at the time, does not reflect the embedded changes that have taken place since the research project concluded. Today, PC is seen in the synergy between each form of capital, with programmes like LS acting in the role of promoting social capital, but ultimately having a deep influence on the culture of PC. What this research project began to show was LS's alignment with human capital and the kind of environments and cultures we create within the school; SC, in the form of the culture of collaboration and enquiry, creates decisional capital (DC), which goes beyond basic instructional practice through to curriculum, pedagogy and the self-directed improvement of teaching and learning. This chapter will explore practices after the conclusion of the LS research at the school, providing a roadmap of the climate and cultural change using examples from the schools own publications, policies and practices. It will also draw upon publications about the school, including inspection reports, books, and articles written in the years after LS was originally introduced.

Inward Looking to Outward Facing

The research school has become a well-known learning centre, supporting the growth and development of its own teachers, leaders and learners alongside many other schools, locally, nationally and internationally (Hannay, 2016b, 2018a; Ofsted, 2019b). This ethos of openness and sharing was developed alongside the original LS project. As LS is built upon the notion of SC, the school came to understand that this did not need to be limited to inside its own walls or even local authority.

From 2016, the school opened its doors to support other schools in developing the Singapore approach to mathematics. This was borne out of the extensive study, improvement, confidence and self-efficacy grown through LS. Teachers developed a deeper understanding of effective lesson structure for learning and became inspired to support other schools in moving away from “ability” grouping. This occurred because the school’s maths results have remained a strength since the introduction of LS and the Singapore approach to teaching mathematics (DfE, 2021; Ofsted, 2019b). The school was the first school awarded “accredited school” status and instrumental in the creation of this type of open-sharing approach of Maths No Problem! in 2015 (MathsNoProblem, 2021). The school was also a national training centre for Talk for Writing between 2015-2018, a well-known approach to teaching writing and oracy. The school hosted visits in these two domains exclusively in 2015 and 2016, with a wider offering made available from 2017 in teacher research groups and supported other schools through the regional schools’ commissioner using LS. It was also at this time that the school began publishing more on its unconventional approaches through media like

Twitter, TeachWire and various other UK education publications. At this stage, schools from further afield began to contact the school and headteacher for visits and keynote addresses at education conferences. The school has worked in partnership with schools from a variety of countries, including: Canada, Singapore, Malta, Sweden, New Zealand, Germany, the Netherlands, Cyprus, Australia, Wales, the United States, and Belgium (Ofsted, 2019b). The headteacher has spoken at many conferences across the country and been the keynote speaker for larger organisations such as the National Association of Headteachers and Australian Council for Educational Research (Hannay, 2020). The school has been the "Outstanding School" feature in Teach Primary twice since 2016, once highlighting the use of Singapore mathematics and once for their different approach to school leadership and pedagogy (Smail, 2019). These initiatives have been featured in a number of popular books about education. Thousands of teachers and school leaders have been to the case school to learn and grow, with specific focus on instructional programs, school climate and culture, Lesson Study, teacher research groups, and/or leadership (Hattie & Clarke, 2018; Howard, 2020; Waters, 2021).

The school is successful, but not static. Over the last five years, priorities have changed, aims have become bolder and deepened, and the school has transformed how it embodies professional capital with increasing levels and sophisticated forms of professional agency, collaboration, and enquiry (see Figure 12).

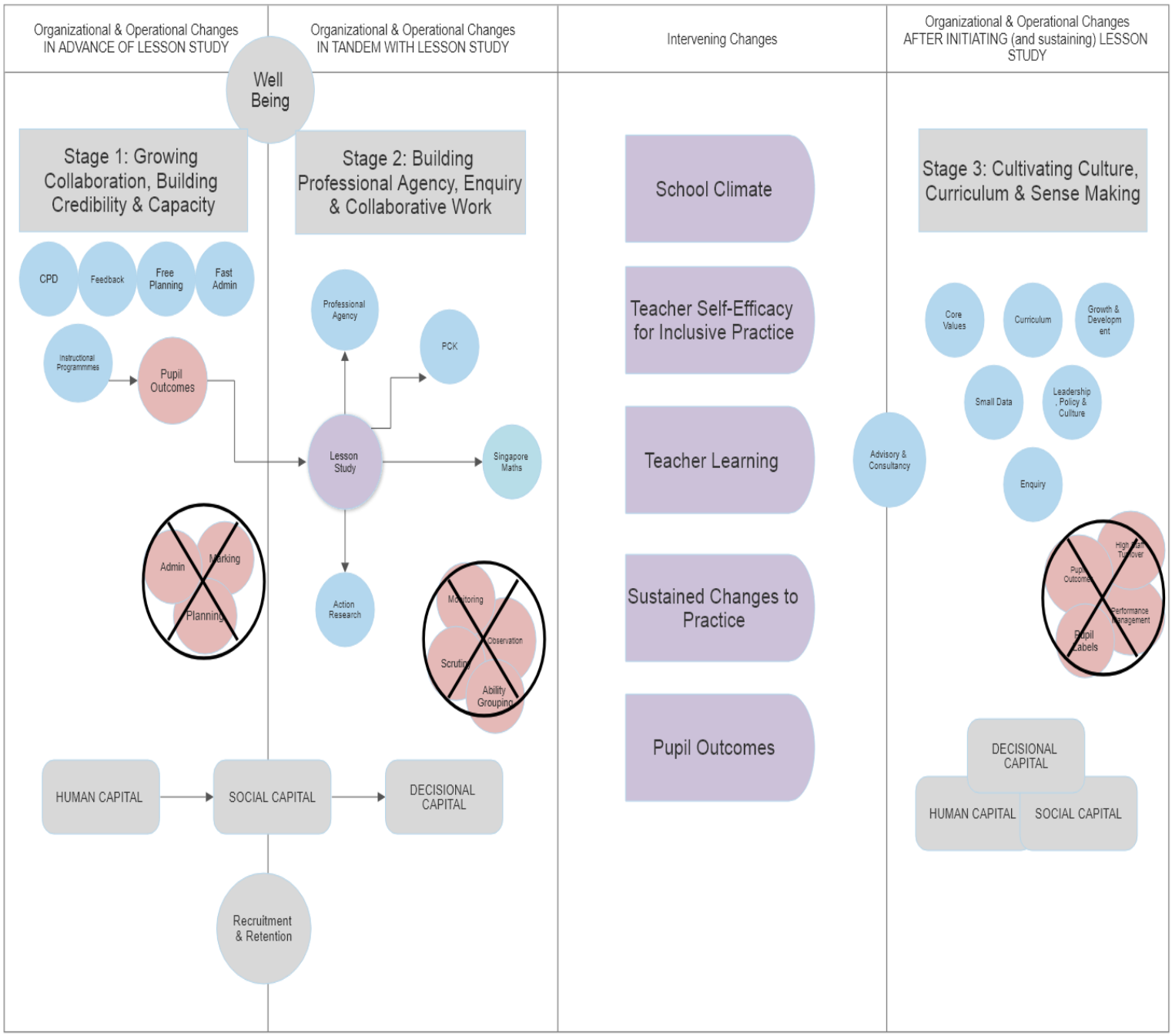


***Figure 12*:** *Theoretical Structure with Stage 3 (Post-Research Study)*

Capital Development - Changing Priorities

A major shift that has occurred in the years since the project concluded is the shift in how this PC theory has been interpreted, as shown in Figure 12. As the

school has shifted from quite a heavy regime of “top down” influencers (observations, monitoring, scrutiny), increasing and harnessing the power of the collective through social and decisional capital, the distribution of leadership has consciously and naturally changed. As the distribution of leadership has changed, the climate and culture of the school has also changed. The school began transforming the original “lead from the top”, to a new, requisite “lead from the front”, to a more distributed, capacity using, “lead from the rear” supporting staff to begin taking more responsibility and agency over their own and the school’s development.

At a school level, this can be seen through the development of school planning over time. From 2013-2016, the school’s development plan was quite traditional: based on an analysis of deficits within the achievement of pupils and pupil groups with targeted and specific plans to bring about change in those target groups. In the initial LS conducted at the school, the terms “struggling” and “advanced” learners (although a shift from “low ability” and “high ability”) were used to identify this exact phenomenon: labelling pupil groups to do something about it. While the researcher considers achievement a top priority, it is less about what the focus was and more about how to approach the focus. Previously, it was done through deficit planning led from the top. Teachers would submit their data to senior leaders, who would analyse the data to identify deficits. The senior leaders would tell teachers where the areas of focus were. From 2017 onwards (also when the researcher shifted from DHT to HT), school development planning took on a new look - aspirational, strength-based planning. In essence, we asked ourselves who we wanted to be as a school, and planned accordingly. We also bent the rules slightly, moving from single-year plans to three-year cycles. As a

school that had come to practice enquiry more regularly and naturally, it was clear to us that great accomplishments often take more than 12 months. The first three-year period was from 2017-2020. As seen in Figure 13, pupil achievement was still a priority - but not because we saw weakness. It was based on the fact that we wanted to have greater strength. It should also be noted that pupil achievement at the school rose considerably from 2013 onward, compared to both the school's own performance trends and local and national data. In 2012, 67% of pupils achieved the expected standard (Level 4) in reading, writing and mathematics by the end of year 6. In 2013, it reached 87%. In 2014, 91%. This trend has continued, notwithstanding a curricular and national assessment change, to present day, where 80% of pupils achieve the expected standard in all of the core subjects.

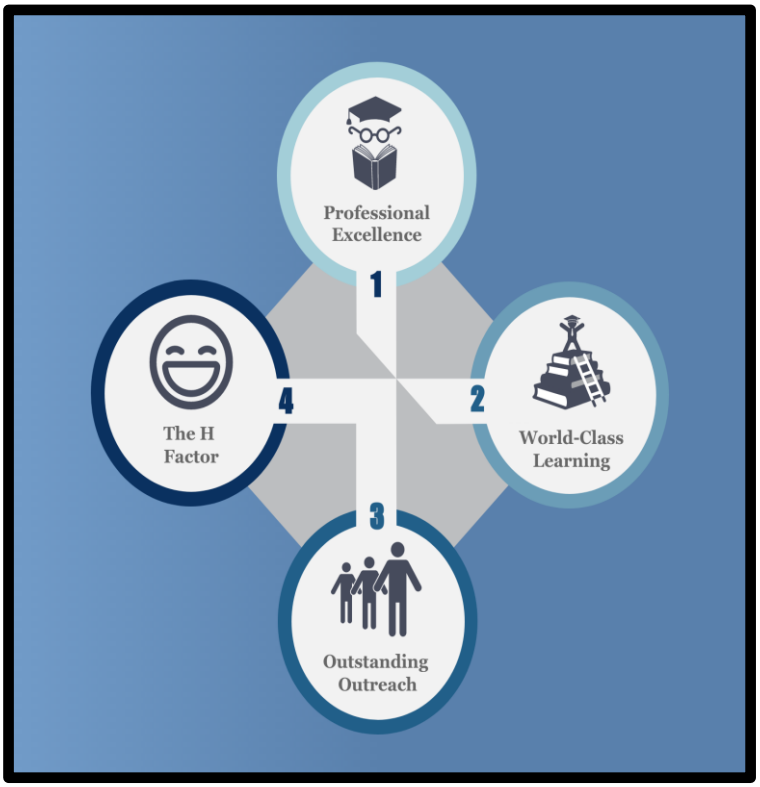


***Figure 13**: Development Priorities 2017-2020*

This planning model in Figure 13 was reflective of the changing culture and climate of the school. "The H Factor" idea (happiness, one of the four priorities) was part of the priority is testament to how the school was changing; it was seen as vital to the overall development of the school. Additionally, Professional Excellence was characterised by "practice-based" research; an entitlement for all. Many of the factors that were uncovered by the original LS were in-built to the development plans as requirements or entitlements in the reformation of the school. LS was no longer an "add on" – it had become embedded within the culture of improvement within the school. New teachers who have started at the school since the 2015/16 school year would not know any other way of enacting school development and improvement.

An example of this evolution can also be seen in subsequent LS posters. One

example is work that a team of teachers did in the autumn of 2017 (Appendix I), 18 months after the original study. This study involved both open lessons, whereby visitors from other schools attended all of the sessions as guests, and public questions and debriefing by the LS team. In the poster, you can see a shift in language away from “struggling” or “advanced” to describe the learners. Instead, the learners are characterised by levels of confidence, gender, and the date they joined the school. The professional revisions and conclusions are also better developed than in the original study. The team was able to articulate a five-domain frame for challenge within a mathematics lesson, supported by the knowledgeable other, Dr Yeap Ban Har from Singapore. This frame did not rely on the labelling of pupils as low or high, struggling or advanced, rather it articulated a position for the teacher in recognising areas of strength and struggle that lie within all budding mathematicians in primary school, regardless of their attainment measures. The poster nicely summarises the new thinking of the Lesson Study team and school at this point in time: “How can we make this better?”

School development as a measure of distributed leadership improved the climate and culture, and a reflection of the key priorities of the school, continued to develop into 2020. While the school felt that its initial four domains were reflective of the school at that point in time, there was a growing feeling that it was beginning to limit development. From the perspective of the researcher and school leadership team, the initial changes in professional capital from 2013 onwards were always with the view to the kind of schooling experience we wanted for our children and community. While one reason to introduce professional capital as a theoretical leadership framework in the school’s operations was, indeed, to

improve the working and learning conditions for our staff, ultimately, to be successful, those experiences provided for the teachers needed to translate directly into new and improved experiences for the children. However, development planning from 2013-2017 rarely, if ever, spoke about teachers or parents, and from 2017-2020 there was a clear focus on both children and teachers, however, still as separate entities, and with no mention of parents, governors, or the wider community touched by the school. As LS embedded more deeply, so did the school's views about collaboration, coherence and collective work. This shift was evident in 2020 (see Figure 14).

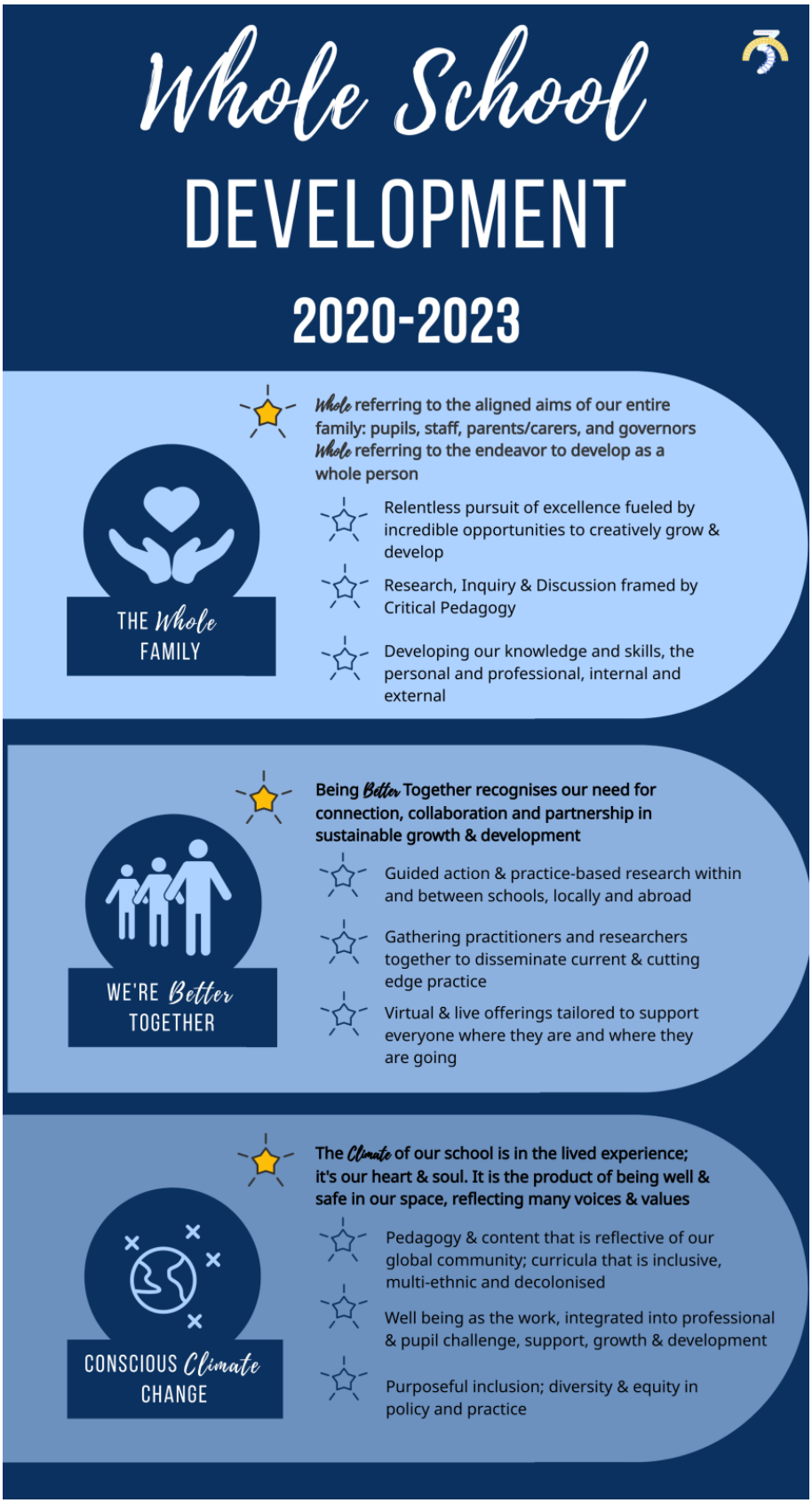


***Figure 14**: School Development 2020-23*

Once the original research project concluded in 2016, professional capital began to shift from the sequential, somewhat hierarchical, model presented in the initial research to a more harmonious, synergistic set of guiding principles for decision-making at the school leadership level. They also began to translate into the lived experiences of the children and families. Once the teachers had been immersed in a professional world complete with enquiry, collaboration, mistake-making, learning, and growth, they wanted the same (and more!) for their pupils.

As each element established itself at the school, less was discarded per se; but deeper conceptual changes were made to affect change across the entire school community, embedding the original findings of this LS research into the school culture and, ultimately, going deeper and embedding change. These are explored in the sections below.

The remainder of the chapter will look at the documentary evidence publicly available about the school, including articles written about the school by the researcher, policy documents, government inspection reports, and further LS research posters published from 2016 to present. The chapter is organised by professional capital themes (human, social, decisional capital) in order to show connection with the original research and the alignment necessary over time to further develop and sustain the work established as part of the initial study. If there is one generalisation to make here about school development and improvement, school climate, teacher self-efficacy, teacher learning and pupil outcomes, it is that none of it happens overnight, little of it happens quickly, and the deeper, sustainable changes take years of concerted effort, vision, and belief

(especially when the system in operation around you is promoting and legislating the opposite).

Human Capital

Human capital (A. Hargreaves & Fullan, 2012) was originally explored as both the quality of educator that the school was able to recruit and the environment created for that educator that would retain them in the school. Teacher retention was seen as a pervasive problem, impacting upon virtually every initiative at the school. While some suggest that the revolving nature of the classroom teacher can bring many benefits (mostly related to expense and "new ideas"), professional capital theory rightly suggests that for teachers to be their very best takes years of practice, social collaboration, and professional learning (A. Hargreaves & Fullan, 2012). However, it is also important if a school wishes to move beyond the basic role of the teacher. A new teacher is often preoccupied with early career questions: how do I teach this lesson? How do I manage behaviour? Much of their time is preoccupied with the basics of the job. In order to support the teacher in moving beyond the basic questions of the job, they need experience and practice. This is best managed if the teacher remains a teacher. Developing human capital also speaks to the deeper forces that aim to create real wellbeing in the workplace: professional challenge, professional growth, professional agency, and professional excitement and inspiration.

As part of the renewed focus on human capital and the conditions in which the teachers were working, the school initially focused on happiness as a key driver of human capital. In 2016, the Guardian wrote a focus piece on the school entitled

‘”Is this the happiest school on earth?” (Lightfoot, 2016). The article highlighted a number of the strategies the school had implemented to date related to the happiness and wellbeing of its staff, originally picked up by an article written by the researcher about marking earlier in the year (Hannay, 2016a). It highlighted the focus the school had placed on reducing marking and the introduction of new approaches to feedback. It was the most read education article of 2016. The following year, the Guardian featured the researcher as an expert on reducing teacher workload, with emphasis on the work that the school completed related to the three elements from Stage 1, including marking, planning and data entry (Stokes, 2017). In 2018, the Education Leader and Manager (ELM), a national publication from the National Education Union and Association of Teachers and Leaders, wrote about the school’s unique approach to planning and the development of agency (Gillen, 2018) .

> “Supporting and developing staff, and making sure they’re not spending lots of time on unnecessary work, are key features of Hannay’s leadership style” (Gillen, 2018).

However, the development of human capital was not limited to marking, planning and data administration. In an article written in 2018 by the National Education Union, the author points out the shift that had occurred from school leaders telling teachers to teachers leading (Watson, 2018). This change in approach was also highlighted in an article written in 2016 by the researcher, explaining the shift away from high-stakes observations.

> So, while the teacher is the most important element in the classroom, it is our responsibility to provide the conditions under which she can be her best, all the time...We moved our focus from subject knowledge to pedagogy; from teachers and

> teaching to learners and learning, and from compliance to collaboration and knowledge. (Hannay, 2016c)

Our collective work on wellbeing did not follow a conventional direction. In 2018, many schools began publishing wellbeing toolkits and initiatives happening at their schools. However, when wellbeing is seen as a distraction or escape from the work that everyone is upset about, rather than deep and meaningful collaborative changes to the conditions under which everyone works, it often fails (Hannay, 2018a; Howard, 2020). Free coffee and biscuits in the staffroom or subsidised teacher yoga are nice things to do - but human capital is not concerned with that (A. Hargreaves & Fullan, 2012). The development of long-lasting and meaningful wellbeing and human capital is rooted in professional collaboration, inspiration, challenge and agency.

> Simply ‘doing less' is not what any of us got into teaching for. It's also masking the real narrative that we're all feeling: low trust, high threat. Whether it's marking or planning to provide evidence, excessive admin to prove progress, regular scrutiny to monitor compliance - if we want our work-life balance to be in harmony, we have to feel trusted, supported, developed, aligned, inspired and valued. We need to feel in control of our time and our professional decisions, ultimately allowing us the freedom to determine what is meaningful and what is meaningless when it comes to our workload and wellbeing. (Hannay, 2018a)

Social Capital

Social capital (A. Hargreaves & Fullan, 2012) was originally explored as

intentionally organising teachers in meaningful and impactful ways to analyse and discuss learners and learning. Lesson Study was seen as a clear and coherent way of doing this. Prior to this at the case school, there had been no action- or practice-based research, no clear or systematic instructional programmes or understandings to speak to collectively, and professional learning was seen as something done external to the school environment. LS changed the way that the professionals in the school saw meaningful collaboration; it began to generate a wider culture of enquiry and sense-making within the teaching team. If groups of teachers were able, without senior leaders, to analyse and make sense of their practice and it had a positive impact - what else could they take ownership of and make better? This was a question for the researcher by nature of growing up in a different educational jurisdiction. LS, especially in its 2015/16 incarnation, was only the beginning.

LS enabled the teachers in the school to begin formally working together. However, it also enabled the school to begin working more meaningfully with other schools, both locally and abroad.

> So we began searching the globe for that special someone with best practice in enquiry-based learning. We wanted to improve by learning from the best in the world, and we knew exactly what we were looking for and what we had to offer. (Hannay, 2016b)

Each year, the school hosts hundreds of visitors in the spirit of collaboration and collective learning. The school leads teacher research groups, professional research groups and a leadership series and retreat for schools locally, nationally and abroad. This both supports the view of social capital through collaborative work about learners and learning and also creates the kind of conditions whereby

the school improves.

> CPD should rarely be reactive. Strong leaders will know their staff, be able to anticipate when new developments are likely to cause a struggle, and effectively gauge where that struggle will be for people that are new. If we're constantly responding to what's wrong, we'll never move forward. (Hannay, 2019b).

This is where human capital and social capital begin to intersect. Human capital is improved through social capital. As school leaders, we must take responsibility for the development of our staff in the best possible conditions for growth.

> In England, we've become obsessed with the seeds. We monitor them, measure them, weigh them, inspect them, and have managed to over-engineer them at the expense of the soil. Successful nations – successful schools – support their seeds by taking care of the soil. We need to be soil people. (Hannay, 2019d).

Creating the right kind of soil involves bringing teachers together, on purpose, to improve their impact, knowledge, skills and strategies. At the case school, this started with LS within the school, then shifted to LS within the school in partnership with other schools, then within the school with multi-professional teams, and eventually became supporting the development of other schools at the call of the regional schools commissioner using LS. It meant the removal of traditional approaches and their replacement with teacher-led learning and development.

> In this world we've been led to believe that an "inspection culture" is synonymous with a "development culture"; that in order for schools, leaders, teachers and pupils to improve,

> they must be constantly measured and monitored. (Hannay, 2018b)

The development is not centred on professional inspections anymore, but rather professional collaboration (Rincon-Gallardo, 2020; Rincon-Gallardo & Fullan, 2016). The school no longer performs regular observations and monitoring, or uses overly prescriptive performance policies. Instead, we discuss and design pedagogy, engage in action research and regularly perform learning and Lesson Study. It is with this information and experience that teachers are then making decisions that impact upon instruction, and today, curriculum, school operations and development directions (Brown et al., 2016; Chapman, Chesnutt, Friel, Hall, & Lowden, 2016; Drew, Priestley, & Michael, 2016; Fullan et al., 2015; Levin et al., 2008; Shirley, 2016; Stone-Johnson, 2017; Tong & Razniak, 2017).

Decisional Capital

Decisional capital (A. Hargreaves & Fullan, 2012) was originally explored as the result of high levels of human and social capital - the capacity for competence, insight, judgement, inspiration and improvisation that directly impacts their work. This can be thought of in terms of having informed control over the decisions that impact upon learners and learning in the classroom. Initially, this was in the form of the instructional programmes and instructional decisions within those programmes. There was also some limited scope to influence the emerging pedagogies as the initial LS study was exploring Singapore maths as a pedagogic approach. A teacher's ability to contribute was, during the original research period, linked directly to their participation in LS. As the ways in which we sustain and improve the human capital experience and contribution has changed, and

the nature of social capital has also evolved, decisional capital, professional agency and the influence that a teacher has at the school, has also changed.

In 2018, the school changed its approach to teacher performance management. Historically, performance management was a look at pupil data, and then a triangulation of pupils' data, lesson observations, book and planning scrutinies. These would inform a teacher's development targets for the year, often heavily focussed on the improvement of the pupils' data. There were often, if not always, three targets for a teacher, based on their stage of career and placement on the payscale, of which at least two of the three targets centred around the pupils' data in English and mathematics. The other was often a wider school target or, again, English and mathematics related.

In 2018, this approach changed and was renamed "Professional Growth and Development" rather than "performance management". Teachers were asked to design "lines of enquiry" as micro-research projects. They were assigned a professional growth partner from the senior team to use growth coaching to support them in answering their lines of enquiry, which were framed by rationales and approaches to answering the question. Twice a year, they would meet with the headteacher to discuss how answering their question was impacting upon the children and themselves. There were no pupil data targets and no links to the pay spine. Teachers were free to choose two of the three lines of enquiry to do anything that they were passionate about and were interested in. One of the three lines of enquiry needed to be linked to a wider school development target; however, it was their choice. It was not simply English and mathematics targets, so reflecting the evolution of an authentic decisional capital.

In 2020, the lines of enquiry were replaced after the COVID closure periods with “Passion Projects” allowing all staff to pursue a project of their liking, linked to national teacher standard 8: something that would make a contribution to the wider school community, to one of either pupils, parents, or fellow staff . While it may seem a long leap between LS in 2015/16, and Professional Growth and Development or Passion Project Plans in 2020, it is not. Just as human capital was a requisite development point in 2013/14 prior to LS, LS itself was a developmental step in supporting teachers to become avid enquirers (Hall, 2014). Teachers had no experience of action- or practice-based research prior to LS. By 2018, they had been actively researching for three years. They were then prepared to lead their own learning in a meaningful and practised way.

LS created the conditions under which teachers were able to conduct meaningful enquiry that would ultimately improve themselves and the school. Performance management was no longer needed. However, without the introduction of LS in 2015, the proposal of leading their own performance management would have been difficult for many and had a negative impact upon the human and social capital of the school (Hall, 2014).

Additionally, all of the changes that have been enacted for the teachers have reflected the mindset that for teachers to enact deep and meaningful learning for their pupils, they must have been exposed to similar experiences first. It is more likely that teachers will be able to enact meaningful collaboration in a classroom between pupils if they have had meaningful opportunities to collaborate first. The teachers enquire so they may create the conditions for their pupils to enquire.

The teachers lead their own learning so they may create the conditions for the pupils to lead their own learning as well. As an example, the school has moved away from data- driven parents' evenings, where teachers provide parents with a data sheet and discuss how well their child has performed in the term. Instead, the school now uses pupil-led conferences, where pupils discuss the work they have completed over the term; which work they enjoyed, which challenged them, what they learnt, and so on.

In 2018, the school also re-wrote its curriculum. However, this was not done by a small number of senior leaders. This was a collaborative project undertaken with the feedback of parents, pupils, governors and staff. This ultimately resulted in a remarkable project infused by the school community. To form the theme of the curriculum, the school asked the key groups two important questions: i) what are the hopes, dreams, and aspirations we have for our young people - now and in 20 years? and ii) What knowledge, skills, and habits of mind do you think are necessary to uncover that? Figure 15 shows the initial responses, which were thematically analysed and turned into the school's six core themes, as indicated in Figure 16. This is decisional capital in action, at every level.

***Figure 15**: Initial Collective Response to Curriculum*

***Figure 16**: Final Curriculum Themes*

Final Conclusion: Professional Capital in Harmony

Originally, at the inception of this research project, PC was seen as a function of each element (HC, SC, DC) in sequence; develop one, to develop the next, to develop the next. LS itself was originally thought of as a model of SC and examined as such. However, over the course of the research project (2015-2021), the researcher has come to see PC in a new way. While it was necessary to look at things more compartmentally in the first instance, today PC is not looked at in stages and LS is not seen solely as a model of SC. PC is the combined

outcome of the three forms of capital working synergistically with one another, all at the same time. LS is a form of SC, but it is also something that directly impacts upon a teacher's self-efficacy related to HC or the conditions under which they work. It also is a form of decisional capital, providing the requisite knowledge and expertise to teachers to manage the complex decisions a teacher must make every moment of the day.

LS, in its first incarnation, was also a stepping stone to a deeper, longer lasting culture at the school. It paved the way for future development, such as a Professional Growth and Development policy, Passion Projects, and the support and development of other schools in the UK and abroad (Hannay, 2016b; Ofsted, 2019b). LS gave the school the injection of professional collaboration it needed to open its doors to other schools from around the nation and further afield so that all partnerships were meaningful and forward moving, and it gave the school the confidence over time to phase out the destructive, high- stakes accountability measures cited as the best way to improve a school. Over time, what the project has shown is that while LS, at the time of study, showed a very promising association with the improvement of the school climate, teacher learning, teacher self-efficacy in using inclusive practices, and pupil outcomes, all take time to develop. LS, like PC, is not an intervention. In this project, it should not be seen in isolation to other factors happening at a school, both before or after the completion of the short study, nor should it be viewed without due regard for its alignment with PC theory and practice. LS can now be viewed through the lens of PC theory as both a short- and long-term approach to altering the structure and culture of a primary school over time.

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Appendices

A: Participant Information Sheet

Title of Research Project
Lesson Study, School Climate and Teacher Self-Efficacy: using lesson study to bring about positive change in an inner-London primary school

Details of Project
The project aims to use Lesson Study during the Spring 1 term and the Summer 1 term to improve the teaching of mathematics teaching for struggling and advanced learners in addition to school climate and teacher self-efficacy as it relates to inclusive practice and mixed ability teaching. The use of Lesson Study involves a small team of 3-4 teachers working together to interrogate the learning of case pupils from pre-planned and reviewed strategies. Lesson Study is considered to be a powerful professional learning approach internationally and I expect it to be useful in this project too.

The lesson study project will be evaluated through online questionnaires, focus groups and individual interviews. Some of the review and planning meetings will also be observed by an external reviewer in order to document some of the sessions. Data will be analysed to examine the impact of Lesson Study on school climate and teacher self-efficacy as it related to inclusive practice and mixed ability teaching.

You have volunteered to take part in this study and have been provided with information about its aims and methods. If you agree to take part, you are still able to with draw at any time from the study.

All data will be treated as anonymous and confidential. It will be accessible to the research team and stored both in an online password protected university drive and on a password protected computer in a locked room.

Contact Details
For further information about the research, please contact:

Name: Jeremy Hannay
Postal address: Three Bridges Primary School, Melbury Avenue, Southall UB2 4HT
Telephone: 00 44 (0) 208 571 1491
Email: jsmh201@exeter.ac.uk

If you have concerns/questions about the research you would like to discuss with someone else at the University, please contact:
Professor Brahm Norwich Dr. Alison Black

b.norwich@exeter.ac.uk a.e.black@exeter.ac.uk

North Cloisters
University of Exeter
St Luke's Campus
Heavitree Road
Exeter EX1 2LU

Confidentiality
Interview recordings and transcripts will be held in confidence. They will not be used other than for the purposes described above and third parties will not be allowed access to them (except as may be required by the law). However, if you request it, you will be supplied with a copy of your interview transcript so that you can comment on and edit it as you see fit (please give your email below so that I am able to contact you at a later date). Your data will be held in accordance with the Data Protection Act.

Data Protection Notice

Data Protection Notice - The information you provide will be used for research purposes and your personal data will be processed in accordance with current data protection legislation and the University's notification lodged at the Information Commissioner's Office. Your personal data will be treated in the strictest confidence and will not be disclosed to any unauthorised third parties. The results of the research will be published in anonymised form. Data will be kept until the end of the degree, at which point it will be destroyed. All data will be stored in a secure, password protected university U-Drive account.

Anonymity

Interview and Focus Group data will be held and used on an anonymous basis, with no mention of your name, but we will refer to the group of which you are a member.

Consent
I have been fully informed about the aims and purposes of the project.
I understand that:

- there is no compulsion for me to participate in this research project and, if I do choose to participate, I may withdraw at any stage;
- I have the right to refuse permission for the publication of any information about me;
- any information which I give will be used solely for the purposes of this research project, which may include publications or academic conference or seminar presentations;
- If applicable, the information, which I give, may be shared between any of the other researcher(s) participating in this project in an anonymised form;
- all information I give will be treated as confidential;
- the researcher(s) will make every effort to preserve my anonymity.

....
(Signature of participant) (Date)

....

B: Ethics Approval Form

UNIVERSITY OF EXETER

GRADUATE SCHOOL OF EDUCATION

St Luke's Campus
Heavitree Road
Exeter UK EX1 2LU

http://socialsciences.exeter.ac.uk/education/

CERTIFICATE OF ETHICAL APPROVAL

Title of Project: Lesson Study, School Climate and Teacher Self-Efficacy: using lesson study to bring about positive change in an inner-London primary school

Researcher(s) name: Jeremy Hannay

Supervisor(s): Brahm Norwich
Alison Black

This project has been approved for the period

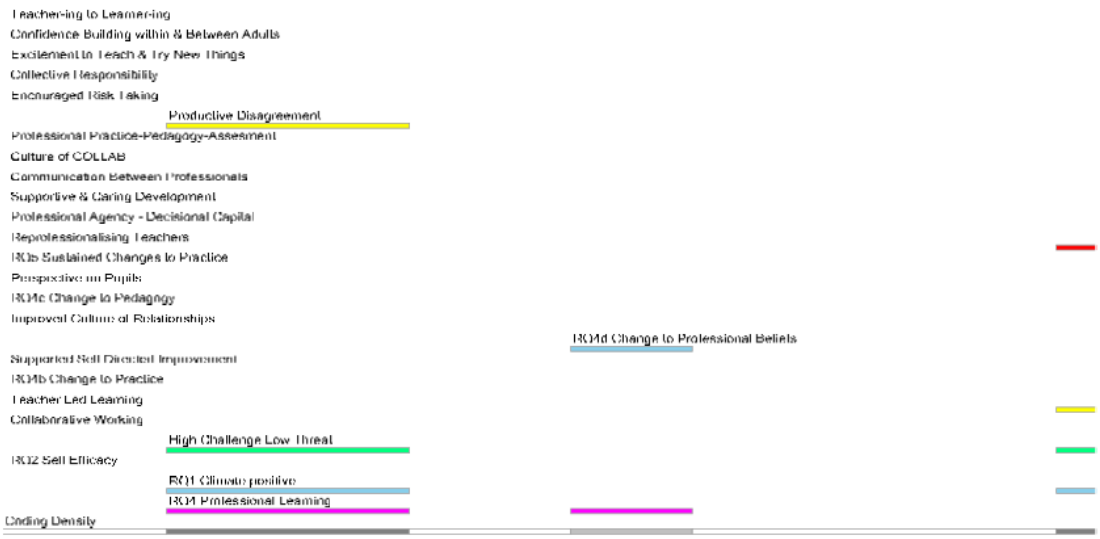
From: 16.12.2015
To: 31.08.2017

Ethics Committee approval reference:

D/15/16/17

Signature: Date: 16.12.2015
(Dr Philip Durrant, Chair, Graduate School of Education Ethics Committee)

C: Coded Extracts from Interviews



INT: Yeah, Okay. Teachers agreeing on collective working and teaching methods.

RES: Teachers agreeing... yep. So... yep...

INT: So the last bit was teachers agreeing on collective working and teaching methods.

RES: We agreed and we disagreed on some things. I'm trying to think of an example off the top of my head. Oh, when we had specific kids working together that weren't working well together, we separated them, and then introduced the triangles for talking – back to that point. And then we kind of were disagreeing or agreeing to maybe put them back to the original child, and then using the triangles. And there was disagreement about that; and we fleshed out both ideas, and ended up going with putting them back; and it was actually quite effective. But I think you know, there was... a lot of the times we were in agreement, and supporting and trying things. There were times we disagreed, but that's going to happen, isn't it? And you know, we just tried it, and if it didn't work it didn't work; and if it did work it did work; so yeah.

INT: Did you... Do you think you...? Sorry, I'm prompting here, I'm not sure I'm supposed to do this.

RES: That's okay.

INT: Did you feel you got any ideas from the others or vice versa?

RES: Yeah, absolutely. Absolutely. I mean, everybody has strengths and weaknesses in different areas. Obviously the teacher who was teaching that specific class would be stronger in a specific... actually in understanding their kids. So that was definitely a strength. And then just different experience, different – what's the word – theoretical understandings of what you might be doing, underpinning what you were doing. So...

INT: It must be interesting actually, seeing your children, who are in your class normally, who you teach, so therefore you know pretty well...

RES: In a different learning environment.

INT: Yes. With a different teacher.

RES: Yeah, they do, they act very, very differently. It's very funny, different dynamics.

INT: Yes. That was a by the way. I'm sorry Jeremy! [Laughs].

RES: No, you're all right. It's interesting! [Laughs].

INT: Right, now whole school enjoyment. What impact do you feel that lesson study has had on your enjoyment of working at this school?

RES: Enjoyment... It's interesting. I think – I'm not sure it's an enjoyment facet of it, I mean it's quite a lengthy and difficult process if you're really sitting

RES: Exactly right; which is yeah, wonderful.

INT: Teachers supporting other teachers with instructional problems.

RES: With instructional problems?

INT: I know. What does that mean?

RES: That sounds more like helping the teacher to teach in a different way, and I think we tried to sway away from that as much, because that to me, if you're commenting on their instruction, that's kind of like more analysing them as a teacher rather than the process. So I don't think we did a lot to do with the instruction, but we did implement just changes to routines and things like that that would help to change instructional... change the way instruction was given.

INT: Okay. Right, now your professional work: what impact do you feel that lesson study has had on changing your ways of teaching?

RES: What ways has it affected the way I teach?

INT: Has it? It may not have.

RES: No, no, it definitely has. I mean, every session you take away one or two little morsels of goodness that you necessarily won't use in every lesson, you'll just use in you know, some lessons and others. Focusing on paired talk, focusing on who's working with who; once again, you know, using sheets with partial work mapped out to save time, or to assist in scaffolding some of the students – something that I already did, but adopted new ways of doing it through with the guys. Anchor charts – doing it slightly different, just seeing different perspectives on how people do it. Yeah, so there's lots of different ways. It also gave me a scope in... like seeing sets, in each of the sets, seeing you know, the struggling learners and seeing the advanced learners, and really seeing that there is a benefit in intertwining those children, having that really fantastic dialogue, because, you know, trying to ask questions with the struggling learners, it really is hard to prompt those ideas to come forward: you really need those other kids to have great, fantastic dialogue, so...

INT: And any other lessons?

RES: Sorry?

INT: Any other lessons in the curriculum, not just maths, has it affected, do you think benefitted?

RES: [Pause] I think it would. I haven't really reflected on that to be fair, to think if I've brought it into. But I think things that you adopt in one area generally trickle into all the other areas, so...

INT: Yeah... Okay, your relationship with your pupils: has it had an effect?

RES: Yup... Has it had an effect on those? It certainly has. It was interesting when I was speaking with parents: it was really nice to be able to, you know,

for kids not in my set to be able to say, 'Oh! I saw them during the lesson study: they were working in this way, ra ra ra'. So I have more of an understanding of some of the kids that I don't teach in general classes, how they are in those classes. The relationship with the children: I think, I don't know, I think they found it interesting that we were coming in to their other classes and having a look; and it showed that we were interested in their learning as a broader, not just specifically what we're doing. I think we have a pretty good relationship with the kids at this school in general, though, so I mean, they seem to enjoy, I don't know, working with us, and we seem to enjoy working with them, so it's quite amicable.

INT: Okay. Do you think it's had an impact on your interest in trying out new ways of teaching?

RES: Mm. Absolutely. I went to some thinking skills training not long ago, and they were talking about trying challenging or new difficult, I think it was called golden lessons or something. Now I think that's a really good thing that lesson study offers is not necessarily refining and trying new ways, but trying something outlandish, or trying something that's so left-of-centre, that you've thought about but you haven't actually tried, you know. It gives you that real environment to try something out like that, and be able to break it down and have a look and see if it is effective or it did have an impact or it didn't, so... mm.

INT: Okay. Impact: has it had an impact on your interest in dealing with pupils in new ways?

RES: In dealing with pupils in new ways. That's a very broad question. Has it... Can I just have a look at the...?

INT: Yes. Your interest in dealing with pupils in new ways.

RES: Your interest in dealing with pupils in new ways. [Pause]. I don't quite know what that means! Dealing with pupils – as in the way you interact with the students?

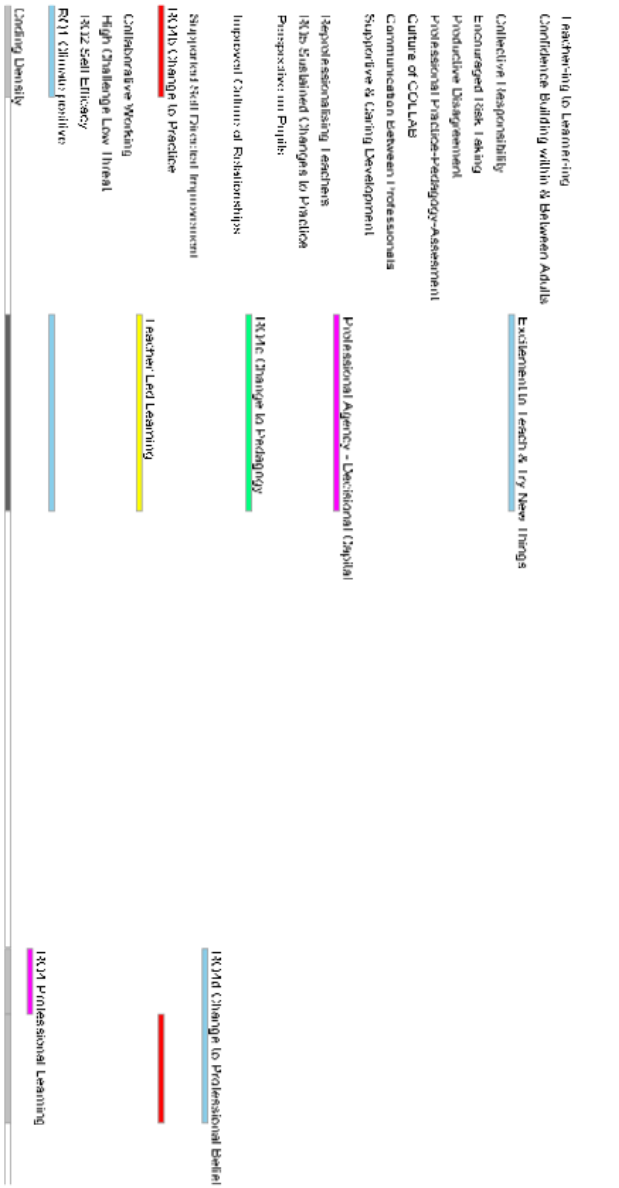
INT: It probably is. Think about the ones that perhaps you were looking at.

RES: Yep.

INT: Did it sort of introduce a different way of discussing with them, or [0:18:28] questioning them?

RES: I guess one of the biggest things that I noticed is that there are a lot of kids that rely on other children and don't do a lot of thinking for themselves, and it's very easy for them just to slip under the radar. And with a system like this, with the lesson study, you can really pinpoint those kids, and then once you know that a child is doing that sort of coasting, with a partner, then you can really try to mix it up; and that was one thing that I really noticed and identified since then with my class – there's quite a few kids that do that, and miss out on really good learning, so...

INT: Yeah. Okay. The influence on the organisation of your work and your classroom.



[*Interruption*]

RES: The interest in...

INT: Your interest... Oh, sorry! The influence on the organisation or your work.

RES: Your work and your classroom.

INT: Does it change that at all?

RES: The organisation of your work. No. No, I don't think it's changed the way we've organised the work. I mean, especially for the maths lessons: it's very, very systematic and organised, and the stages in which we teach those lessons are quite systematic. I don't think it changed any of that. Maybe assisted in slightly adjusting the timing, and seeing how people do things slightly different to try and move things along with pace. But I think the general organisation and the flow of the lessons is quite static and organised, so...

INT: Okay. And your own professional development needs as a teacher, and as a maths teacher.

RES: Mhm... I think it's fantastic. It's probably the most beneficial thing that a teacher can do with their time, lesson study, because it's, once again, it's non-judgemental, it's collaborative, I mean, it's everything that we want our learning to be for our students, and that's the same sort of learning environment for the teachers. So I think it's fantastic in that way. And it's not very often as a teacher you get a chance to sort of get into the mind of other teachers, or experience their teaching process, once again in a non-judgemental way. So I think it's fantastic.

INT: Brilliant! The next section's on self-efficacy. So the change not captured in questionnaires. In December you were asked to complete a self-efficacy questionnaire. The responses to that questionnaire showed a high level of self-efficacy for inclusive practice. Do you feel that lesson study improved upon your own self-efficacy for inclusive practice, had little to no impact; or had a negative impact on your self-efficacy for inclusive practice?

RES: Me personally, I think I've been growing and improving since the start of the year. It's a very different approach to teaching, and making sure that the class is inclusive throughout the maths programme is, I mean, it's something that's engrained in the Maths – No Problem! process. And I think, you know, using more resources; using more things to scaffold the student: I guess, you know, that to me has been increasing constantly over this year; and I think that this process has definitely helped to make that happen.

INT: Okay. Right, behaviour: what impact do you feel that lesson study has had on making your expectations clear about pupils' behaviour.

RES: Yeah, as I said before, that it was interesting to see the difference in behaviour between various classes and my class, and the kids and vice versa. You know, behaviour is something that's paramount for learning, and I think the behaviour is generally very, very good at this school. I think it's hard to

judge on behaviour, because I know that during the lesson study process there's additional adults in the room; so that's going to change the kids' behaviour. There's like potentially the teacher of those students in the classroom, so that's going to impact, you know, once again on their behaviour. So I think maybe behaviour-wise it's a different perspective. You know, like you're not getting an exact, natural behaviours that they would normally go. But it's still interesting to see how they behave differently in a different environment.

INT: Mm, okay. Do you think it's had an effect on calming a pupil who is disruptive or noisy?

RES: I'm not sure any of the kids that we specifically looked at were challenging on that front. I think most of the students we picked were quite well behaved. One student was a little bit excitable, but I think they were more so excitable because their teacher was in the classroom; but you know, still producing quality work, and...

[*Interruption*]

INT: What about – not necessarily the ones you picked, but the other children in the class – if they were sort of noisy or disruptive? Do you think that lesson study has made you teach in a way that perhaps they're more involved or more...?

RES: Yeah. I think, especially with Dave's class, because he's got a lot of advanced learners, and we really thought about systems in which we could have various phases of the same problem set out and ready to go. So in that way, if some of the kids got through the problem a lot faster, we could push them on, and enrich them with a similar problem in a more dynamic way. And I think that was fantastic for his class, really to be able to drive them further, in the lower set – sorry, the struggling learners.

INT: [Pause] That might not be a new one, no.

RES: Yeah, not so much. But with the advanced learners, definitely.

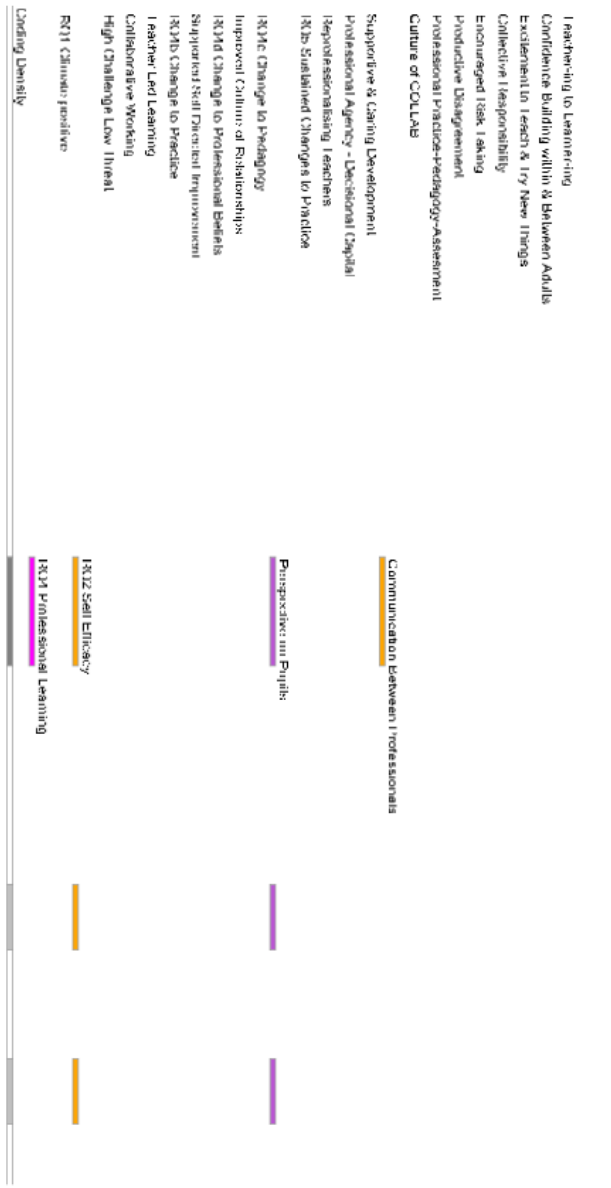
INT: Okay. How about preventing disruptive behaviour in the classroom before it occurs?

RES: Preventing behaviour before it occurs. I think if you're providing kids with the scaffolding support to do the work, generally that's going to stop the disruption. So it probably did help in that way. But once again we don't have hardly disruptive learning environment, so it's a bit hard to...

INT: Controlling disruptive behaviour in the classroom. If you haven't really got any, that's a tricky one.

RES: No. Yeah, once again I think it's just providing the kids with the right scaffolding and support, and the disruption definitely goes along with that, so vanishes with that.

INT: Yeah. Okay. Did I say controlling disruptive behaviour?



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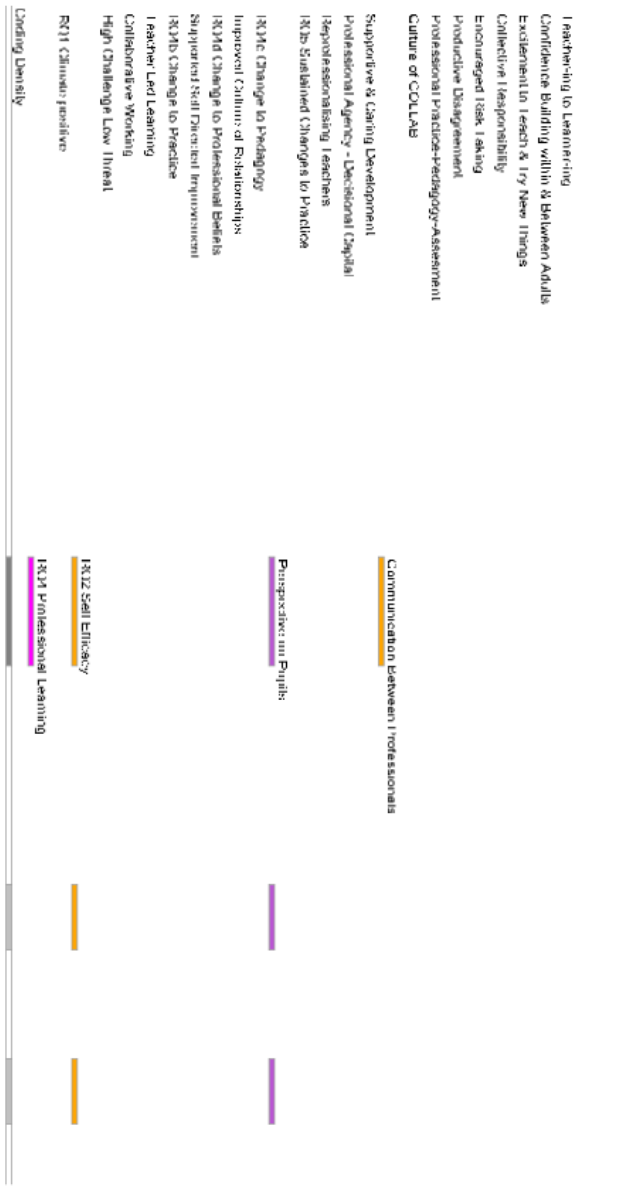

D: School Climate Questionnaire

School Climate Scale

This survey is designed to help understand the nature of factors influencing the climate of a school. School climate refers to the quality and character of school life as it relates to norms and values, interpersonal relations and social interactions, and organizational processes and structures.

Please select the answer that best represents your opinion about each of the statements.
* Required

1. Name *

2. I like the collegial atmosphere at this school. *

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

3. I like the teachers' professional attitude at this school.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

4. Teachers at this school are helpful towards each other.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

5. Teachers at this school generally agree on working and teaching methods.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

6. I enjoy working at this school.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

7. New teachers are easily accepted in the school.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

8. The teachers at this school are keen to try out new ways of working and cooperating.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

9. I discuss with the other teachers at my school how I work with my pupils.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

10. I speak openly with the other teachers at school about my relationship with my pupils.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

11. The teachers at school speak openly to each other about their relationship with their pupils.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

12. The teachers at school collaborate with regard to working and teaching methods.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

13. Teachers at this school consult each other on professional issues and concerns.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

14. When a teacher has problems in her/his teaching, other teachers offer help and support.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

15. To what extent have you changed your way of teaching in the past two years?

Mark only one oval.

	1	2	3	4	5	6	
Seldom/Never	◯	◯	◯	◯	◯	◯	Very Often

16. To what extent has your relationship to your pupils changed in the past two years?

Mark only one oval.

	1	2	3	4	5	6	
Not at all	◯	◯	◯	◯	◯	◯	Significantly

17. I am keen to try out new ways of teaching.

Mark only one oval.

	1	2	3	4	5	6	
Seldom/Never	◯	◯	◯	◯	◯	◯	Very Often

18. I am keen to try out new ways of dealing with pupils.

Mark only one oval.

	1	2	3	4	5	6	
Seldom/Never	◯	◯	◯	◯	◯	◯	Very Often

19. I have a great deal of influence on the organisation of work in my classroom (within the general given framework).

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

20. I have little opportunity to organise the work in my class as I would like.

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

21. I am relatively free to organise the work in my class as I would like (within the general given framework).

Mark only one oval.

	1	2	3	4	5	6	
Does not apply at all	◯	◯	◯	◯	◯	◯	Applies Exactly

E: Self-Efficacy for Inclusive Practice Questionnaire

Teacher Efficacy for Inclusive Practice Scale

This survey is designed to help understand the nature of factors influencing the success of routine classroom activities in creating an inclusive classroom environment. In an inclusive classroom students from a wide range of diverse backgrounds and abilities learn together with necessary supports available to teachers and students.

Please select the answer that best represents your opinion about each of the statements.
* Required

1. I can make my expectations clear about pupil behaviour.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

2. I am able to calm a pupil who is disruptive or noisy.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

3. I can make parents feel comfortable coming to school

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

4. I can assist families in helping their children do well in school

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

5. I can accurately gauge pupil comprehension of what I have taught.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

6. I can provide appropriate challenges for very capable pupils.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

7. I am confident in my ability to prevent disruptive behaviour in the classroom before it occurs.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

8. I can control disruptive behaviour in the classroom.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

9. I am confident in my ability to get parents involved in school activities of their children with learning difficulties

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

10. I am confident in designing learning tasks so that the individual needs of puipls with learning difficulties are accommodated

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

11. I am able to get pupils to follow classroom rules

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

12. I can collaborate with other professionals (e.g., itinerant teachers or speech pathologists) in designing educational plans for pupils with learning difficulties

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

13. I am confident in my ability to get pupils to work together in pairs or in small groups

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

14. I am able to work jointly with other professionals and staff (e.g., aides, other teachers) to teach pupils with learning difficulties in the classroom

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

15. I can use a variety of assessment strategies (e.g., portfolio assessment, modified tests, performance-based assessment, etc.)

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

16. I am confident in informing others who know little about laws and policies relating to the inclusion of pupils with learning difficulties

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

17. I am confident when dealing with pupils who are physically aggressive.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

18. I can ask a range of questions for pupils with different levels of understanding

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

19. I am confident finding different points of entry for different pupils within the same maths lesson.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

20. In a maths lesson, I can provide both written and oral ways for pupils to show what they have learned.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

21. In a maths lesson, I can provide pictorial or concrete approaches for pupils to show what they have learned.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

22. I can introduce different learning strategies for pupils to approach the same learning task.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree
- ◯ Strongly Agree

23. I can provide visual or other materials to support pupils in solving a maths task.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Disagree Somewhat
- ◯ Agree Somewhat
- ◯ Agree

F: Individual Interview Schedule

Individual Interview Questions

Summer 2016

Post Wave 1 and 2

With a view to the impact being positive, neural or negative impact:

1 - In December you were asked to complete a school climate questionnaire. The responses to that questionnaire showed a very positive school climate, making it more difficult to interpret the impact of using Lesson Study. Do you feel that Lesson Study improved upon the positive climate; had little to no impact; or had a negative impact on the school climate?

2 - What impact do you feel that Lesson Study has had on the collegial atmosphere of the school?

3 - What impact do you think it’s had on teachers’ professional attitudes at the school?

4 - What impact do you think it’s had on teacher collaboration?

5 - What impact do you think it’s had on teachers agreeing on collective working and teaching methods?

6 - What impact do you feel that Lesson Study has had on your enjoyment of working at this school?

7 - What impact do you think it’s had on accepting new teachers at the school?

8 - What impact do you think it’s had on teachers being keen to work in new ways?

9 - What impact do you feel that Lesson Study has had on collaborative discussion about pupils’ learning

10 - What impact do you think it’s had on teachers talking openly about their relationships with pupils?

11 - What impact do you feel that Lesson Study has had on teachers at the school collaborating on working and teaching methods?

12 - What impact do you think it's had on teachers consulting each other on professional issues and concerns?

13 - What impact do you think it's had on teachers supporting other teachers with instructional problems?

14 - What impact do you feel that Lesson Study has had on changing your ways of teaching?

15 - What impact do you think it's had on your relationship with your pupils?

16 - What impact do you think it's had on your interest in trying out new ways of teaching?

17 - What impact do you think it's had on your interest in dealing with pupils in new ways?

18 - What impact do you think it's had on the organization of your work?

19 - What impact do you think it's had on your own professional development needs as a teacher, and as a maths teacher?

20 - In December you were asked to complete a self-efficacy questionnaire. The responses to that questionnaire showed a high level of self-efficacy for inclusive practice. Do you feel that Lesson Study improved upon

your own self-efficacy for inclusive practice, had little to no impact; or had a negative impact on your self-efficacy for inclusive practice?

21 - What impact do you feel that Lesson Study has had on making your expectations clear about pupils' behaviour?

22 - What impact do you feel that Lesson Study has had on calming a pupil who is disruptive or noisy?

23 - What impact do you feel that Lesson Study has had on preventing disruptive behaviour in the classroom before it occurs?

24 - What impact do you feel that Lesson Study has had on controlling disruptive behaviour in the classroom?

25 - What impact do you feel that Lesson Study has had on getting pupils to follow classroom rules?

26 - What impact do you feel that Lesson Study has had on dealing with pupils who are physically aggressive?

27 - What impact do you feel that Lesson Study has had on making parents feel comfortable coming to school?

28 - What impact do you feel that Lesson Study has had on assisting families in helping their children to do well in school?

29 - What impact do you feel that Lesson Study has had on getting parents of children with learning difficulties involved in school activities?

30 - What impact do you feel that Lesson Study has had on gauging pupils' comprehension of what you have taught?

31 - What impact do you feel that Lesson Study has had on providing appropriate challenges for very capable pupils?

32 - What impact do you feel that Lesson Study has had on designing learning tasks so that the individual needs of pupils with learning difficulties are accommodated?

33 - What impact do you feel that Lesson Study has had on getting pupils to work together in small groups or pairs?

34 - What impact do you feel that Lesson Study has had on using a variety of assessment strategies?

35 - What impact do you feel that Lesson Study has had on asking a range of questions for pupils with different levels of understanding?

36 - What impact do you feel that Lesson Study has had on finding different points of entry for different pupils within the same lesson?

37 - What impact do you feel that Lesson Study has had on introducing different learning strategies for pupils to approach the same learning task?

38 - What impact do you feel that Lesson Study has had on providing visual or other materials to support pupils in solving a maths task?

39 - What impact do you feel that Lesson Study has had on collaborating with other professionals in designing plans for pupils with learning difficulties?

40 - What impact do you feel that Lesson Study has had on your ability to provide written and oral ways for pupils to show what they have learned in maths?

41 - What impact do you feel that Lesson Study has had on your ability to provide pictorial or concrete approaches for pupils to show what they have learned in maths?

G: Group Interview Schedule

Group Interview Schedule

1. **The broad aim of the Lesson Study:**
    a. *The aim of the Lesson Study was:*

1 – To positively change school climate through the introduction of Lesson Study as professional learning and development tool

2 – To improve teacher self-efficacy in teaching in inclusive, mixed-ability classes in mathematics

3 – To revise and adapt current teaching strategies being used with struggling and advanced learners in Singaporean style mathematics with regard to pupil progress in a lesson

4 – To design a programme of lesson study that meets the professional development needs of the school and teachers

To what extent were these aims met?

i. Probe for all aims
    1. Can you give more detail?
    2. What made it possible to meet or not meet this aim?

2. **Lesson study procedures and practical issues:**
    a. How did the communication in research and planning meetings work?
        i. What do you think worked well?
        ii. How was the quality of communication?
        iii. What needs to be improved and how?
    b. What kinds of knowledge were used in the lesson studies?

(if practical/professional knowledge used ask:)

i. What was the practical knowledge?
ii. How was practical knowledge used?
iii. Whose knowledge was it?

(if research based knowledge was used ask)

iv. What research based knowledge was used?
v. How was the research-based knowledge used?
vi. Whose knowledge was it?

c. Where did it come from?

d. What needs to be improved as regards the LS team and how?

How did your team cooperate?

i. What worked well?
ii. What needs to be improved and how?
iii. What do you think each one of you offered to the team?
iv. What do you think was your own role/contribution to the team?
v. Did you experience any tensions in your team?

e. Did you have any problems regarding time?

i. Was there enough support from the school (especially regarding cover)?
ii. Were there an issues over time?
    1. Was there enough time for the review and planning meetings?
    2. Did you have enough time or too much time between the review and planning meetings and the research lesson?
    3. Anything else regarding time?

f. What are your views about the usefulness of the Lesson Study templates?

i. If yes, in what ways?
ii. If not, why?
iii. Who completed the templates, and why?
iv. Where there any practical difficulties as regards the templates?

3. Lesson study process

a. What were the strengths and difficulties of this Lesson Study process?

i. Was there something that you feel was particularly useful in the LS process?
ii. Was there something that you feel was problematic?

4. **Outcomes of the Lesson Study**:

a. What were the positive and negative outcomes of the lesson study...?

	+ve	-ve
For yourself?		
For others in your team?		
For case pupils?		
For other pupils in the class?		
For practice?		
For future research?		
For professional development?		
Other?		

b. What went on in LS process...?

i. That resulted in positive outcomes?

ii. That resulted in any negative outcomes?

c. What other (contextual) factors affected the project's outcomes?

i. In a positive way?

ii. In negative ways?

d. Did you find the process to be creative enough?

5. **Is there anything left undiscussed?**

H: Sample Research Poster

Three Bridges Primary School
Lesson Study: Advanced and Struggling Learners in Mathematics
Spring 2016

Group Members

[redacted]

Class Context & Unit of Work

Multiplication and Division. The first lesson looked at using 4 times table facts to work out 8 times table facts. The second lesson was the first lesson on division and making groups of three or three equal groups of counters. The third lesson was on dividing by 4 and 8 by putting objects into 4 and 8 groups and using inverse multiplication facts to derive answers.

In Year 3, the majority of the cohort is working below, however there is a small group of pupils working significantly above average. Progress through the Maths No Problem workbook has been slow as teachers have found the majority of lessons need to be spread over 2 days to ensure minimal step progression from the target group of struggling learners. Teachers spend much of the learning time with struggling pupils who require more reinforcement, meanwhile some more able pupils are not yet able to independently challenge themselves and deepen their own understanding.

Case Pupils (age and other information)

Sadie, aged 8, weak number sense, lacks self-confidence, doesn't ask for help, copies others if stuck.

Jimmy, age 7, good number sense, quick to grasp concepts, reluctant to explain his thinking verbally and doesn't demonstrate his knowledge or self-check

Strategy Analysis (Chosen strategies, observations and evidence of success)

We aimed to unpick the language contained in the anchor tasks and make sure pupils had understanding of the key words and phrases in order to make them accessible to all learners and remove potential causes of confusion, for example in the division lesson, the teacher emphasised "make groups of 3" and "make 3 equal groups" and this was modelled to the class repeatedly at key points and pupils were encouraged to use the key vocabulary in their partner talk.

We also provided additional concrete materials to scaffold independent learning of key concepts such as "lots of" and "grouping", for example using counters and grouping frames on sheets of paper. Pupils used a scaffolded activity on Explain Everything (iPad app) to photograph what they did with the concrete materials, which supported them in writing number sentences, and then groups were selected to share with the whole class.

We attempted to make more able pupils more accountable for their own learning and develop verbal skills by asking them to record their methods and thinking on iPads which could then be used to present to the whole class. In addition, we provided more able pupils with a daily checklist of tasks in each stage of the lesson that should be completed before moving on or asking the teacher what to do next. This was used to encourage greater independence and allow for differentiation of pace within the lesson.

After the first lesson, where Sadie was observed copying, with little understanding, from her more able partner during the guided practice, we decided to put pupils into similar ability pairings. In order to facilitate higher quality exchanges and evaluation of one another's methods, we gave whiteboards out between pairs rather than individually.

Progress Measures (analysis of effectiveness)

Sadie was able to use the concrete materials provided – coloured counters, pictures of bird stands (the anchor task in the second lesson involved working out how many stands would be needed for six birds), sheets with 8 circles for grouping. A changing of pairings from mixed ability to similar ability and a clearer understanding of the relevant mathematical language led to her being observed explaining her method to her partner. She was able to self-correct when questioned by the teacher and was even able to make a connection between dividing by 4 and dividing by 8.

Jimmy became more focused because over the course of the lesson study the teacher developed the confidence to allow pupils to move on at a quicker pace. In the final lesson, he met all success criteria and was able to independently move on to the enrichment task and write an appropriate word problem to demonstrate his understanding of division.

Conclusions / Future Research

Similar ability pairings work best for anchor task and guided practice

Teachers should not be afraid to differentiate the pace of the lesson to allow able learners to move on at their own pace while struggling learners spend longer on practical tasks, even if they do not get on to independent worksheet

Providing pupils with a simple checklist may help them to become more independent, but time needs to be taken to show pupils how to use this effectively

Keep tasks simple and scaffolded for struggling learners – cut down on any distractions, e.g. different coloured counters

Sequence methods according to difficulty on anchor chart

Make pupils accountable for their own learning by asking them to record their methods using an iPad

Develop partner talk and listening skills by having one mini whiteboard between two and asking pairs to take it in turns to talk and write

I: Sample Research Poster Post Research Study

Lesson Study 16-18 Oct 2017

Research Team	Progress Measures (analysis of effectiveness)
[redacted]	1) Slight change to pairings We noticed that pupil B was talking across the table for the majority of the lesson to just one pupil, rather than to his partner. By simply swapping pupil B and his partner, it meant he was slightly removed from this pupil so would refer to his partner and the girl opposite for support more, rather than just interacting with the child opposite, which wasn't always most effective. There were also other pairs that were swapped to improve their interactions and enable them to contribute more to class discussions, as one partner was able to draw on the other's thinking. 2) On Wednesday, the children were given a choice of 2 questions to answer in their journals, rather than the normal case where there is only one question. This enabled the children to use their higher order thinking skills. One of these required the children to find the most sophisticated method for the numbers given and the other was to describe the method they used. We had used the phrasing 'best method' and found most pupils interpreted this to mean their favourite method, rather than the most efficient. In future, the phrasing of questions will be considered to ensure this misconception does not arise again. 3) On Monday, the students did not have enough time to explore the anchor task in depth, so it was discussed to give them longer on the following lessons. We found that this then meant when the anchor chart was created, all methods had already been explored. It also resulted in the reading and reflecting being discussed before books were even opened. This can be phrased as 'Wasting time to save time.' 4) By having different resources available, it enabled pupils who were able to use the abstract method straight away to now explore different methods. We also found that proximity to the anchor task helped, so photocopying this and giving a copy to each child removed a barrier in their learning. Pupils A and B would automatically use the abstract method in lesson 1, but by the end of the lesson study were more confident with exploring using the concrete materials. 5) Answering questions as a pair is a new concept that needs to be embedded. Rather than benefiting whole class discussion, we found it benefitted the partner talk more, as students knew they would both be called upon within the lesson. As the lesson went on, this became less effective so would need to be consistently used in order to be fully effective. 6) Children who were initially reluctant to share their ideas on day 1 knew that they had knowledge to share on the subject on the following days, and so became more confident with sharing more of their ideas. Revisiting concepts allowed children to build upon their knowledge and develop the courage to speak out in class.
Class Context & Unit of Work Year 6 mixed grouping class 20 students Mixed grouping on tables Three maths lesson on fractions, moving from simplifying fractions to comparing them	
Case Pupils (Age and characteristics) Pupil A - 10 year old girl, confident learner, quiet in nature, joined Three Bridges midway through year 4 Pupil B - 10 year old boy, confident member of the school	
Strategy Analysis (Chosen strategies, observations and definition of success) 1) Slight change to pairings 2) Journal choices given 3) Longer time spent on anchor task and discussing the various methods 4) Concrete materials provided, including a choice of pre-drawn bars 5) Answering questions as part of a partnership rather than individually 6) Revisiting previous strategies, such as repetitive use of vocabulary	**Conclusions/Professional Learning** During our lesson study, we came across five domains of challenge: 1) **Cognitive** - the actual maths. Students being able to solve the problem using any method. The movement between concrete, pictorial and abstract. 2) **Metacognitive** - pupils being able to spot mistakes, recognising and selecting the most effective methods, being able to make generalisations and adding a new perspective to a previous response. 3) **Mindsets** - having a productive set of beliefs, developing an understanding of how they work best and the ability to challenge themselves. 4) **Social collaboration** - contributing to the learning of others and developing themselves through this, seeking help and questioning of their partner. 5) **Affective** - showing perseverance, restraint and enjoyment within the lessons, understanding that it is okay to struggle with a task or problem. Teachers need to be able to recognise the turning points within the lesson and that children learn at different points. Learning happens when children are teetering on the edge. We can't push them so far they fall off, but ye, we can't keep them too stable. Lesson study empowers teachers to develop their understanding of the curriculum, how students learn and their attitudes towards learning. For example, in lesson 2, which involved finding equivalent fractions, the turning points were: • Can the pupil divide? • Can the pupil divide by an appropriate number? • Can they divide by a common factor? • Can they divide by the highest common factor? Teachers need to develop an understanding of how far to push the children through these turning points based upon learning routines and the child's readiness. It is important that the teacher facilitates confident learners who feel that their learning environment is inclusive, are given the provision of time for exploration and are aware that different representations will be accepted. Teachers need to be non-judgemental. This lesson study confirmed our previous belief that students learn best in mixed ability settings. They are all exposed to the same language and ideas, so can build upon these themselves when ready. A question we will always face as teachers is 'How can we make this better?'