

**THE IMPACT OF LESSON STUDY ON THE PROFESSIONAL DEVELOPMENT OF  
EARLY GRADE TEACHERS**

**by**

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**Submitted in partial fulfilment of the requirements for the degree**

**PHILOSOPHIAE DOCTOR**

**in the Faculty of Education**

**at the**

**UNIVERSITY OF PRETORIA**

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## **Declaration**

I declare that the dissertation/thesis that I hereby submit for the degree philosophiae doctor at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.



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1 January 2021

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The author, whose name appears on the title page of this thesis, has obtained, for the research described in this work, the applicable research ethics approval. The author declares that she has observed the ethical standards required in terms of the University of Pretoria's *Code of ethics for researchers and the Policy guidelines for responsible research*.

## **Dedication**

I dedicate this research to my mom, Emmy Bradshaw, for being gently courageous, a wise counsellor, and my true friend.

## **Acknowledgements**

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## **Abstract**

The professional development of teachers in South Africa needs critical attention, particularly in the area of early grade mathematics. The Integrated Strategic Planning Framework for Teacher Education and Development in South Africa 2011–2025 (ISPFTED) (DBE, 2011) proposes the creation of professional learning communities as a school-based initiative to this end. In a South African context, Japanese lesson study is a relatively undocumented professional development tool. This inquiry is a case study exploring the effect of introducing lesson study in the early grades of a primary school, particularly in the subject of mathematics. Findings suggest that lesson study has a marked and positive effect on the professional development of early grade teachers in a local context.

Seven teachers from Grade R to Grade 2 participated in a lesson study programme for a period of four months, meeting weekly to plan and provide feedback on lessons. Key findings of the study reveal that lesson study is a highly effective collaborative tool for improving both the subject content knowledge and pedagogical content knowledge of early grade teachers. This was evidenced in a more problem-centred approach to teaching. Furthermore, improvements were noted in teacher creativity, self-confidence and learner-centeredness. Lesson study provoked intergrade collaboration, curriculum development and lesson flow. The findings suggest that learning extends beyond the scope and confines of the actual lesson study sessions to provoke extensive self-reflection and self-analysis. Through lesson study, the professional development process becomes highly contextualised.

Findings furthermore suggest that teacher motivation to participate in lesson study remains a multi-faceted problem and the cooperation of school management is critical for making time allowances and working within the school timetable. An inherent fear of demonstrating lessons in front of others, as well as the fear of inadequate input during group sessions are additional personal challenges to the process.

This study proposes a model for the effective facilitation of lesson study sessions and navigating the dynamic and interrelated variables of goal-setting, content exploration, activity planning, resource selection and peer feedback. The scientific importance of the study lies in building a knowledge base by gaining an understanding of the

outcomes, viability and practical challenges facing schools as they implement this collaborative and contextually-based professional development method.

**Key Terms:**

Collaboration, content knowledge, early grades, fears in professional development, intergrade, learner-centred, lesson study, mathematics, observation, pedagogical content knowledge, problem-centred, professional development, professional learning community, self-reflection



## Declaration by the Language Editor



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### THE IMPACT OF LESSON STUDY ON THE PROFESSIONAL DEVELOPMENT OF EARLY GRADE TEACHERS

for **Erika G Helmbold** for the purpose of submission as a postgraduate  
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## **List of Abbreviations**

|         |                                                                                                         |
|---------|---------------------------------------------------------------------------------------------------------|
| DBE     | Department of Basic Education South Africa                                                              |
| ISPFTED | Integrated Strategic Planning Framework for Teacher Education and Development in South Africa 2011–2025 |
| LS      | Lesson study                                                                                            |
| PD      | Professional development                                                                                |
| PLC     | Professional learning community                                                                         |
| ZPD     | Zone of proximal development                                                                            |

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## **1. CHAPTER ONE: GENERAL ORIENTATION**

### **1.1 INTRODUCTION**

A Japanese proverb states, “Better than a thousand days of diligent study is one day with a great teacher” (Vapnik & Izmailov, 2015:2024). Learner success is linked to effective teaching and the teacher’s classroom practices determine learners’ achievements (Kane, Taylor, Tyler & Wooten, 2011:611; Stronge, Ward & Grant, 2011:351). Towards this end, teachers should continually grow in knowledge and skills in order to be effective and to implement the best educational practices possible (Mizell, 2010:3). Professional development (PD) of teachers is a necessary process that promotes the growth of this knowledge and enables teachers to put knowledge into practice for the benefit of their learners (Avalos, 2011:10). In South Africa, many teachers enter the workplace feeling unprepared to teach the subjects assigned to them (Deacon, 2016:14). They are often placed as educators of subjects in which they never specialised (Deacon, 2015:13) or in grades for which they have no professional training (Green, Parker, Deacon & Hall, 2011:111). South African teachers’ lack of content knowledge, particularly in mathematics, is disconcerting (Venkat & Spaul, 2015) and their poor teaching standards have elicited scathing criticism in the press (Brown, 2019; Robinson, 2019; Savides, 2017). For the sake of learner achievement, there is an urgent call for intervention through the effective PD of South African teachers (CDE, 2015:22; HRDC, 2014:7; Steyn, 2008:16; Steyn, 2010:157).

Teachers’ PD is addressed in the Department of Basic Education’s (DBE) (2015:34) Action Plan for the period 2015–2019. The goal of improving professionalism in teaching (goal 16) describes the DBE’s vision to strengthen and improve teacher capacity in the country. This goal is a confirmation of the DBE’s Integrated Strategic Planning Framework for Teacher Education and Development in South Africa 2011–2025 (ISPFTED)(DBE, 2011a). A portion of the ISPFTED vision for the continuous PD of teachers is currently being implemented by the South African Council for Educators (SACE). SACE pre-dates the ISPFTED as an institute for the registration of educators. The body also ensures that educators adhere to a professional code of ethics and promotes PD. SACE introduced the Continuing Professional Teacher Development Management system (CPTD) virtually concurrently with the launch of the ISPFTED, to

better achieve their PD goals. Participation is compulsory for teachers in the public sector.

Continued PD in South Africa is offered primarily through SACE approved courses. However, the ISPFTED advocates an additional avenue of PD with the creation of professional learning communities (PLCs) (DBE, 2011a:14). These school-based PLCs are meant to help teachers integrate their own professional knowledge with the latest research-based knowledge. Evidence suggests that school-embedded, collaborative PD has a greater effect on teacher PD than non-school-based PD courses and workshops (Opfer, 2016:29).

Although the ISPFTED's proposed school-based collaborative PD initiatives are highly commendable, criticism centres on the fact that these professional learning communities are slow to form and "have yet to take off across a wide range of schools" (DBE 2015:35). There is almost no documented evidence of the envisioned wide-spread creation of these learning communities in a South African context. This either implies a lack of formal recording, or a lack of motivation and know-how to successfully implement this bottom-up PD approach.

The ISPFTED's top-down PD approach of "workshopping" has resulted little documented improvement and seems still to fit the pattern of criticism expounded by Steyn over a decade ago – that short-term workshops translate into little evidence of actual lasting improvement in schools (Steyn, 2008:18). Teachers complain that many of the PD programmes offered by the CPTD system are of a poor quality, particularly in terms of their content and style of delivery (Mukeredzi, 2013:99; Steyn, 2010:171). Workshops have been criticised for their disregard of the participant teachers' needs in a "one-size-fits-all" approach (Mukeredzi, 2013:99; Bertram 2011:13). These courses have also been described as having little practical value, merely repeating what is already known and translating into a waste of time and money (Steyn, 2010:171). The short duration of the courses makes them less effective than other more sustained PD approaches of a longer duration (Cordingley, Higgins, Greany, Buckler, Coles-Jordan, Crisp, Saunders & Coe, 2015:4; Darling-Hammond & Richardson, 2009:49; DeMonte, 2013:7; Taylor, 2008:25). Even with the SACE-prescribed accumulation of PD points for educators, the DBE acknowledges that the

average South African teacher only spends 12 or less hours on PD annually (DBE, 2015b:34).

In addition to the criticism associated with non-starter PLCs (DBE, 2015:35) and ineffective CPTD short-term courses, there is concern about the level of personal responsibility teachers have to take for their own PD. The DBE relies on teacher motivation for active and meaningful participation in the opportunities provided by the state (DBE, 2011a:1). However, research indicates that one of the greatest challenges to PD is the high level of motivation required for teachers to move out of their comfort zones and become involved in PD and learning (Heystek & Terhoven, 2015:629). Many veteran teachers are unwilling to voluntarily attempt change and venture into new teaching styles or approaches as they feel let down by the constant school reforms and are disenchanted with young, enthusiastic administrators who have insufficient respect for their experience (Snyder, 2017). Teachers approaching retirement age often do not see the benefit of further developing themselves (Geldenhuys & Oosthuizen, 2015:210). Although motivation levels for PD may be higher in younger teachers, More (2016:104) researched non-age-specific demotivating factors contributing to the lack of involvement in PD among South African teachers. He concluded that factors like poor communication about opportunities, long travel distances to courses, personal resistance to change, negative attitudes towards PD, lack of finances and time constraints, all resulted in teacher resistance to PD.

Steyn posits that in a school community, the challenge of motivating staff to engage in PD is the responsibility of the school head (2011:51). Quality leadership indirectly spurs on staff and creates a spirit of commitment and the working conditions conducive to PD (Leithwood, Harris & Hopkins, 2008:32). The importance of school leadership in moulding a collaborative learning environment has been highlighted in several studies (Bush, Joubert, Kiggundu & van Rooyen, 2010:162; Heystek & Terhoven, 2015:629; Jones, Stall & Yarbrough, 2013:360; Supovitz, Sirinides & May, 2010:35). Effective teacher development should incorporate quality in-service co-learning among teachers (Avalos, 2011:17; DuFour, 2007:8) and be initiated and supported by principals for a more successful and sustainable outcome (Brown & Militello, 2016:704; Mendels, 2012:56). This contextually relevant, collaborative and long-term approach accurately describes some of the fundamental attributes of the well-

established teacher development method of Japanese lesson study (LS) (Arani, Fukaya & Lassegard, 2010).

LS is a PD tool that involves the creation of collaborative teaching communities in schools. It has the potential to be launched and sustained in the micro-schooling system. LS communities cooperatively plan, present and analyse lessons, and teachers work together to develop lessons and teaching styles that best promote learning in their individual school contexts (Murata, 2011:3).

In addition to the noteworthy principles mentioned above, a further appeal of the Japanese LS method is its foundation in improving mathematics instruction through problem-based learning (Shimizu, 1924). With the press constantly drawing the public eye to the devastatingly poor performance of South African children in mathematics (News24, 2017; Fin24, 2017; Citizen, 2016; Ngoepe, 2016; Walton, 2016) and 42% of matriculants achieving below 30% in the subject, (DBE, 2018:56), LS as an early intervention strategy for the PD of early grade teachers teaching mathematics may be one of the best tools for remedy at our disposal.

Little research has been done on the implementation of LS in the South African context. Although an LS pilot project was unsuccessfully implemented in Mpumalanga (Ono & Ferreira, 2010) and a second research project was started in the Western Cape (Coe, Frick & Carl, 2010:214), there is no known recorded research on the implementation of LS in early grades in South Africa, particularly in mathematics. In light of exhaustive research into the implementation of LS internationally, it is pertinent that more research be undertaken on the flexibility of LS as a fitting tool for PD in a local context.

## **1.2 RATIONALE**

Having worked at a primary school for twenty years, I have often been frustrated with the lack of motivation among my colleagues to professionally develop themselves. Veteran teachers often resort to the adage, “if it isn’t broken, why fix it?” and find themselves repeating their content and teaching styles year after year. Younger teachers start with motivation to develop professionally but are quickly frustrated by the lack of quality and relevant learning opportunities afforded to them, as well as limited time to engage in these opportunities. In addition to this, I have found that the

result of short-term courses is a brief spark of interest, but seldom the long-term desired result in the classroom.

Furthermore, contrary to the collaborative PLC approach, I have witnessed the apparent unwillingness of South African teachers to share their intellectual resources. It is difficult to determine whether this stems from a deep-rooted fear of “idea theft” without due credit; the insecurity of putting forward something of little interest to others; or simply a life-long habit of teaching in isolation. An education system that does not lend itself to creating the time and structure for collaboration could be a contributing factor (Du Plessis & Marais, 2015:123; Ramatlapana & Makonye, 2012:21; Steyn, 2015).

Many years ago, as a beginner teacher, I was personally mentored by two talented Froebillian Dutch teachers who shared all their knowledge without reserve. As a result, I have always had a personal interest in sharing similar PD experiences with others, particularly in the area of early grade mathematics. It is against this backdrop that I began investigating the Japanese approach to PD called LS. A preliminary literature review revealed that LS has enjoyed world-wide success. Emerging in the US after 1999, it rapidly spread across 335 schools in 32 states over the short span of four years (Lewis, Perry & Murata, 2006:3). LS was successfully introduced in the UK in 2003 (Dudley, 2014:2) and in South-East Asian countries like Thailand in 2002 (Inprasitha, 2011:1). Malaysia started in 2004 (Cheah & Lim, 2010:3) and European countries like the Netherlands in 2013 (De Vries, 2016:2). The World Association of Lesson Studies (WALS) promotes the development of LS internationally, with annual conferences and research projects to improve the quality of teaching and learning through LS (WALSnet.org). I was impressed by the apparent simplicity, yet powerful effectiveness of LS as a PD tool (Makara, 2016:195; Mitchell, 2017:134; Ní Shúilleabháin, 2016:223). I was also surprised by the very limited documented research concerning its successful implementation in South Africa, despite it being a relatively “old” PD method, particularly as it was initially intended as a mathematics teacher PD method. It would appear to be an urgent and worthwhile endeavour to investigate its effectiveness in a South African context, where effective mathematics teaching seems to be in a crisis.

I hoped to become part of a community of teachers who successfully implement LS in my school over the course of the research, carefully documenting the process. I was curious about the personal and professional challenges we may face in implementing LS. I endeavoured to collaboratively explore the effectiveness of LS as a tool for staff development, and to investigate its effect on our pedagogical and content knowledge. I also trusted that by accurately recording this research, other school leaders and teachers would be inspired to try this “new” approach to PD and would be able to avoid the pitfalls we experienced along the way and be inspired to attempt LS in their own schools.

### **1.3 PROBLEM STATEMENT AND RESEARCH QUESTIONS**

#### **1.3.1 Problem statement**

Effective teaching acts on learner success. The DBE has proposed improving teaching practice through the ISPFTED, but there have been some challenges along the way. One such challenge is the poor course quality offered based on the top-down approach, and a second is the lack of know-how to create collaborative learning communities from the bottom up. These challenges set the stage for implementing Japanese LS as a PD tool at school level. This is still a relatively undocumented and emerging approach in the South African context.

#### **1.3.2 Primary research question**

The primary research question is:

- What is the impact of LS on the professional development of early grade teachers?

#### **1.3.3 Secondary research questions**

- What are teachers’ perceptions of the impact of using the LS method on curriculum development in mathematics in the early grades?
- What are teachers’ perceptions of the impact of using the LS method on their pedagogical content knowledge and content knowledge in teaching mathematics to the early grades?
- How can LS be adapted in a South African context to fit into a full school timetable?
- What are the challenges a school may encounter when implementing LS for the first time?

## **1.4 PURPOSE STATEMENTS**

The purpose of the proposed study was to determine the effect of the LS method as a tool for the PD of early grade teachers in a South African school context, in the subject field of mathematics. I investigated the viability of using LS, incorporating its characteristic cyclic nature by:

- implementing three LS cycles with early grade mathematics teachers; and
- observing, recording and describing the processes and challenges involved in the endeavour.

## **1.5 OBJECTIVES**

The objective of the research was to describe the effect of LS on early grade mathematics teachers in the following areas:

- overall professional development
- reflective thought processes
- cooperation across school grades
- content knowledge of Mathematics
- perceptions regarding curriculum development

Furthermore, the objective of the research was to describe the challenges and hurdles that teachers faced in implementing LS for the first time.

## **1.6 CONCEPT CLARIFICATION**

### **1.6.1 Impact**

According to the Oxford Dictionary, an impact is the measure of the “effect on someone or something” (OxfordLivingDictionaries.com). The Cambridge Dictionary goes further to explain that it is “a powerful effect that something, especially something new, has on a situation or person” (CambridgeDictionary.org). In the context of this research, impact refers to the observable changes in teacher behaviour, more specifically in all behaviours related to teaching (preparation, content knowledge, pedagogical knowledge, lesson delivery, lesson appraisal, curriculum development, learner interaction and peer interaction).



### **1.6.2 Lesson study**

LS is a form of classroom inquiry in which several teachers collaboratively plan, teach, observe, revise and share the results of a single class lesson. This study can be repeated cyclically. Over a cycle, teachers may “innovate or refine a pedagogical approach that will improve learners’ learning and which will be shared with others” (Dudley, 2014:1). It is a “systematic, research-oriented inquiry into the quality of classroom learning that results in a professional community of teachers who learn together” (Stols & Ono, 2016:1).

### **1.6.3 Professional development**

This is the term used in education to describe the activities that enhance the knowledge and skills of those in the workforce (Buysse, Winton, & Rous, 2009). It involves the development of competence or expertise in a profession and the necessary skills to improve performance in that profession (OxfordLivingDictionaries.com). Effective PD implies both a change in teacher knowledge and practices and a change in the outcomes of learner learning (Darling-Hammond, Hyler & Gardner, 2017:2). Within the context of the proposed research, PD includes the LS activities in which teachers engage that are designed to improve their expertise and overall teaching quality.

### **1.6.4 Early grades**

“School is compulsory from the beginning of the year in which the learner turns seven until the end of Grade 9 or of the year in which the learner turns 15 (whichever comes first). This stage is called General Education and Training, and it falls into three phases: The Foundation Phase (Grade R to 3). The Intermediate Phase (Grades 4 to 6). The Senior Phase (Grades 7 to 9)” (WCG, 2018). For the purposes of the proposed research early grade teachers or learners include Foundation Phase teachers who teach the first official four years of schooling (Grade R, 1, 2 and 3) (SASA, 1996:4) and the teachers who teach the two preceding grades (Grade RRR-R), which do not fall under the service delivery of the DBE (2001).

### **1.6.5 Mathematics**

Mathematics is “the science of numbers and their operations, interrelations, combinations, generalizations, and abstractions and of space configurations and their

structure, measurement, transformations, and generalizations” (Merriam-Webster.com). The Curriculum and Assessment Policy Statement (CAPS) document (DBE, 2011b:8) describes mathematics as a language that uses symbols and notations to describe numerical, geometric and graphical relations. The CAPS document goes further to describe it as a “human activity that involves observing, representing and investigating patterns and qualitative relationships in physical and social phenomena and between mathematical objects themselves” (DBE, 2011b:8). One of the most enduring definitions of mathematics is that it is “the science of numbers, magnitudes, and forms” (Boyer & Merzbach, 2011:1). This is confirmed in the broad definition of mathematics proposed by Burton: “Mathematics involves the study of issues of a quantitative or spatial nature – number, size, order, and form” (Burton, 2011:1). In the prescribed South African curriculum for the Foundation Phase, mathematics includes five particular content areas, namely: numbers, operations and relationships; patterns; functions and algebra; space and shape measurement; and data handling (DBE, 2011b:9).

#### **1.6.6 Professional learning communities**

Hord (1997) defines PLCs as communities “in which the teachers in a school and its administrators continuously seek and share learning, and act on their learning.” She continues to expound that these communities have the goal of improving professional effectiveness for the benefit of the learners (Hord, 1997). In her later work, Hord (2009:40) expands that a professional learning community combines learning about ways to assist learners in areas that they require assistance. It is a group of teachers with a “shared purpose, mutual regard and caring, and an insistence on integrity and truthfulness” (Hord, 2009:41). This community can include “a range people based inside and outside a school can mutually enhance each other’s and pupils’ learning as well as school development” (Stoll, Bolam, McMahon, Wallace & Thomas, 2006:223). In the context of this research the PLC is the LS group who met collaboratively to mutually learn and develop strategies to enhance learner learning in the lessons that were planned.

### **1.7 LITERATURE REVIEW**

A preliminary literature review revealed several themes that need further exploration to develop a well-rounded understanding of the research field. The theoretical

framework underpinning the research approach is explored from a combined conceptual perspective. Thereafter, the themes of PD in general and LS in specific are considered. Both of these themes are also considered in a South African context. Lastly, the theme of focusing the PD research on early grade mathematics in South Africa is explored.

### **1.7.1 Conceptual framework underpinning the study**

LS as a collaborative, adaptive and socially constructed method of PD, can be analysed through the theoretical lenses of three acclaimed educational reformists, namely John Dewey, Lev Vygotsky and Albert Bandura. The conceptual framework also incorporates the work of social psychologist Joseph McGrath. All four of these fundamental theories possess essential attributes that provided a handle on my interpretation of the effectiveness of LS as a PD tool.

#### **1.7.1.1 Vygotsky's social development theory**

In his social development theory, Vygotsky hypothesised that knowledge acquisition is affected by other people and mediated by community and culture (Amineh & Asl, 2015:10). Humans engage in cooperative learning through language and dialogues with more capable individuals. In this way, we collaboratively acquire the methods of performance to use independently at a later stage (Verenikina, 2010:np). Vygotsky's social development theory forms a very suitable framework for research regarding LS, as the theory proposes that a social context is required to learn about learning and for effective PD to occur. The analysis of a PD tool cannot occur in a social vacuum or as an exclusively objective academic endeavour. Hands-on researching of LS propagates the development of field-specific knowledge through the researcher interacting in a social context with teachers, collaboratively constructing lesson plans for research lessons, observing lessons and providing feedback collectively with a view to improving teaching and learning (Groves, Doig, Widjaja, Garner & Palmer, 2013:10).

#### **1.7.1.2 Dewey's educational theory**

Measuring the impact of LS is not only determined by the extent of the socially collaborative learning that occurs, but also the extent of the personal growth of educators who observe teaching in context, reflect about the teaching practices and

the lesson planning process, and utilise this introspective knowledge to analyse and adapt their own teaching. Researching LS involves examining the cognitive processes whereby research participants are led to a place of profound thinking about teaching both on a general and specific scale (Doig & Groves, 2011:86).

These cognitive processes involve building new knowledge onto prior experiential knowledge and concepts, as recommended by Dewey's educational theory (Dewey, 1938). He posited that education is not merely the transmission of knowledge onto blank slates but is a meta-cognitive process. The teacher's role, and in the context of this research, the role of the PD tool, should be that of creating a contextually relevant and experience-based assimilative learning experience (Dewey, 1938).

#### **1.7.1.3 Bandura's social learning theory**

The third theoretical framework underpinning this research draws on Albert Bandura's social cognitive theory. One of the pivotal concepts of this theory is that learning can take place vicariously, through the observation of behaviours in others (Bandura, 1965). As one of the critical components of LS involves the observation of lessons presented by others, it necessitates the researcher to consider the effectiveness of professional growth propagated through a vicarious process. An individual's self-efficacy is developed through external experiences, like performance accomplishments, vicarious experiences, verbal persuasion, and physiological state (Bandura, 1977:195).

Another tenet of social cognitive theory relevant to a research on LS is the idea that humans are capable of self-regulation. We influence our own actions and motivation by paying attention to our own performance, the conditions under which this performance occurs and the effects of our behaviour (Bandura, 1991:250). Assuming Bandura's theoretical framework is accurate, research should bring to light that participation in LS evokes a measure of self-regulatory behaviour in participant teachers. This can be investigated by exploring the impact LS has on the teacher's approach to teaching subjects outside of mathematics and on the teacher's lesson planning procedures, outside of the scope of LS research lessons.

#### **1.7.1.4 McGrath's input-process-output theory**

McGrath (1984) posits that group interaction is determined by a variety of inputs. The major categories of which are: the properties of the group members, the relation between the members, the group purpose and the environment in which the group functions. Changes made to the input conditions will translate into changes in the group's interactive processes, which will impact the group's output processes. McGrath's model is not, however, purely linear. He describes how interactive processes of the group feed back into the input variables in a fluid and continuous pattern. In the light of LS, McGrath's model implies that for impact to be made on the PD of a group of teachers, there has to be changes in the input variables of the group. If the input variables are strengthened this may lead to effective PD and the collaborative output of shared knowledge. Conversely, this implies that a lack of original, quality input of e.g., content and pedagogical knowledge, can be a drawback to the successful output of effective PD. Teachers may simply be working together to reinforce the school's status quo, without improving teaching practice (Stanley, 2011:73). This was the experience in research conducted by Ogegbo, Gaigher and Salagaram (2019:5) where participants in one South African LS case study did not improve their content knowledge due to their mutual ignorance. In this situation, teachers could not support each other, creating an environment of mutual misunderstanding. It is imperative that "to carry out effective and high-quality lesson studies, teachers need to acquire strong content knowledge and pedagogical skills so they can anticipate student learning behaviours and develop a plan that reflects appropriate content and methodology for the concepts to be taught" (Yoshida, 2012:145).

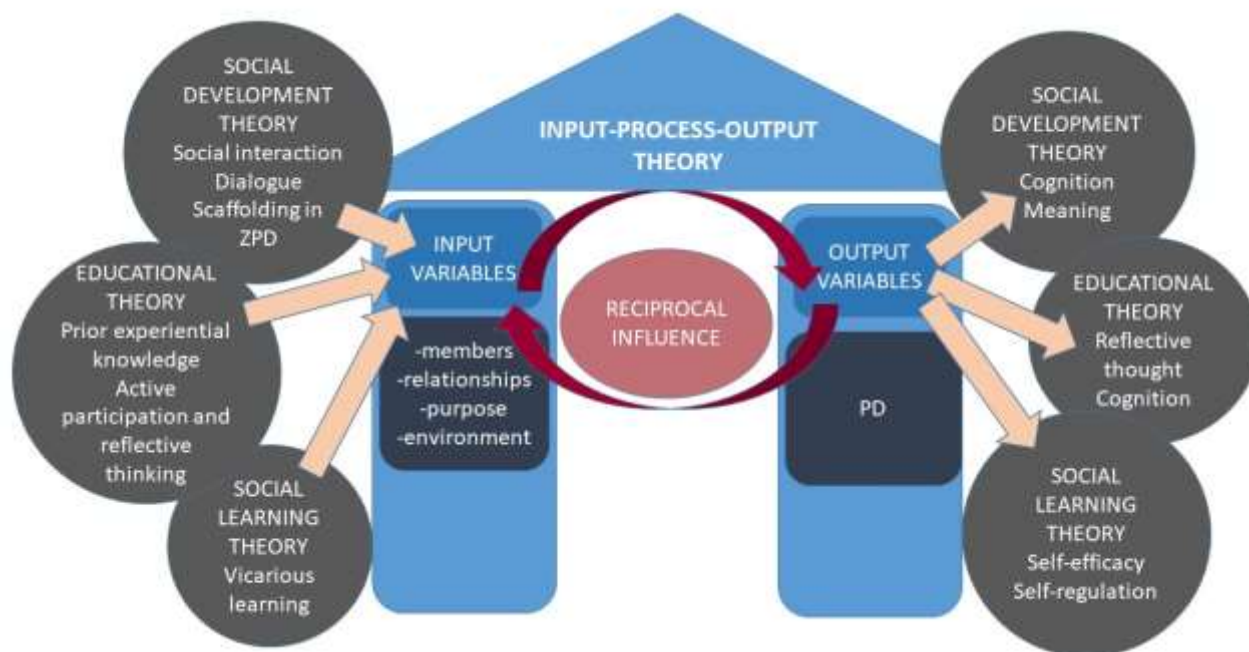


Figure 1.1: Conceptual theories guiding research on impact of lesson study (compiled by author)

### 1.7.2 Effective professional development and the challenges we face in the South African arena

In a comprehensive paper consolidating the emergent findings from an umbrella review of evidence, the following characteristics, among others, were highlighted as primary components for effective professional teacher development (Cordingley *et al.*, 2015):

Firstly, PD programmes should be carefully designed with a strong focus on learner outcomes (Cordingley *et al.*, 2015:4). With the many changes in the South African curriculum from post-apartheid 1994 until present day, PD approaches in South Africa in the past two decades have centred heavily on implementing curriculum changes rather than improving teacher knowledge (Bertram, 2011:18). It is therefore necessary for PD programmes in South Africa to embrace a shift of attention to the learning outcomes of learners. Butler, Schnellert and MacNeil (2015:8) suggest that by focussing on improving the learning outcomes of learners, teachers will be more committed to PD, specifically through collaborative inquiry.

Secondly, prolonged interventions are more effective than shorter ones. PD programmes should last at least two school terms in order to bring about significant

organisational and cultural change (Cordingley *et al.*, 2015:4). Unlike shorter courses that have been criticised for lacking depth and for their minimalistic impact (Bayar, 2014:324), sustained PD practices create greater opportunities for transformation and cumulative knowledge development (Darling-Hammond *et al.*, 2017:15). Courses launched as a result of the ISPFTED and the CPTD programmes have been criticised for their short duration. However, long term courses are particularly difficult to implement in a South African context. This challenge can be attributed to the fast pace of the CAPS curriculum (Du Plessis & Marais, 2015:121), the paperwork and administration overload of teachers (Molapo & Pillay, 2018:6), their tight work schedules (Teane, 2018:99) and their reluctance to train after hours or outside of school terms (Geldenuys & Oosthuizen, 2015:209).

Thirdly, PD programmes should have a “rhythm” through multiple cases of support and follow-up activities (Cordingley *et al.*, 2015:5). There should be time for teachers to reflect, receive input and feedback, and make corrections (Darling-Hammond *et al.*, 2017:vi). This is not an apparent attribute of the workshop-type courses, commonly utilised in the CPTD system. Cyclic feedback requires either an extensive investment on the part of course presenters - or alternatively, - the responsibility mantle should rest on the school leadership where internal collaboration and follow through can be assessed. As noted by Geldenuys and Oosthuizen (2015:211), the professional progress of teachers must be monitored and regularly supported, in order to sustain change and increase teacher knowledge.

Fourthly, the content of PD programmes must be relevant to participants and their daily experiences and aspirations for their learners. Effective development programmes should ideally match both the needs of the teachers and the school (Bayar, 2014:323). The lack of practical application and personal relevance of PD courses in South Africa was noted by teacher participants in the Geldenuys and Oosthuizen study (2015:209) as well as in the study conducted by Steyn (2010:15).

Fifthly, there should be a shared sense of purpose between participants (Cordingley *et al.*, 2015:5). Lack of shared purpose, particularly in collaborative PD settings can lead to despondency and lack of interest among teachers (Szczeniul & Huizenga, 2014:186). Sharing a sense of purpose is also referred to as sharing a domain of

common interest, which, according to Wenger's communities of practice theory, is a fundamental component for learning to occur in a communal group (Wenger, 2011:1).

The concluding essential components for effective professional teacher development as described by Cordingley *et al.* (2015:5) are pedagogy and subject knowledge. Both are equally important contributors. In a comparative study of the preparedness of teachers across six countries, researchers agreed that the primary cognitive abilities required by middle school mathematics teachers to be successful, include both general subject knowledge and pedagogical knowledge, even though the study concluded that different countries seemed to emphasise either one or the other (Schmidt, Blömeke, Tatto, Hsieh, Cogan, Houang & Schwille, 2011:2). Content knowledge implies a deep understanding of fundamental concepts of a subject, as well as the interconnectedness of these concepts and how they are utilised in teaching (Bertram, 2011:6).

It has been noted that South African teachers possess a critical deficit of general subject knowledge in the area of mathematics. In an analysis of the answers provided by a nationally representative sample of South African Grade 6 teachers, Venkat and Spaull concluded that the poor content knowledge of primary school mathematics teachers was alarming (Venkat & Spaull, 2015:19). Similar concerns were raised by Bansilal and his colleagues in their investigation of the content knowledge of South African high school mathematics teachers (Bansilal, Brijlall & Mkhwananzi, 2014:34). The problem of inadequate content knowledge also evidenced among early childhood teachers. In a case study conducted by Musundire, the research concluded that the content knowledge of fourth grade teachers was inadequate in topics like capacity and fractions (Musundire, 2017:59). Feza (2016) explored the content knowledge reception-year teachers possessed on five and six-year-old counting. Feza concludes that although these teachers possess some content knowledge, their knowledge "is superficial and lacks basics" (Feza, 2016:488). In a study involving numerous case studies and a survey of 65 South African schools, Taylor claimed that principals also underestimate the need for improving their teachers' subject knowledge. The same study indicated that even teachers who are aware of their content knowledge deficiency often have little motivation or urgency to improve in this area (Taylor, 2011:5). Venkat and Spaull (2015:19) suggest not only that the content knowledge of



South African teachers be raised, but that urgent focus be placed on improving their pedagogical content knowledge in particular.

Over and above the six components from the proposed list by Cordingley *et al.*, Deacon suggests that effective PD in a South African context should incorporate a methodology whereby teacher educators or mentor teachers model the best practice in actual classrooms. Modelling teaching practice, as suggested by LS, will provide opportunities for reflection and learning in others (Deacon, 2012:44).

### **1.7.3 Lesson study as a professional development strategy**

#### **1.7.3.1 What is lesson study?**

Although there are numerous international contextualised variations currently being explored, LS consists of certain common and basic components, namely: the formulation of goals to address the needs in learner learning and development; group formulation of a lesson to plan to attain the goals; presentation of the lesson by one member of the group, while the others observe and gather evidence; and the group discussing and reflecting on the evidence gathered during the lesson, using their reflection to improve the lesson and their own teaching practice (Groves, Doig, Widjaja, Garner & Palmer, 2013:10). In the Japanese context, the lesson plan may be drafted before the initial group meeting, after which the group will devote the bulk of their time discussing the flow of the lesson and anticipated learner responses (Fujii, 2016:422).

Participants are engaged in LS for the purpose of learning something new, not refining a lesson (Takahashi & McDougal, 2016:515). In its original state, LS is neither a funded nor a mandatory form of teacher development (Doig & Groves, 2011:77) and traditional LS is celebrated as a highly collaborative model, developing a “community of teachers who learn together” (Stols & Ono, 2016:1).

#### **1.7.3.2 Lesson study as a possible professional development solution in South Africa**

The ISPFTED strategy envisions multiple approaches to strengthen PD of teachers in South Africa. One stream of thought involves the establishment of professional learning communities (PLCs) in schools (DBE, 2011a:14). The plan acknowledges that realising this goal requires external input through the introduction of well-trained

facilitators. It is believed that these PLCs would allow teachers to integrate their professional knowledge with cutting edge research, as well as help teachers keep track of development trajectories. Furthermore, PLCs would allow teachers to have a better understanding of the use of the curriculum and textbooks.

Although the ISPFTED predicted that “subject-based and issue-based PLCs [will be] widely established” by 2017 (DBE, 2011a:23), there is very little evidence of this at school level. The time is ripe for LS to come onto the South African stage, as it fulfils all the criterion of a well-tried and reliable method for establishing PLCs within schools and districts. With a growing body of evidence proving that LS is a highly effective and flexible method of teacher development (Cajkler, Wood, Norton & Pedder, 2014; Dudley, 2013; Lewis, Perry, Friedkin & Roth, 2012; Hunter & Back, 2011), South Africa is lagging behind in implementing, analysing and documenting this PD tool. LS tempts us with a pragmatic road map for PD, which fits into the larger plan of the Department of Basic Education (DBE, 2011a). However, like with any map, without those brave enough to attempt the journey, the destination will always remain a theoretical possibility and not a proven reality.

#### **1.7.4 Why professional development through lesson study should begin with teachers who teach maths in the early grades**

Internationally, studies have highlighted the importance of quality mathematical instruction for the young. In a well-known and extensive research undertaking by Duncan and his colleagues (Duncan, Dowsett, Claessens, Magnuson, Huston, Klebanov, Pagani, Feinstein, Engel, Brooks-Gunn & Sexton, 2007:1443) the researchers concluded that the mathematical abilities of children in their preschool years was a strong determinant of later learning ability in school, even more so than their early literacy or attention skills. Similar claims were made in a recent study in Australia where results showed that mathematics performance at age 4-to-5 was a determiner of mathematics performance in Grade 3 (MacDonald & Carmichael, 2017:1). It is even proposed that early mathematics performance at preschool is a determiner of performance at age 15 (Watts, Duncan, Siegler & Davis-Kean, 2014:352). Early intervention strategies are becoming pivotal in changing the direction of higher-level Mathematics trends, particularly if the gains in preschool are maintained in primary school (Watts, Duncan, Clements & Sarama, 2018:540). Similarly,

impressive long-term results have been noted for learners who are able to make substantial gains in the early growth of their mathematical skills after entering Grade 1. Regardless of their skills upon entering school, early gains translate into consistent gains in mathematics throughout school (Watts *et al.*, 2014:358).

South Africa's poor mathematics performance has been highlighted on the international stage as well. In the 2016/2017 World Economic Forum report, South Africa ranks lowest out of 138 countries in quality of maths and science education (WEF, 2017:325). The 2015 TIMSS (Trends in International Mathematics and Science Study) report compared South Africa's Grade 5 and 9 learners with those of Grade 4 and 8 learners from other countries (TIMSS & PIRLS, 2015:4). TIMSS uses five benchmarks to scale the scores, grading from "advanced achievement" (above 625 points) down to "not achieved" (under 400). The South African Research Council (HSRC) introduced their own benchmarking system for scores between 325 and 400, calling this level the "potentials" group, and moved "not achieved" to below 325 in the South African context (NACI, 2017:np). With this criterion, only 1% of Grade 5 learners achieved "advanced achievement", 22% were at "low"; 28% were "potentials"; and 33% at "not achieved". These results are alarmingly low when compared to international scores.

The call for the improvement of mathematics teaching to young South Africans is an urgent and loud one. Research must be undertaken into the suitability of LS to meet this demand. It has further been proposed that for successful LS to occur, the truly Japanese approach of presenting lessons from a problem-solving platform is required (Fujii, 2018; Pjanić, 2014:91). Fujii (2018) postulates that this dual-idea of LS and problem solving is at the heart of LS in mathematics and cautions that this relationship should not be overlooked. In earlier work, Fujii (2016:414) suggests that the presentation of the research lesson should begin with the presentation of a problem and should exclude any direction from the teacher. Learners should work on the task for at least 10-20 minutes. The problem-based tasks should be solvable by some learners and should also be understandable with minimal teacher intervention. It has been postulated that the problem-solving approach of LS in Japan is, in actual fact, a consequence of more than a hundred years of applying LS in their teaching culture. In essence, it is the culmination of years of teaching about learning how to learn (Isoda,

2010:17). One of the earliest written records of the problem-solving approach utilised in Japanese LS was recorded in the book “Teaching Elementary School Mathematics through Problem Posing” by Jongo Shimizu (1924). This problem-posing idea was also expounded in the Stigler and Hiebert TIMMS video study (1999).

South Africa is facing a mathematics crisis in the lower and higher grades. Literature reveals that a school-based, teacher-directed LS method, which incorporates a problem-solving approach, is a little-explored but highly viable solution to the problem that certainly begs further investigating.

## **1.8 DISCUSSION OF THE RESEARCH DESIGN FOR THIS STUDY**

### **1.8.1 Epistemology – social constructionism**

“Epistemology tries to understand what it means to know” (Gray, 2013:19). The epistemological orientation of the research is a social constructionism perspective. “Social constructionism is concerned with how knowledge is constructed and understood” (Andrews, 2012:39). Andrews expounds further that it primarily focuses on the social practices of people and how people use their language to construct reality. According to Galbin (2014:83), social constructionism emphasises that individuals are complex and multi-faceted participants of their communities. Galbin describes the features of social constructionism as standing in opposition to traditional positivism, rejecting so-called common-sense knowledge regarding the social world. Understanding is generated through interaction and negotiation between people (Galbin, 2014:83).

### **1.8.2 Theoretical perspective – interpretivism**

Interpretivism is a theoretical perspective that allows a researcher to construct a worldview by analysing the perceptions and experiences of the research participants and interpreting their understanding of their context (Thanh & Thanh, 2015:24). Reality is socially constructed and individually interpreted (Tuli, 2010:101), and the researcher has an empathic and subjective epistemological approach to the research phenomenon (Blanche, Durrheim & Painter, 2012:6).

Interpretivism, often referred to as a constructivist or naturalist paradigm, emerged as an alternative to the positivist paradigm (Mustafa, 2011:23) which dominated the 20th

century and originated in the natural sciences (Tuli, 2010:98). Research in the interpretivist paradigm implies the exploration of real-world situations that unfold naturally, and research in this field is non-manipulative, unobtrusive and non-controlling (Tuli, 2010:100). The researcher begins with vague speculations regarding the research questions and progresses into making sense of phenomena by observing them in context (Blanche *et al.*, 2012:6).

The advantages of the interpretivist paradigm include the building of a partnership with research participants, which leads to a deeper understanding and richness of the data collected (Tuli, 2010:100). Unfortunately, due to researchers submerging and participating in the research, their subjectivity may distort the research findings and interpretations. Great care was taken in this study to prevent this. Also, interpretivist research results are often contextually framed and cannot be generalised to wider situations (Mustafa, 2011:25). Attention must therefore be given to the trustworthiness and credibility of data gathered through interpretivist research, which is comparable to the validity and reliability of data within positivist research (Tuli, 2010:101).

Most often, in the interpretivist approach, the preferred method of data collection is qualitative (Thanh & Thanh, 2015:26). This implies the collection of data in a natural setting, allowing for the generation of theory by closely observing and documenting the observed phenomena (Mustafa, 2011:27). This methodology is particularly useful when investigating small data sets (Håkansson, 2013:68). Qualitative research implies the collection of data through language, or observations recorded in language, and an analysis of the data collected by identifying and categorising themes (Blanche *et al.*, 2012:47). Qualitative research methodology has the advantage of allowing the researcher depth, openness and detail when studying issues (Blanche *et al.*, 2012:47). Choy (2014:101) further lists two of the primary advantages of the qualitative methodological approach as the opportunity to raise further issues through broad and open-ended investigation, and to understand behaviours founded in values, beliefs and assumptions. Qualitative research allows us an in-depth understanding of the participant's viewpoint, particularly within their context. Unlike quantitative research which focuses on predicting or controlling behavioural frequency, strength or longevity, qualitative research is descriptive or explorative, allowing the researcher to gain insight into the "beliefs, values, and motives that explain why the behaviours occur"

(Castleberry & Nolen, 2018:807). Choy (2014:101) however, acknowledges the weaknesses of this approach by listing the problems caused by lack of researcher objectivity: unverifiable results, the need for skills in conducting effective research, and the time constraints characteristic of the intensive data collection process. He further postulates that qualitative research may lead to secondary issues going unnoticed by the researcher's interpretation limitations (Choy, 2014:102).

### **1.8.3 Methodology – case study**

Within the interpretivist theoretical perspective, I utilised the case study method to investigate the effect of LS as a PD tool for early childhood Mathematics teachers. Case study design is recommended as an intensive research method for investigating individuals, programmes or events (Hancock & Algozzine, 2016:11).

In his book on case study research, Peter Swanborn (2010:13) defines case study broadly, describing it as a method of studying social phenomenon occurring within a social system containing the phenomenon. It is a study in a natural context and within a specific time frame, in which the researcher draws a description and explanation of the social processes unfolding between participants or social institutions. The researcher is guided by a broad research question, and after exploring the research data uncovers more specific research questions. Swanborn further proposes that case study utilises several data sources.

Examining several data sources guides the researcher into reporting, with illustrative descriptions, key aspects of a case (Hancock & Algozzine, 2016:10). In the context of this research, data was obtained eclectically, through in-depth interviewing, questionnaires, journals and multiple participant-researcher recordings and observations.

### **1.8.4 Research methods**

The following is a brief description of the data collection methods, time-frame, context and sampling criteria of the research.

#### **1.8.4.1 Data collection overview**

As an initiator and participant in the research project, I collected data in a naturalistic setting while personally taking part in the activities of the teachers being studied.

Hence, I was a participant observer (Musante & DeWalt, 2010:2). To adhere to the collaborative requirements of LS, research participants met once a week after school to engage in pre-lesson planning or post-lesson discussions.

Furthermore, data was collected at regular intervals throughout the research process through field-notes, reflective journaling, questionnaires and a semi-structured focus group interview.

#### 1.8.4.1.1 Semi-structured focus group interview

The first LS group meeting included a semi-structured focus group interview, whereby the participants engaged in collective conversation that reflected on pertinent qualitative data (Kamberelis & Dimitriadis, 2013:1). This interview was held with a measure of latitude, by introducing predetermined topics pertaining to the research questions but allowing the conversation to move in unpredictable and unexpected directions (Kamberelis & Dimitriadis, 2013:7; Ritchie, Lewis, Nicholls & Ormston, 2013:179). The question were topical and probed participants to enter into discussion to determine commonalities and group understanding (Ennis & Chen, 2012:3). A drawback of this time-consuming process was that there were a limited number of topics that could be explored (Jamshed, 2014:88).

Focus group interviews have the advantage of de-centring the researcher's role and democratising the research process. Participants were empowered and could experience greater ownership of the research (Kamberelis & Dimitriadis, 2013:16). My role was to encourage open discussion and ensure that the voice of every participant was heard. This role included steering the group away from irrelevant issues and preventing the conversation being dominated by any individual (Ritchie *et al.*, 2013:180).

#### 1.8.4.1.2 Questionnaires

The participants were invited to complete two research questionnaires during the study. One at nine weeks and one at 14 weeks. The questionnaire allowed the research participants to answer questions in their own time and not be influenced in their answering by researcher bias (Phellas, Bloch & Seale, 2011:195). They were also empowered to answer questions honestly, particularly when the questions were more personal in nature (Phellas *et al.* 2011:182).

#### 1.8.4.1.3 Field notes

Data was collected through extensive field notes, which can be defined as “private, personal thoughts, ideas, and queries regarding...research observations and interviews” (Phillippi & Lauderdale, 2018:381). Phillippi and Lauderdale explain further how field notes can provide rich and descriptive information for the research. In this particular research, field notes were supported by physical recordings of the interactions between research participants, which were transcribed and analysed.

#### 1.8.4.1.4 Reflective journaling

All research participants were required to keep a reflective journal throughout the research process. Reflective journals incorporated the “presuppositions, choices, experiences, and actions during the research process in a sufficiently precise way so that it allows others [could] follow what we mean[t] and did” (Mruck & Breuer, 2003:3), thereby allowing others the access to choices and decisions that were made in the research process. In addition to this, the process of reflection, enhanced through journal writing, provided evidence that professional learning occurred (Clarke, 2004:11)

To enhance the richness and explicitness of the reflective journaling data, a loosely structured framework was initially recommended to the participating teachers (Woodward, 1998:417). Journal entries were collected via email after each LS meeting.

#### 1.8.4.2 Research context

Research was conducted in an independent, non-subsidised school situated in urban Gauteng. The community in which the school is situated is on the border between the township of Tembisa and the outer Kempton Park suburbs, and the researcher would define it as having middle class socio-economic status. The school has a demographic distribution similar to that of the general population of South Africa (74% African, 12% Indian, 9% White, 4% Coloured and 1% Asian).

The school currently has 420 learners, of which 256 are early grade learners (Grade RRR – 3).



#### **1.8.4.3 Sampling**

As the research was conducted within my own school, the non-probability sampling method of convenience sampling (or accidental sampling) was utilised. This sampling involved selecting participants who were easily geographically accessible to myself (Lavrakas, 2008:525). Purposive sampling was also employed in that participants did need to meet certain defining criteria.

LS can incorporate a variety of teachers from different subjects and grades in the observation and collaborative post-lesson discussions and observations (Doig & Groves, 2011:84; Takahashi & McDougal, 2016:515). Excluding myself as the participant-researcher, all of the 11 teachers who teach the early grades in my school were invited to participate in the LS research. This included all the teachers teaching from Grade RRR (3-4-year-olds) to Grade 3 (8-9-year-olds). Five of these teachers were ECD teachers (Grade RRR to R) of which two had NQF level 7 qualifications, one had a NQF level 6, and two had NQF level 4 qualifications. The remaining six Foundation Phase teachers (Grade 1–3) all had NQF level 7 or higher qualifications. The average number of years of teaching experience was 15 years per teacher, with the teacher having the least amount of experience at 1 year and the teacher with the most at 46 years.

In keeping with the problematic criteria described in the introductory analysis of the challenges facing South African teachers, three teachers in the sample of qualified teachers did not specialise in the phase that they are currently teaching.

LS often incorporates inviting outside observers from different grades in a school and even observers from surrounding schools to the final lesson presentation of a lesson and the post-lesson discussion (Doig & Groves, 2011:84). I invited early grade teachers from surrounding public and independent schools to participate in this phase. Learners in the Grade 1 classes participated in the research as passive participants.

#### **1.8.5 Thematic analysis of data**

The model of thematic analysis was adhered to. Thematic analysis “is a method for systematically identifying, organising, and offering insight into patterns of meaning (themes) across the data set” (Braun & Clarke, 2019:57). The authors describe how the process begins with the researcher gaining familiarity with the data. This is

followed by a generation of initial codes, a searching for themes, a review of potential themes and defining and naming of these themes. The process concludes with the production of a report. The first step of gaining familiarity with all the data began with my transcribing the data gathered. Attention was paid to recording both a content-based analysis (based on what the data says) as well as an interpretative analysis (based on how it was said) (Sgier, 2012:19). This step was followed by a process of reading and re-reading the data to further gain familiarity with its content (Castleberry & Nolen, 2018:808).

The data was coded according to interesting or descriptive features inherent in the data. I simultaneously created personal definitions for the codes while applying them, giving them criteria of inclusion or exclusion. This allowed for reliable application of the same codes throughout the data analysis process (Castleberry & Nolen, 2018:809). Once codes were applied, themes were constructed. Themes are patterns that “capture(s) something significant or interesting about the data and/or research question” (Maguire & Delahunt, 2017:3356). My orientation towards the data analysis was a blended deductive and inductive approach. I began analysing the data with a predetermined set of concepts or topics I wanted to use to code the data (deductive analysis). Simultaneously, I analysed themes that emerged themselves from the data (inductive analysis) (Braun & Clarke, 2019:58). After the themes were created, they were reviewed by me and an auditor. This involved modifying and developing the themes and reviewing the data to justify and support them. Themes were rechecked for coherency and distinction (Maguire & Delahunt, 2017:3358). The final stage was the drafting of the report, which could be described as the telling of a “compelling story”, reaching beyond mere description, and constructing an answer to the research questions (Braun & Clarke, 2019:69).

#### **1.8.6 Trustworthiness**

According to Lincoln and Guba (1985:301), the criteria for trustworthy constructivist inquiry include credibility, dependability, confirmability and transferability.

Credibility refers to the truth value of the data (Guba, 1981:80). The credibility of a qualitative research can be improved by prolonged engagement in the research, careful observation, triangulation of data collection methods and member checking (Korstjens & Moser, 2018:121). By disclosing the field notes of individual participants

for a process of metasynthesis, credibility was enhanced (Phillippi & Lauderdale, 2018:382). In accordance with these recommendations, this research commenced over a period of four months and utilised a variety of data collection methods for data triangulation purposes. The research participants were asked to check the transcriptions and emergent findings of the data for accuracy.

Dependability refers to whether the process of analysing data conforms to the design standards of a particular research design (Korstjens & Moser, 2018:122). It is the equivalent of consistency and attempts to establish if the findings of the data could be replicated, if replication of the subjects or context were possible (Guba, 1981:80). Dependability was enhanced through my justifying the rationale and “the decisions taken about the theoretical, methodological and analytic choices throughout the study” (Koch, 2006:92) with an auditor. I recorded my decision-making process and provided a clear audit trail for any other researcher to follow. I also engaged in reflexive journaling (Nowell, Norris, White & Moules, 2017:3).

Confirmability is the objectivity that the researcher accomplishes in that given the opportunity, two or more independent researchers would reach the same conclusions regarding the data’s accuracy, relevance and meaning (Elo, Kääriäinen, Kanste, Pölkki, Utriainen & Kyngäs, 2014:2). It is an enquiry into how much the findings in a research are free of researcher bias and slant (Guba, 1981:80). Confirmability was enhanced through my clear indication of how my data analysis was a product of my decisions and what factors influenced my thinking during this analysis (Koch, 2006:93). Again, a reflexive journal was utilised to record my thinking processes during the transcribing and analysis of the data.

Transferability is attained if the research results are relevant to those who did not participate in the study and others can extrapolate meaning from the research (Cope, 2014:89). A noteworthy potential shortcoming of convenience sampling is that I could not overgeneralise the findings (Koerber & McMichael, 2008:463). In this study, transferability was increased, however, through deep and rich descriptions, conveying as much contextual information as possible to be meaningful to the reader (Korstjens & Moser, 2018:121). The reader is empowered with sufficient detail to determine the transferability of the research to different contexts.

The first step in combatting the many threats to trustworthiness inherent in the process of qualitative research, is an awareness of the researcher's potential subjectivity and a sensitivity to adhering to Lincoln and Guba's trustworthiness criteria. Elo and his colleagues believe the trustworthiness of data analysis can be enhanced through systematically checking relevant trustworthiness criteria off a list (Elo *et al.*, 2014:3). Like others, they confirm that trustworthiness can be improved by collecting rich, saturated data. Again, this was preceded by thorough preparation and accompanied by clear reporting on the sampling method, participant contributions and data analysis processes (Elo *et al.*, 2014:8). In conclusion, transparency and visibility in the process of both data collection and analysis enhanced the truth and validity of the planned research (Ortlipp, 2008:697).

### **1.8.7 Ethical considerations**

Ethical clearance was obtained from the University of Pretoria's Ethical Clearance Board and the Gauteng Department of Education: Research Unit before any research in the field commenced.

Ultimately, as this research impacted the lives of teachers, and indirectly, young learners, the commitments explained in the ERIC charter (Graham, Powell, Taylor, Anderson & Fitzgerald, 2013:26) were my ethical guide. Although the principles outlined in the charter are focussed particularly on young participants, they are relevant to older participants, and were applied as a guide to my ethical treatment of the teacher participants.

Informed consent or assent was obtained from all research participants, both teachers and learners, including the option of withdrawal from the research project at any stage before formal transcription. Informed consent implied that participants were provided with sufficient understanding and not merely surface information, allowing them to make a reasonable judgement regarding their participation in the research (Hammersley & Traianou, 2012). With regards to learner assent, I used the family consent model suggested by Gibson *et al.*, whereby parents explained the research proceedings to their own children, once being informed themselves, and as a family provided their consent for their child's participation in the research lessons (Gibson, Stasiulis, Gutfreund, McDonald & Dade, 2011:507). In addition to this, learners were

also required to give their assent to participate in each research lesson. In the course of this study, two learners declined and did not participate.

I do expect that my position as a colleague and participant researcher may lead to the question of the obligatory coercion of teaching staff to participate. Evidence to the contrary presents itself in that of the 11 staff members who were invited to participate, only six accepted. In addition to this, the research began with the advantage of my already working with the potential participants, and thereby already having built a rapport and relationship of trust. Sensitivity was exercised to ensure that participation was not coerced, and each participant made a completely autonomous decision to participate without experiencing negative consequences when they declined to participate (Gyure, Quillin, Rodríguez, Markowitz, Corona, Borzelleca, Bowen, Krist & Bodurtha, 2014:4). I also understood that without the maintaining of a non-threatening relationship based on trust, the research was subject to bias through the Hawthorne effect, “where people modify their behaviour when they know they are being watched or studied” (Oswald, Sherrat & Smith, 2014:53). To avoid both unethical research and biased data, I implemented the additional safe-guard of entering into a fiduciary relationship with my participating colleagues. Such a relationship “exists where there is special confidence reposed in one who in equity and good conscience is bound to act in good faith and with due regard to the interest of one reposing confidence...Out of such a relation the law raises the rule that neither party may exert influence or pressure upon the other, take selfish advantage of his trust or deal with the subject-matter of the trust in such a way as to benefit himself except in the exercise of the utmost good faith and with the full knowledge and consent of that other...” (Black, 1979:564). There was an agreement in place between me and the participant teachers before any data was collected. In this agreement, I resolved to treat the teachers as equals in the research process. Their dignity, confidentiality and opinion, particularly if diverse from mine, was treated with the highest respect and given impartial recognition in the data collection and processing. The fiduciary agreement reiterated that participation in the research, or lack thereof, would not translate into any consequences, positive or negative, outside of the research scope. Staff were fully briefed about this fiduciary relationship before committing to participation in the research. The agreement of trust was sustained throughout the research project,

utilising a relaxed mode of interaction, and thereby minimalizing the Hawthorne effect (Oswald *et al.*, 2014:53).

## **1.9 OUTLINE OF CHAPTERS**

### **Chapter 1: Overview and rationale**

This chapter explores the background and the rationale behind the study. The primary and secondary research questions are presented, as well as an explanation on the methodology utilised. The trustworthiness and ethical considerations of the study are expounded.

### **Chapter 2: Investigating the literature**

Chapter 2 explores the existing literature on the topic. Factors contributing to effective professional development are investigated, as well as the authentic components of Japanese LS. The chapter also explores professional development of teachers in a local context and the need for intervention in early childhood mathematics.

### **Chapter 3: Conceptual framework underpinning the study**

This chapter describes the work of four socio-educational theorists and how their work contributes to the design of the study and analysis of the findings. The conceptual understanding of social development theory (Vygotsky), educational theory (Dewey), social learning theory (Bandura) and input-process-output theory (McGrath) are expounded, and the application and relevance thereof is explored in the context of LS.

### **Chapter 4: Research design and methodology**

In chapter four, the research epistemology of social constructivism is presented as the framework for the study. The method of case study research is explained. This chapter also presents the sampling process and describes my role as participant researcher. The trustworthiness of the study is defended as well as the ethical procedures followed.

### **Chapter 5: Research findings**

Chapter 5 presents the research findings, categorised into themes that emerged through the data analysis process. Evidence is quoted in defence of the themes. The themes that are listed also address the research questions presented in chapter 1.

## **Chapter 6: Alignment of findings to the literature and conceptual framework**

This chapter examines the findings in relation to the pre-existing expectations created by the literature. It expounds on various confirmations and contradictions presented in the findings. It also examines the findings in relation to the conceptual framework considered in chapter 3. This chapter comments on the absences and silences noted in the literature, and how the study addresses these absences.

## **Chapter 7: Conclusion and recommendations**

In this concluding chapter, an overview of the preceding chapters is presented. The research findings are then aligned to the primary and the secondary research questions. Other key findings not aligning to the research questions are briefly presented. The chapter explains the limitations of the study and recommendations for future research.

### **1.10 CONCLUSION**

LS is a well-established Japanese PD method that has garnered international recognition since the turn of the century. South Africa faces considerable challenges in the PD of its teachers (DBE, 2011a:1), yet recognises the need to “improve the quality of teacher education and development in order to improve the quality of teachers and teaching” (DBE, 2011a:1). There is very little documented research into the implementation of LS in South Africa, even though the method matches the ISPFTED goal of establishing PLCs for PD to be implemented at a school level. Furthermore, there is no documented research into the implementation of LS in the early grades of South Africa, and little international precedence for early grade LS research in general. This study attempts to address the lack of documented research of LS primarily in South Africa through investigating a case study in a local primary school, particularly for the development of mathematics teachers in the early grades.

## **2. CHAPTER 2: LITERATURE REVIEW**

In the previous chapter, the rationale and background of the study were presented. The primary and secondary research questions were introduced, and the research procedure briefly elucidated. This chapter is an exploration of the literature in three particular themes. It looks at the professional development (PD) process of teachers and isolates core commonalities identified in effective PD. The focus then shifts to LS as a PD tool, and the elements that constitute authentic Japanese LS. The chapter concludes with an examination of the topic of mathematics in the early grades, and the evidence in the literature emphasizing the need for early intervention in the field.

### **2.1 THE PROFESSIONAL DEVELOPMENT OF TEACHERS**

“Professional development is the process whereby people’s professionalism may be considered to be enhanced, with a degree of permanence that exceeds transitoriness” (Evans, 2014:17). In expounding this stance, professional development (PD) implies a change in the behavioural (work performance), attitudinal and intellectual (professional-related knowledge) orientation of teachers (Evans, 2014:20). PD is therefore a multi-dimensional and personal process, moving beyond merely changing teachers’ outward behaviours, to changing their inner mind-sets. PD can be characterised as a process whereby teachers learn (knowledge and skills), then learn about learning (pedagogical content knowledge) to transform this knowledge into practice that benefits their learners, ultimately allowing teachers to become better at what they do (Avalos, 2011:10, DeMonte, 2013:2–3; Yoon, Duncan, Wen-Yu Lee, Scarloss & Shapley, 2007:4).

Extensive research has been undertaken into identifying the key features of effective PD (Avalos, 2011; Bayar, 2014; Cordingley *et al.*, 2015; Darling-Hammond, *et al.*, 2017; Patton, Parker & Tannehill, 2015). The following is an exposition of selected core commonalities emerging from the literature:

#### **2.1.1 Focus on learners and their learning**

Desimone (2011:71) postulates that “the final test of the effectiveness of professional development is whether it has led to improved student learning”. However, direct empirical evidence linking features of PD to learner attainment is difficult to establish (Hill, Beisiegel, Jacob, 2013:477; Shaha, Glassett & Ellsworth, 2015:29). In a



comprehensive analysis of over 1300 PD studies, only nine studies could directly link teacher PD to improved student achievement (Yoon *et al.*, 2007:2). In spite of this empirical gap, learner-focused PD is advocated as having a “significant impact on student achievement” (Cordingley *et al.*, 2015:4) and is emphasized as a vital component for effective PD (Patton *et al.*, 2015:10).

Although it is common practice to plan PD around new teaching practices or ideas, PD should begin with a focus on student outcomes (Guskey, 2014:14; Patton *et al.* 2015:10). Dufour (2004:6) aptly describes the fundamental purpose of education as “not simply to ensure that students are taught but to ensure that they learn”. If teachers take the time to investigate what their learners are actually learning, their PD can be more specifically targeted to improving their lessons and assessments (Stewart, 2014:30). It has been suggested that teachers use their classroom assessment results as a comparative platform to determine the percentage of learners who are improving in proficiency and for establishing learner-centred PD (DuFour, 2004:6; Guskey, 2014:14). Brodie (2013:15) describes how, through the analysis of learner errors, teachers can understand their learners’ needs and can begin to understand their own needs as teachers, by identifying their own conceptual and pedagogic gaps.

Learner-oriented PD goes beyond analysing learner outcomes for mediation, however, and incorporates the idea of developing teaching skills that recognise learners as part of their own learning process (Msonde & Msonde, 2017:234). Learner-centeredness is a constructivist ideology whereby the teacher’s focus shifts to the learner. Knowledge is not regarded as facts that need to be transmitted from the teacher to the learner, learners become central in constructing their own knowledge under the mediation, guidance and prompting of the teacher (Bada & Olusegun, 2015:68).

In a cyclic argument that PD should be learner-centred to be effective, it is interesting to note that learner-oriented teaching is a natural outflow of the professional learning community (PLC) method of PD (Hawley & Valli, 2000:2; Hord, 1997:27; Lalor & Abawi, 2014:82), and conversely, intense participation in PD has been posited to develop the natural outcome of learner-centeredness. This was proven in a Dutch research linking teachers’ learner-orientation beliefs with their PD engagement. Researchers concluded that the greater the intensity of teachers’ involvement in

continuous professional development, the greater the increase in their student-oriented beliefs and practices, even more so than the increase in their subject-oriented beliefs (De Vries, Jansen & van de Grift, 2013:88). In conclusion, PD should be about learners, and learner accomplishment should be the motivating drive behind teacher participation in PD.

### **2.1.2 Prolonged duration**

The notion of once-off workshop-type PD has been strongly criticised as an ineffective PD tool. This is owing to its disconnectedness with classroom practice, fragmentation and malalignment with learning theories and school-level vision, and ultimately poor enhancement of teacher knowledge (Bantwini, 2012:529; Borko, Jacobs & Koellner, 2010:548; Darling-Hammond *et al.*, 2010:8; De Clercq & Shalem, 2014:142; Nabhani, Nicolas & Bahous, 2014:233). The duration of PD participation has been linked to gains in learner achievement (Shaha *et al.*, 2015:31). In their analysis of the nine studies meeting the criteria of linking PD to student achievement, Yoon *et al.* conclude that “positive and significant effect” was noticed in PD studies that extended for more than 14 hours (2007:3). In an umbrella review of 46 effective PD studies, Cordingley *et al.* (2015:4) suggest that significant change to an organisation or teacher’s culture can only be wrought after at least two terms of intervention. Darling-Hammond, Wei and Andree (2010:2), further suggest that noteworthy gains in student learning through teacher PD are only accomplished after 50 hours or more over a 6 to 12-month period. One concludes through these studies, therefore, that although discrepancies exist in the precise recommended number of hours required for effective PD, there is a general consensus regarding the causal link between the number of hours a teacher spends in PD activities and the PD’s effectiveness (Lumpe, Czerniak, Haney & Beltyukova, 2012:63).

PD of a longer nature has the advantage of allowing teachers to implement and practice the skills and knowledge they learn, and then bring their experiences back to the PD table for discussion (Ingvarson, Meiers & Beavis, 2005:14; Patton *et al.*, 2015:7). Providing adequate time for longer duration PD also allows teachers to reflect on their beliefs and values regarding their teaching practice. It provides opportunities for them to share resources and strategies (Saunders, 2014:177). This corresponds with Cordingley *et al.*’s (2015:5) findings that PD structured around a rhythm of

sessions, followed by practical application, resulted in substantive changes to the teachers' approaches to teaching. This process lays the foundation for teachers to embed new learning into their teaching practices (Saunders, 2014:177).

### **2.1.3 Contextually relevant and meeting the needs and interests of teachers**

"Teacher learning may be most relevant when it focuses on teachers' real work in schools with young people and addresses the unique context of their schools" (Patton *et al.*, 2015:4). This type of PD is often described as job-embedded, which implies PD should be "grounded in day-to-day teaching practice..." (DeMonte, 2013:7). The most effective PD has been attested to develop at a school level, where teachers can coordinate learning goals, and align the PD activities to school priorities and address perceived areas of weakness (Schleicher, 2016:44–45). Ignoring teachers' direction in their own learning and professional development leaves them feeling less empowered and does not establish feelings of positive professional identity (Flint, Zisook & Fisher, 2011:1163).

Knowles' theory of adult learning is guided by six fundamental tenets of learning. Adults need to know the reason for their learning something. Their learning is guided by their self-concept and personal involvement in the design and evaluation of the learning experience. Learning should be rooted in their experiential knowledge and participants need to understand the relevance of the learning to their own work and lives in order to be receptive. The orientation of learning should be problem-centred rather than content-centered, and adult motivation to learn is strongest when motivation is internal, rather than external (Knowles, Holton III & Swanson, 2015:4–6). Based on these tenets, it can be concluded that PD constructed on meeting the needs and interests of teachers would be more effective than PD that is prescriptive or contextually irrelevant. Evidence of these assertions was found in a Turkish study of 16 teachers' perceptions of effective PD. The research participants described how PD activities that centred on their needs and on their school's needs had the most impact for them. Teachers wanted to be active participants in their own PD and have personal involvement in the planning and design of their PD (Bayar, 2014:323).

In a South African longitudinal study of three teachers involved in the MSSI (Mpumalanga Secondary Science Initiative) PD project, researchers concurred that teachers be directly involved in their own PD, making it "personally meaningful" and

“aligned with [their] personal circumstances and motivations” (Mokhele & Jita, 2010:1765). Furthermore, PD should utilise the existing “competencies, attitudes and knowledge” of participating teachers as a launch pad (De Clercq & Shalem, 2014:143). These recommendations have often been ignored in the South African PD context, where workshops are “not meeting immediate and future classroom needs” of teachers (Bantwini, 2012:522).

Singh’s (2011) investigation of the school-based professional development programmes offered in the Capricorn District of Limpopo Province, explored a qualitative comparison between schools implementing a school-oriented, specifically designed PD programme and those without such a personalised programme. Amongst her findings, Singh describes how the staff in the structured PD programmes expressed their positivity in that the programmes were “‘tailor made’ for them and their school environment” (Singh, 2011:1633). Conversely, the needs of teachers involved in unstructured PD programmes were not being addressed. Through her research findings she recommends that schools should design PD specifically to suit the needs of their school and its teachers, and that “the key element of PD is the context within which it takes place” (Singh, 2011:1634). She concludes that PD is impossible to plan or implement effectively if there is no initial understanding of the needs of teachers. Without personalising the context of PD, teachers lack the heart to implement new reforms and a counterproductive attitude of resentment is probable (Flint *et al.* 2011:1164).

#### **2.1.4 Improvement of pedagogical knowledge, pedagogical content knowledge and subject content knowledge**

“Professional learning that has shown an impact on student achievement is focused on the content that teachers teach” (Darling-Hammond *et al.*, 2017:5). Brodie posits that professional learning, through the introduction of external knowledge, is a key factor in creating functioning PD groups that do not simply reinforce the status quo (Brodie, 2013:15). In their analysis of 35 effective PD studies over three decades, Darling-Hammond *et al.* (2017:6) conclude that 31 studies utilised a content-focus in their training. In a large-scale study of 3250 teachers who participated in PD activities in Australia, researchers noted that the largest determiner of teacher change (teacher knowledge about what they teach, teaching strategies, pedagogical content

knowledge, catering for diverse learner needs, assessment, and classroom management) was the extent to which PD programmes focused on content (Ingvarson *et al.*, 2005:14). Professional learning is further enhanced when teachers are exposed to content knowledge over a long duration, and when “teachers gain a rich and flexible understanding of subject matter [as] they grapple with it through cycles of exploration, implementation and improvement” (Stewart, 2014:31).

In a comprehensive analysis of the 2013 TALIS (Teaching and Learning International Survey) results in the report on the sixth international summit on the teaching profession held in Germany, 2016, Schleicher (2016:44) concludes that participating primary and secondary grade teachers, indicated a 91% positive impact when engaging in PD focused on purely subject-matter content and an 87% positive impact when engaging in pedagogy-content related PD. This was a much higher reported impact than the 77% positive impact when involved in PD focused on what the same teachers identified as “higher need” PD areas e.g., special needs education or multilingual setting education (Schleicher, 2016:29). In addition to this, a significantly higher portion of teachers reported a preference for participating in PD focussed on content or pedagogical knowledge rather than on PD focussed in areas of perceived “higher need” (Schleicher, 2016:44). It would appear from these results that in spite of claims to contrary, teachers gravitate towards PD structured on content and pedagogical knowledge and claim that this orientation has the greatest impact on their teaching practice.

The descriptions of content knowledge, pedagogical knowledge and pedagogical content are founded in the work of Shulman (1986) who defined content knowledge as the “amount and organization of knowledge per se in the mind of the teacher” (Shulman, 1986:9). General pedagogical knowledge has been defined as the “required cognitive knowledge for creating effective teaching and learning environments” and is the quality of non-subject specific teaching performance (Guerriero, 2014:5). When combining content knowledge with pedagogical knowledge, a new concept of pedagogical content knowledge emerges. This is teaching knowledge that is both subject specific and incorporates “the ways of representing and formulating the subject that make it comprehensible to others” (Shulman, 1986:9). It includes knowledge about what makes learning in a particular domain challenging or easy, the strategies

of teaching for favourable outcomes, and an understanding that learners are not *tabula rasa*'s, but learners with preconceptions and different ages and backgrounds (Depaepe, Verschaffel & Kelchtermans, 2013:22). Pedagogical content knowledge “goes beyond the acquisition of instructional strategies and techniques, per se, to include an understanding of how students develop insights in specific subject matter” (Van Driel & Berry, 2012:27). Pedagogical content knowledge is specialised to the context, situation, and participants. PD should incorporate this type of knowledge, ideally through teacher input and practical examples. It should create opportunities for teachers to apply learned strategies and thereafter reflect on the experience (Van Driel & Berry, 2012:27).

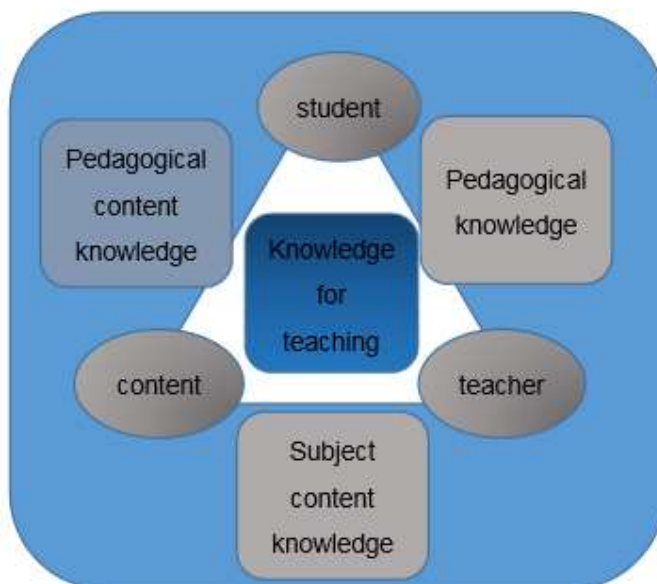


**Figure 2.1: Shulman's interplay between content knowledge, pedagogical knowledge and pedagogical content knowledge in the PD of teachers [Adaptation from Little (2006:6)]**

The interplay between all three definitions of content becomes apparent in the PD literature. The argument for the superiority of pedagogic content knowledge over content knowledge in PD has been disputed in research for years (Guerriero, 2014:4; Baumert, Kunter, Blum, Brunner, Voss, Jordan, Klusmann, Krauss, Neubrand & Tsai, 2010:167). It has been further postulated that content knowledge is a precursor for pedagogical content knowledge (Kleickmann, Richter, Kunter, Elsner, Besser, Krauss & Baumert, 2013:92; Ward, Kim, Ko & Li, 2015:138). In her study of early grade mathematics teacher competency, Henning (2013:141) argues for the importance of content knowledge concerning child cognition over pedagogical knowledge. She claims that learner-centred teaching (pedagogical knowledge) will be a natural outflow

of a teacher's content knowledge concerning the thinking of a child. In their exploration of the interrelatedness of pedagogical content knowledge, content knowledge and teacher practice, Brodie and Sanni argue against the general assumption that content knowledge precedes pedagogical content knowledge in teacher training. These researchers posit that the two develop simultaneously (Brodie & Sanni, 2014:196). Cordingley *et al.* (2015:5), settle the apparent conflict by describing that the concepts of content knowledge and pedagogical content knowledge are of equal importance in PD. In their analysis, the effectiveness of PD programmes is enhanced through content that is related to pedagogic knowledge, learning trajectories (content knowledge) and formative assessment (pedagogical content knowledge related to how learners demonstrate their learning).

The majority of South African teachers have been criticised for possessing weak fundamental knowledge for the content and pedagogical content of the subjects they teach (Bansilal & Rosenberg, 2011:118; De Clercq & Shalem, 2014:144; Kaino, Dhlamini, Phoshoko, Jojo, Paulsen & Ngoepe, 2015:157). As Spaul (2015:123) succinctly describes the problem, "teachers cannot teach what they do not know". Furthermore, a shortage of content knowledge and knowledge for practice in those appointed to lead PD (subject advisors), was noted by teachers in a study on the effectiveness of South African PD strategies (Bantwini, 2012:526). To date, this complex problem is further exacerbated by a lack of research into large scale PD projects on the home-front, limiting our understanding and remediation into the content knowledge of teachers in South Africa (Spaul, 2015:126).

#### **2.1.5 Collaboration and social learning engagement through professional learning communities**

Communities of practice are collaborative networks that are fuelled by the willing participation of their members who are driven to learn and build capacity through sharing knowledge and expertise, problem-solving and joint purpose (Cordingley *et al.* 2015:5; Serrat, 2017:582). This definition resonates with Wenger's communities of practice theory of 1991 whereby individuals initially engage in situated learning within communities due to their common interests or goals. Collegial communities of practice enhance the sharing of knowledge (Darling-Hammond & McLaughlin, 2011:80) and have been dubbed over the years as professional learning communities (PLCs) (Myers

& Myers, 1995; Hord, 1997). They serve the unique function of furthering professional learning and focusing on matters related to learning through collaboration (Chauraya & Brodie, 2017:223; Dufour, 2011:160). This collaborative inquiry method has gained notoriety as a respected means for successful teacher PD in the literature (Akiba & Liang, 2016: 8; Butler, Schnellart & MacNeil, 2015; DuFour, 2011:162; Croft, Coggshall, Dolan, Powers & Killion, 2010:9; Schleicher, 2016:47; Vangrieken, Meredith, Packer & Kyndt, 2017).

In Akiba and Liang's (2016) longitudinal study of 467 schools in the US, researchers examined the effects of formal and informal PD activities on student achievement growth, particularly in the area of mathematics, over a four-year period. The data demonstrated that collaborative PD activities were more effective than workshops, university courses or private learning endeavours for teachers. The researchers attributed their findings to the specificity of informal collaborative interactions between teachers. In collaborative groups teachers addressed the particular learning issues they were facing, and the information shared was relevant to their daily classroom interactions. The researchers concluded that "schools are likely to improve student achievement when they focus on promoting teacher-centered collaborative and research-based learning activities" (Akiba & Liang, 2016:9).

The ISPFTED recognises PLCs as "communities that provide the settling and necessary support for groups of classroom teachers, school managers and subject advisors to participate collectively in determining their own developmental trajectories, and to set up activities that will drive their development" (DBE, 2011a:14). The Department of Basic Education describes how these envisioned communities have the primary goal of improving teaching practice which, is believed, will translate into improved learner achievement (DBE, 2015a:5). It is suggested that these communities be organised at a school level and that the frequency, duration and intensity of participation in these communities will be proportionally related to their benefits (DBE, 2015a:15).

In her original white paper on PLCs, Hord (1997:18) lists the necessary components for the successful creation of PLCs. She firstly describes the role of supportive and shared leadership. She advocates that principals become a part of the PD process. Secondly, she highlights the importance of creativity, evident in reflective dialogue



centred on issues relevant to learning and teaching. The PLCs need to have a shared vision and value base, evolving out of issues that need addressing in learner learning. Participants should engage in non-evaluative sharing about their practice in the classroom, in an atmosphere of respect and trust, for the purpose of constructive peer feedback. Hord also addressed the practical aspects of establishing PLCs, describing that the when, where, and how questions of meeting should be addressed before establishing a PLC.

Based on the work of Tuckman (1965), it can be assumed that PLCs will progress through various stages. Tuckman posited that group development over time will progress simultaneously in the social realm and in the task realm. Within the social realm, the stages are described as “testing-dependence, conflict, cohesion and functional roles” (Tuckman, 1965:384). Within the task realm, the stages are defined as “orientation, emotionality, relevant opinion exchange and emergence of solutions” (Tuckman, 1965:384). The first stage (testing and dependence/ orientation to the task) is characterised by group members discovering the acceptable and expected behaviour of members of the group. They identify the task parameters and determine how the group will proceed to accomplish the task e.g., exploring what information is required in dealing with the task. In the second stage (intragroup conflict/emotional response) group members assert their individuality and express hostility as a measure of resisting the group structure. They may also develop a resistance towards the task, particularly if it requires a personal change. The third stage (developing group cohesion/ open exchange) is characterised by group members accepting their identity as group members and behaving in a manner as to maintain the status quo. It is in this stage that group members feel secure to discuss themselves and their experiences and share their personal opinions. In the final stage (functional role-relatedness/ emergence of solutions) the group progresses to problem-solving. Members sound off ideas on one another. This is also the stage of personal insight and purposeful action.

As groups progress through these proposed stages, it can be assumed from Tuckman’s description, that the road to PLC success is not necessarily a smooth and easy one, and that persistence is required to reap the benefits of improved learner attainment. Practical considerations like time, teacher work-stress and conflicting personal beliefs regarding instructional practices can add to the challenges of

establishing successful PLCs (Linder, Post & Calabrese, 2012:20). DuFour explains how although the PLC model is a ‘grand design’, it “eventually translates into hard work” (DuFour, 2004:11). Staff must be disciplined to initiate and sustain the group, shift their focus from teaching to learning, work collaboratively and hold each other accountable for attaining results, as “the rise or fall of the professional learning community concept depends not on the merits of the concept itself, but on the most important element in the improvement of any school—the commitment and persistence of the educators within it” (DuFour, 2004:11).

Hord’s original work (1997) also expounded on the expected advantages of PLCs. Based on her findings, PLCs reduce staff isolation, increase commitment to a joint purpose and vision, share the responsibility for the learner’s successful learning, increase content knowledge, inspire teachers and boost their morale, allow for quicker adaptation of teaching to meet learner needs, promote commitment to lasting change and ultimately increase the probability of systemic change, and develop “powerful learning that defines good teaching and classroom practice” (Hord, 1997:27). Hord’s advantages have been confirmed in numerous reviews and research undertakings since (Brodie, 2014:237; Butler & Schnellert, 2012:1216; DuFour, 2014:32; Laal & Ghodsi, 2012:489; Louis & Wahlstrom, 2011:54). Furthermore, participation in PLCs has been related to improvements in teacher self-efficacy and job satisfaction (Schleicher, 2016:53).

Accepting the given fact that PLCs are advantageous to PD and learner development, Ronfeldt, Farmer and Grissom (2015) investigated 9000 teachers in 336 schools in the US and identified two particular forms of collaboration that are likely to translate into the most noteworthy gains in learner learning. The first type being collaboration aimed at analysing learner data and designing teaching responses to the data. The second form being directed at curriculum or teaching strategies (Ronfeldt *et al.*, 2015:479).

A local example of the first form of collaboration advocated by Ronfeldt *et al.* is seen in the work of Charaya and Brodie (2017), who explored the changes that PLCs could bring to mathematics teachers’ practices in a pilot study with four mathematics teachers in a township high school in South Africa. The teachers met weekly to analyse learner errors in tests and thereby isolate concepts that required re-teaching. They

collaboratively designed mathematics lessons to address these deficits and then met to reflectively discuss the outcomes. Although the gains on learner learning went beyond the scope of the research project, participation in the PLC had a sustained impact on the mode of teaching instruction (direct versus whole class discussion) in two of the four participating teachers. One teacher sustained a shift in her noticing, understanding and engaging with learner errors, while another teacher sustained a shift in her engagement of learners to participate in explanations, questions and reasoning. One teacher also sustained a shift in reducing the errors and imprecisions evident in her teaching. The researchers concluded that “PLCs can be an important vehicle for teacher learning in South Africa” (Charaya & Brodie, 2017:232). Furthermore, these PLCs created opportunities for the participating teachers to grow in their mathematical knowledge for teaching (pedagogical content knowledge).

A local exploration of the second form of collaboration advocated by Ronfeldt *et al.* (2015:496), i.e., collaboration directed at curriculum or teaching strategies, is apparent in a study undertaken by De Clercq and Phiri in 2013. These researchers explored a case study into cluster meetings in Mpumalanga, the design of which does meet Ronfeldt *et al.*’s criteria of being directed at curriculum or teaching strategies. Although research results were again not focused exclusively on the outcome of gains in learner learning, these PLCs were described as improving subject and pedagogical content knowledge and enhancing teacher competencies and skills, as well as additionally sustaining teacher interest in learning, and creating enriched learning experiences for learners (De Clercq & Phiri, 2013:84). In an earlier study into teacher clusters in the province (Ndlalane & Jita, 2009) researchers purposively sampled 120 cluster leaders, who attended the Mpumalanga Secondary Science Initiative (MSSI) professional development workshops, emanating from the Ono and Ferreira’s LS research (2010). Ndlalane and Jita (2009:61) noted that cluster leaders did not originally possess the necessary content knowledge and pedagogical content knowledge for their subjects. However, research participants described how participation in these PLCs helped to break down their feelings of working in isolation and created a collective understanding of content knowledge and pedagogical content knowledge allowing them to “learn more, know more and better organise their CK [content knowledge] and PCK [pedagogical content knowledge] relating to the topics under discussion” (Ndlalane & Jita, 2009:65). A noteworthy mention must be made of the fact that there is an absence

of documented research specifically into PLCs and the collaborative activities of foundation phase teachers in a South African context. This implies a research gap that begs further exploration.

In her document analysis into ways in which professional learning communities can be effectively implemented for PD in South African schools, Steyn (2013:282) proposes that PLCs need to have clarity of focus and commitment to professional learning. Care should be taken to develop conducive relationships within these communities. Schools should clearly explain and support the functioning of PLCs, identify competent facilitators, create a safe and supportive climate conducive to PLCs, involve the school leadership and network with surrounding schools.

The ISPFTED (DBE, 2011a:29) envisioned the goal of nation-wide PLCs to be established by 2016/17, a dream that is lagging far behind in its implementation. Brodie expresses concern over the government's optimism in this regard and cautions that "immense skill and expertise on the part of the facilitators and tremendous commitment from the schools and teachers" is required in implementing successful PLCs in South African schools (Brodie, 2013:15). Dufour (2011:162) also cautions that PLCs do not offer short cut methods to PD and will require commitment and dogged persistence on the part of educators to reap the benefit of improved learner ability.

In an Australian case study into the establishment of a primary school PLC through the joint effort of early grade teachers and a local university, it was concluded that the process can be fraught with challenges (Maloney & Konza, 2011:81). Teachers demonstrated inconsistency in their commitment and energy levels and were reluctant to voice their beliefs on debate-worthy topics. Some teachers were less willing to attend or interact if group meetings were held outside of school hours, or after a school day, and general personal lack of motivation was noted in some participants. The researchers acknowledged that "co-constructing knowledge of learning and teaching within a professional learning community requires staff to have a high level of motivation to learn, to be confident in expressing personal views, and to be receptive to change and innovation" (Maloney & Konza, 2011:84). These traits were evidently missing in many of their research participants, resulting in unclear research results on the effectiveness of their PLC for nurturing PD.

In South Africa, PLCs have been attempted through the creation of regional clusters (De Clercq & Phiri, 2013:79; Ndlalane & Jita 2009:58). Generally, however, there is little evidence of these clusters impacting teaching and learning change (Botha, 2012:401). Botha attributes this to a lack of understanding about the purpose and type of interactions that should be evident in PLCs. Merely having skills or knowledge does not translate into relationships of change over time, unless the essential PLC principles of sharing, reflecting and making inquiry are applied (Botha, 2012:401). Furthermore, Steyn asserts that trends of teacher isolation, particularly in the South African context, may impede the development of successful PLCs (Steyn, 2013:286). Creating effective PLCs is therefore a challenging process requiring persistence and know-how that has yet to be cultivated widely in South Africa.

#### **2.1.6 Role of facilitator**

In their PD analysis, Cordingley *et al.* (2015:6) conclude that “external input is a common factor in successful outcomes”. The interaction between teachers and facilitators in PLCs has been described as the greatest determiner of a teaching community’s successful outcome, both in changing teacher beliefs and in changing their teaching practice (Vangrieken *et al.*, 2017:54). The role of the external facilitator was emphasised by Chauraya and Brodie in their study of collaborative PD for mathematics teachers in South Africa. The researchers maintain that the facilitator’s role in these PLCs could not be underestimated. This confirms Brodie’s prior position, in which she defines the role of the facilitator as “absolutely key to the success [of the PLC]” (Brodie, 2013:15). This stance is forwarded repetitively in her South African work (Brodie & Shalem, 2011:421; Brodie, 2014:237) and she describes how facilitators initiate the reflection process in teachers, allowing for the development of new meanings (Chauraya & Brodie, 2018:8).

Cordingley *et al.* (2015:6) further explain how facilitators provide fresh and diverse perspectives and challenge the existing belief systems of teachers. They list the benefits of expert facilitators as bringing pedagogical and subject knowledge to the table, introducing new skills, providing practical help, creating an understanding of how learners learn and making teacher learning personal. This is accomplished through facilitation that embraces the treating of teachers as co-learners. Effective facilitators

therefore possess a blend of interpersonal talents and professional knowledge (Fulton & Britton, 2011:15-16).

In a study on the pedagogy of facilitation, Patton, Parker and Neutzling (2012:530) describe how expert facilitators were “teacher-centered, providing structure without dictating responses”. They concluded in their findings that expert facilitators acknowledged the expertise of the teachers and engaged them in active learning. In summation, they facilitated learning as a social process (Patton, Parker & Neutzling 2012:526). This implies the facilitator needs to understand the participants’ prior knowledge, experience and perspective. Teachers who feel understood and valued are less defensive when discussing their differences and deficiencies (Patton, Parker & Neutzling, 2012:527-528). Effective facilitators do “whatever [it takes] to build meaningful relationships” (Patton, Parker & Neutzling, 2012:529) and create an environment of safety and security where teachers are free to share.

Brodie (2013:14) describes how the notion of successful PD through PLCs in South Africa is met with criticism. She counters this scepticism by putting forward the argument that effective facilitation is key to PLC success. In their study into identifying factors that supported PLCs, Linder *et al.* (2012:18) found that the second most valued component of PLCs was the presence of an effective facilitator, after the first component of personalised and in-depth content study. The study concludes that effective facilitators are said to be inspirational, directive, knowledgeable, personal, democratic and helpful.

### **2.1.7 Practical, hands-on learning and the use of modelling**

Patton *et al.* (2015:7-8) suggest PD activities should “include action research, observing and receiving feedback, group discussion, and making presentations and/or writing for publication; as opposed to passively sitting through lectures”. Cordingley *et al.* elaborate that “a didactic model in which facilitators simply tell teachers what to do or give them materials without giving them opportunities to develop skills and inquire into their impact on learner learning is not effective” (Cordingley *et al.*, 2015:8).

In Ingvarson *et al.*’s (2005:14) research into PD in Australia, researchers concluded that teaching practice was mostly impacted through PD offering active learning and the opportunity for reflection thereafter. They describe how active participation

influenced teacher efficacy, through its ability to increase the teacher's confidence in implementing changes and meeting learner needs. This implies that in order to teach effectively and to improve learner learning, teachers should be given an opportunity to do what they learn, self-study their performance and reflect on the intricacies and outcomes of the process (Minott, 2010:327).

In personally implementing and reflecting on PD premises, teachers are able to discern the practical value of a proposed approach to teaching practice. This practical perspective to PD is grounded in practicality ethic, first proposed by Doyle and Ponder in 1977. According to these theorists, PD often falls short in its promise of change because teachers evaluate proposed changes only on the basis of its practical value (Doyle & Ponder, 1977:2). Teachers largely operate as sole arbiters within their classrooms due to the isolated nature of teaching. Innovation through PD is, in essence, a threat to this autonomy. This is exacerbated through collaboration and making information regarding evaluation of practices public. These factors threaten teacher autonomy. Teachers will only be motivated towards change if their input is considered. In this way, the decision-making capabilities of the end-users are not ignored. Without the fit between content and user, there is a short-lived interest in PD programmes.

Doyle and Ponder (1977:3) go further to describe how teachers are often viewed in PD programmes as either rational thinkers, "stone-age obstructionists" or pragmatic sceptics. As rational thinkers, PD is structured around the premise that teachers learn through intellectual processing and problem solving. This is at the heart of most workshop-type disseminations. The researchers' tongue-in-cheek response to this view of PD is that "presumably the weight of scholarly evidence, together with an appropriately inspirational rhetoric, will compel any 'reasonable and intelligent' teacher to rush out and try the latest 'new idea' in education" (Doyle & Ponder, 1977:4). Conversely, PD adopting the view that teachers are "stone-age obstructionists" describe teachers as obstacles to innovative advancement. This is evident in prescriptive and dictatorial PD and "teacher-proof" curriculums. The resolution between these two approaches is in viewing teachers as adaptors rather than adopters of innovations. Practicality theory therefore regards teachers as pragmatic sceptics. Teachers filter innovations through their personal preferences, costs and

consequences, the immediate impact it will have on their learners and its concrete and procedural value. “Individualism, immediacy, and concreteness” therefore form the pillars of practicality ethic (Doyle & Ponder, 1977:5).

Congruent with the basic tenets of practical ethic theory, teachers will have superior visual and auditory access to the instrumentality of classroom procedures through the PD method of modelling classroom practice. Modelling has therefore been espoused as a powerful means for teacher learning (Bryan, 2014:30; Hodgson, 2013:393). Through reflection on real-life modelling, teachers can analyse their assumptions and the consequences of teacher choices and actions (Cranton & King, 2003:35). Deacon (2012:44) suggests that effective PD in a South African context should incorporate a methodology whereby teacher educators or mentor teachers model the best practice in actual classroom situations. Deacon postulates how this provides opportunities for reflection and learning in others. De Clercq and Phiri (2013) substantiate these claims in their investigation into the PD benefits of teacher clusters in Mpumalanga. The researchers concluded that these PLCs inspired gradual teacher learning, particularly through experienced teachers modelling teaching techniques (De Clercq & Phiri, 2013:82). “In the most effective [PD], specialists supported teachers by modelling, providing observation and feedback, and coaching” (Cordingley *et al.*, 2015:7). When teachers observe modelled lessons, they can identify important pedagogical knowledge, content knowledge and pedagogical content knowledge as it is displayed (Hodgson, 2013:393). Furthermore, Baier (2018:np) noted how her observation of modelled teaching promoted collaboration, an awakening to new techniques, a way of understanding issues in common with others, as well as reinforcing her beliefs in the benefits of the profession. Caution is, however, expressed by Weade and Evertson (1991:39) in that the benefits of modelling and observation are enhanced more through observing the teaching process (including the learners’ reactions and responses), rather than exclusively focussing on the idiosyncrasies of a teacher.

#### **2.1.8 Supported by school leadership**

In their research involving five case studies, Takahashi and McDougal (2016:519) isolate certain characteristics acting as catalysts for the successful implementation of school wide PD. One of the primary characteristics is an enthusiastic principal who is supportive and communicates this support to the staff. Cordingley *et al.* (2015:10)



describe how school leaders support PD through creating vision, practically coordinating PD activities, establishing a learning culture and inculcating leadership in others.

Principals often overlook their need for direct involvement in PD and in the implementation of such programmes in their schools, to the detriment of their teachers' development (Geldenhuys & Oosthuizen, 2015:208). In her research into their role, King identified that certain actions of principals influenced the sustainability of PD programmes. These actions included the alignment of values between the principal and staff, the willingness of the principal to make organisational changes, and the ability of principals to empower their staff to establish collaborative learning communities (King, 2011:4). In the research findings of Szczesuil and Huizenga (2014:181) staff members required school leaders to take the reins regarding collaborative development, particularly in the early stages. Principals needed to direct the underpinnings of collaborative work and not place this burden exclusively on the shoulders of their staff. The researchers describe how teachers require clarity from the head when it comes to the vision and purpose of collaborative development (Szczesuil & Huizenga, 2014:182) and how principals cannot assume that teachers possess the necessary informal leadership qualities required for collaborative success (Szczesuil & Huizenga, 2014:188).

Steyn (2011:51) elaborated on the essential role of principals to set the example in PD and remain abreast of current educational trends. She expounds that principals need a deep understanding of their teachers, both their strengths and weaknesses, and as a result, a selectivity regarding PD choices. Principals should play a prominent personal role in the equipping and development of teachers within their particular school contexts. However, Maloney and Konza (2011:84) caution against an over-directive role. They elaborate how the school's leaders in their research controlled the PLC agenda, designed the PD tasks, chose the topics and exercised control over participation, all the while losing sensitivity to the democracy and personal expectations of participating teachers. Researchers believed that change and improved teaching practice would be better served if research participants could contribute equally to their own PD (Maloney & Konza, 2011:85). In her white paper, Hord describes how principals should lead from the centre by "being at the centre"

(Hord, 1997:35). This incorporates sacrificing an authoritative role in favour of mutually sharing at every possible opportunity. If school leaders are able to offer democratic support and direction, environments promoting PD will be conducive to allowing principals to spend less time “monitoring teaching” and focus more on collectively working with their staff to “monitoring student learning” (Dufour & Mattos, 2013:39).

### **2.1.9 Teacher change**

According to Mezirow’s transformative learning theory (1978) sustained change is only possible when learning creates a shift in one’s “frame of reference” (Mezirow, 1997:5). This frame of reference is described as the assumptions that one possesses, which define experiences. It encompasses one’s habitual way of thinking, as well as the articulation of one’s point of view. “Effective professional development brings our habits of mind about teaching into consciousness and allows us to examine critically what we believe and value in our work as educators” (Cranton & King, 2003:34). In other words, it allows one to compare new information with an existing frame of reference and experience and accept or reject this new information. It is through a teacher’s “experience, critical reflection and rational discourse” (Khabanyane, Maimane & Ramabenyane, 2014:452) that acceptance of new information becomes possible, metamorphosing a teacher through a “paradigmatic shift” (Taylor, 2017:17).

Similar descriptions were employed by Kagan (1992) who defined professional knowledge as one’s professional beliefs, and “to teach an individual something new means to effect conceptual change in his her or her personal beliefs” (Kagan 1992:75-76). She argues that these beliefs are most strongly impacted by teachers analysing their own practice and that of other teachers, even more so than reading or research. In keeping with transformative learning theory, for PD to be effective, teachers had to unearth their pre-existing beliefs and be challenged by new information that was examined. This measure of “disequilibrium” is what lead to change (Kagan, 1992:78). Evidence of this theoretical ideology put into practice can be seen in a study conducted by Borg (2011) regarding the impact of PD on teacher beliefs, particularly in the subject area of language. The researcher concluded that PD has the potential to impact the beliefs of teachers, both through changing these beliefs or through strengthening and extending their existence. He attributes this transitional process to the range of PD opportunities teachers experience, like teaching practice, supervisor feedback or

coaching, and reflective writing (Borg, 2011:378). For sustained change to occur, PD should challenge a teacher to acknowledge, clarify, talk about, reflect on and question or doubt their pre-existing beliefs (Borg 2011:379).

## **2.2 PROFESSIONAL DEVELOPMENT IN SOUTH AFRICA**

### **2.2.1 Where should our focus lie?**

When it comes to South African education, there is a weak correlation between government expenditure and improved learner outcomes (Spaull, 2015:116). Inadequate teacher professionalism has been considered a probable poor link in the chain of education improvement (Harber & Mncube, 2011:237; Maphosa, Mutekwe, Machingambi, Wadesango & Ndofirepi, 2012:545; Msibi & Mchunu, 2013:27). Teacher professionalism, or “professionalisation”, has therefore become a topic of interest to PD stakeholders in the country (SACE, 2019). The curriculum shifts implemented in post-Apartheid South Africa (OBE, C2005, NCS, CAPS) have demanded high levels of professionalism amongst teachers to cope with vast challenges and changes (Msibi & Mchunu, 2013:19). Many South African teachers feel professionally adrift, however, evident in Henning’s findings regarding early grade mathematics teachers, who view themselves as “mechanical conduits” and “do not appear to know themselves as professionals” (Henning, 2013:151). Poor professionalism has also been acknowledged as a contributor towards PLCs failure to launch in South Africa by Gerard Coetzee, the director of initial teacher education and acting chief director for education human resource development in the national Department of Education (2019). He states that as teachers, “we are on a developmental path towards becoming a professional community, but we are not there yet...once we reach the maturity stage where... teachers are starting to make judgements in terms of what happens in their classes, and what happens within their schools and what happens within their communities, and start integrating those aspects in the way that they teach, that is when PLCs will almost become natural” (Coetzee, interview on 16 April 2019). Upgrading the professionalism of teachers should therefore be at the heart of PD (HRDC, 2014:4). This vision has been expressed in the Department’s action plan to 2019 (DBE, 2015b:3), in which the improvement of the professionalism of teachers (incorporating teaching skills, subject content knowledge and computer literacy) is

regarded as one of the five highest priority goals of the DBE, out of a possible 27 targeted goals for development.

South African teacher PD should also focus on the empowering of teachers towards independence and competence in curriculum delivery. Researchers attest that “much of the failure of education in South Africa has to do with the government’s preoccupation with the curriculum instead of with teachers and their capabilities” (Msibi & Mchunu, 2013:20). CAPS is described as a “modification of what to teach and not how to teach in South African schools” (Du Plessis & Marais, 2015:115). The National Curriculum Statement was “repackaged so that it could be more accessible to teachers” (Kaino *et al.*, 2015:156) by prescribing weekly topics, subtopics and teaching approaches. However, it is criticised for pushing “bureaucratic forms of accountability instead of professional accountability” (Msibi & Mchunu, 2013:25), for being too prescriptive (Coetzee, interview on 16 April 2019; Ramatlapana & Makonye, 2012:S8) and for disguising the poor content and pedagogical content knowledge of South African teachers, instead of tackling the root problem of incompetent professionalism.

However, teacher PD and professionalism, attempted through various models of “teacher capacitation” (NEEDU, 2013:66) remains a complicated and poorly researched issue in the South African arena (Spaull, 2015:126). Stakeholders do acknowledge that the PD of South African teachers should focus on building skills and creating expectations of professionalism, through a process of “empowering [teachers as professionals] with sufficient expertise to conduct themselves as such” (Mbisi & Mchunu, 2011:29). It is suggested that this empowerment can be propagated through the building of content knowledge and pedagogical content knowledge for teaching subjects, higher expectations of good work ethic, professional accountability and the collaborative notion that “teachers can develop one another in the profession” (Mbisi & Mchunu, 2011:30). This is the pursuit of the dream of “getting away from mechanistic compliance and chasing after the targets trap that we are in at the moment... to becoming a professional group of teachers concerned about our children” (Coetzee, interview on 16 April 2019).

### **2.2.2 Who is currently responsible for Professional Development in South Africa?**

In the Norms and Standards for Educators, teachers themselves are expected to “achieve ongoing personal, academic, occupational and professional growth through pursuing reflective study and research...” (DBE, 2000:13). The policy further describes how educators are accountable for specialisation in their fields, incorporating both content and pedagogical content knowledge specialisation (DBE, 2000:14). The National Policy Framework for Teacher Education and Development in South Africa (NPFTED) (DBE, 2006:5) advocates a PD approach that is teacher-driven, school-based and well-co-ordinated. The responsibility of self-development is placed squarely on the shoulders of the teacher, and the role of the national and provincial education departments is to create an “enabling environment for such preparation and development of teachers to take place” (DBE, 2006:5). The NPFTED policy also elucidates how teachers need to enhance their own subject knowledge and pedagogical content knowledge as well as improve their basic skills at teaching (DBE, 2006:16-17). According to this act, the envisioned PD of teachers will be formally monitored through the Continuing Professional Teacher Development (CPTD) system, enforced by the South African Council for Educators (SACE) (SACE, 2013:6). Through the NPFTED policy and Act 31 of 2000 (SACE, 2000:4), SACE is the officially mandated body for maintaining the ethical and professional standards of educators. SACE acknowledges the existence of a wide variety of PD activities available to teachers, and groups them into the three broad categories, namely: teacher priority activities, school priority activities and profession priority activities (SACE, 2013:9). Once again, the guiding principle being that teachers should be enabled “to become less dependent on outside agencies and more able to become responsible for their own professional development” (DBE, 2006:18). In a 2019 teacher professionalisation presentation, SACE described how teachers should engage in PLCs, together with other endorsed PD initiatives. Teachers were again affirmed as being personally responsible for their own academic and professional growth (SACE, 2019:16).

This “bottom-up” PD approach whereby teachers drive their own development was further emphasized as a governmental goal in the Integrated Strategic Planning Framework for Teacher Education and Development in South Africa in 2011 (DBE, 2011a:16). Similar to the NPFTED, the ISPFTED delineates how PLCs should be

established by teachers and supported by professional teacher associations, teacher organisations, districts and provinces. Furthermore, the Department of Basic Education aims at establishing a National Institute for Curriculum and Professional Development (NICPD) to support PLCs with stimulating activities and materials. The plan acknowledged the need for well-trained facilitators in the launch of these PLCs and suggests a process of diagnostic self-assessment to guide teachers in strengthening their weaknesses collaboratively. The plan further describes how these envisioned PLCs would assist teachers in integrating recent research with their current practices. Collaboration should centre on the evidence of learner results, curriculum implementation, the use of support materials and modelling. It is envisioned that district teacher development centres would serve as meeting venues for these collaborative PD activities (DBE, 2011a:14).

Although the PLC goals of SACE, the ISPFTED and NPFTED are noble and well-intended, the move towards teacher-initiated, community-based PD through PLCs is still, however, lagging behind the more traditional and prescriptive top-down PD approaches. It has been reported that there are currently 800 top-down PD programmes, in which an average of 33160 teachers have participated in 2015 alone (Van der Berg & Gustafsson, 2017:22). This is a repetition of the pre-2009 PD climate, which was a period characterised by three particular PD initiatives in the Department of Education, namely workshops focussed on curriculum, short courses offered by district and formal qualification programmes (De Clercq & Shalem, 2014:133). Based on the scant current comparative evidence regarding the establishment of bottom-up PLCs for PD, it can be concluded that the traditional top-down approach is still favoured over bottom-up initiatives, in spite of governments' wishes to the contrary. Coetzee acknowledges that many of the issues raised by the ISPFTED, like PLCs, are "idealistic" and "progressive" within the vast scope of the government professionally developing just under 500 000 teachers. Coetzee describes that although there is a universal realisation in the government sector that PLCs are the way forward, the establishment of PLCs rests in the hands of teachers as professionals, and there is currently little evidence of their widespread existence (Coetzee, interview on 16 April 2019). The department attributes this to the "lack of available external training and guidance on how schools can initiate their own training" (DBE, 2015b:34). Research into the best approaches for implementing PLCs is still

embryonic in South Africa, and the Department acknowledges that “advocacy campaigns informed by the actual experiences of teachers and effective ‘how-to’ guides are needed” (DBE, 2015b:35).

### **2.2.3 Why are current professional development approaches not effective?**

In their analysis of the TIMMS report, Kaino *et al* (2015:158) describe how the confidence levels of South African teachers, particularly in mathematics, outshines that of leading countries in the subject, in spite of learners’ extremely poor performance in international comparative studies. This indicates a lack of awareness on the part of South African teachers for the necessity of PD, as they do not consider personal improvement as a high priority. In addition to this, the more common approach of workshopping has been criticised for not meeting teachers’ needs nor providing practical guidance for improved classroom practice (Geldenhuys & Oosthuizen, 2015:209).

In the development of PLCs, South African teachers do not readily view a collaborative approach as a solution to their PD needs (Bantwini, 2012:527-528). This could be attributed to the impressions created by clusters which have not always met with resounding enthusiasm by teachers, nor been used for their definitive purpose (Bantwini, 2012:524; Mphahlele & Rampa, 2014:3134). Clusters are collaborative “group[s] of teachers from a set of schools in a geographical area” (Jita & Mokhele, 2014:11). Although they should be a platform for the sharing of teaching knowledge and experience (Jita & Mokhele, 2012:3), clusters were initially established in the pre-2009 period, to train teachers on common tasks for assessment (De Clercq & Shalem, 2014:134). Evidently, a lack of clear direction, leadership and supporting structure coupled with overworked subject advisors can be blamed for their failure to successfully implement PD in many contexts (Bantwini, 2012:523–524). Furthermore, clusters, as they are most commonly practiced in the South Africa, digress from truly teacher-driven and initiated PLCs through the process of bureaucratic institutionalisation (Jita & Mokhele, 2012:2). Their apparent “contrived collegiality” (Jita & Mokhele, 2012:3) evident in the administrative control by districts and officials who arrange the agenda and goals of the clusters, the coercion of teacher attendance, the focus on implementing curriculum change rather than addressing the needs of the participating teachers, and the predictability of their agendas, coupled with the district

supervisory and monitoring role all are counterproductive towards the core components of effective PLCs. Therefore, structurally, clusters have been criticised for “merely [becoming] one of the administrative organs of the Department of Education that could help to simplify the management of schools” (Jita & Mokhele, 2012:5). It would appear that teacher-directed “alternative, voluntary clusters” underpinned by self-direction and self-regulation and operating outside of the official government mandate, are more successful conduits for PD (Jita & Mokhele, 2012:9). These types of clusters are, however, less common in the wake of existing clusters (Mphahlele & Rampa, 2014:3133).

Whether top-down or bottom-up, the PD challenges facing South Africa are often exacerbated by the contextual challenges many teachers face, particularly in poverty stricken and rural areas. Bansilal and Rosenberg (2011) qualitatively investigated 41 teachers from impoverished and poorly resources schools participating in PD aimed at improving their skills for teaching mathematics literacy. In their analysis of the teacher responses, the following factors contributed to the challenges of implementing professionalism and knowledge gain through the attempted PD project: (1) The issue of teaching context, including large classes, poor language proficiency and unmotivated learners. (2) Poor teacher content knowledge, which reflected in the fact less than half of the teachers selected for the study completed the programme within the prescribed time-frame and only 51% ultimately graduated. (3) Poor correlation between planned teaching and what was actually implemented. (4) Poor learner attitudes and lack of disciplinary recourses available to teachers. These, and other factors, restricted the participating teachers’ “space for innovation” (Bansilal & Rosenberg, 2011:124).

Broadly, teachers in South African list several reasons for their perceived inadequate motivation for PD, particularly in mathematics. These are a lack of transport, inadequate food provisioning, inconvenient timing of courses and poor support. Furthermore, the lack of implementing PD knowledge, was attributed to inadequate resources and classroom overcrowding (Kaino *et al.*, 2015:161). Spauull (2015:131) concurs that the way to systemic improvement is complex. He describes how improving teacher content knowledge without addressing institutional dysfunctionality (including aspects of teacher professional ethic) would render PD initiatives “unlikely



to yield gains” (Spaull, 2015:131). Furthermore, the role of unions in the education system have been criticised for their maintenance of teacher status quo and limitation of educational reforms (Msibi & Mchunu, 2013:30).

#### **2.2.4 Conclusion to professional development**

In their exploration of the PD literature, Matherson and Windle (2017) conclude that teachers desire four basic things from PD. The first being that PD should be interactive, interesting and relevant to the learning of their students. Secondly, that it offers practical advice, particularly in the field of pedagogical content knowledge. Thirdly, PD should be teacher-driven, particularly in the form of PLCs. And fourthly, PD opportunities should be sustained and develop them over time. This list concurs with many of the findings of Cordingley *et al.* (2015). In conclusion, “professional development should be just as dynamic as the education its participants are expected to provide” (Matherson & Windle, 2017:32).

### **2.3 LESSON STUDY AS A PROFESSIONAL DEVELOPMENT STRATEGY**

#### **2.3.1 What is lesson study?**

LS (*jugyou kenkyuu*) originated almost 150 years ago in Japan, but it has only gained international popularity this century and is now utilised in numerous countries worldwide (Dudley, 2014:1). Recognition of the method first garnered support outside of Japan through the publication of *The Teaching Gap* which documented the research of Stigler and Hiebert (1999), describing the differences in eighth grade Mathematics lessons in USA, Germany, and Japan. They based their findings on a comparative video study from the Third International Mathematics and Science Study (TIMSS). The same year, Yoshida further expounded LS to the world through a doctoral dissertation (described in the English work of Fernandez & Yoshida, 2004).

LS adaptations have evolved in different geographical areas and cultural contexts (Khokhotva, 2018:251). Some of these international contextual differences were explored by researchers Huang and Shimizu (2016). They concluded that Chinese LS differs from Japanese LS in that it is more focussed on lesson content and strategies, repeats lessons multiple times, and makes use of experts in all phases of the process. British LS brings in the element of selecting three case learners to observe as representatives of the class and incorporates at least three LS cycles in the process

of collecting and analysing data. Hong Kong and Swedish LS has evolved into Learning Study, which focuses on more specific and measurable learning goals and is guided by variation theory (Huang & Shimizu, 2016:395-396). Although these contextualised variations exist, LS consists of certain core features and basic components namely: the formulating of goals to address the needs in learner learning and development; group formulation of a lesson plan to attain the goals; presentation of the lesson by one member of the group, while the others observe and gather evidence; and the group discussing and reflecting on the evidence gathered during the lesson, using their reflection to improve the lesson and their own teaching practice (Groves, Doig, Widjaja, Garner & Palmer, 2013:10; Huang & Shimizu, 2016:398). Seleznyov (2018:223) suggests that LS follows a traditional research methodology, in that participants develop a research hypothesis, design an experiment to conduct in class, gather their evidence and generalise their findings.

For the Japanese teacher, LS “is like air, felt everywhere because it is implemented in everyday school activities” (Fujii, 2014:66). Subsequently, because it is so traditionally ingrained, LS is difficult for the Japanese to accurately describe in a neat step-by-step package. Sometimes Japanese researchers try to describe LS by listing what it is not (Fujii, 2014:6). Steeped in cultural convention, the simple transference of LS to other countries may be challenging (Ebaegiun & Stephens, 2013:24) resulting in the aforementioned contextualised adaptations of the original Japanese method. However, in a criticism of adapted American LS models, Yoshida motivates that the productivity and sustainability of the LS process should not be compromised. It is only through authentic Japanese LS that teachers gain “more content, curriculum, and pedagogical content knowledge, and became more motivated and interested...” (Yoshida, 2012:144). In her broad literature review on this theme, Seleznyov (2018:220) identifies several critical components of Japanese LS that should be evident to ensure that fidelity to the authentic Japanese LS approach is maintained.

## **2.3.2 Components of authentic Japanese lesson study**

### **2.3.2.1 Goal setting**

The starting point of all LS is a contextually-relevant question (Fujii, 2014:79). LS is directed by purpose. It is a research undertaking finding a solution to a teaching-learning problem. This process incorporates setting both a smaller content goal for the

lesson, as well as a larger school research goal, called a research theme. The research theme extends across school disciplines and grades and is long-term (Takahashi & McDougal, 2016:519). Examples of such themes are “for students to clearly be able to explain their thinking” (Takahashi & McDougal, 2016:519) or “for students to take initiative as learners”, “be active problem-solvers” or “be active problem-seekers” (Lewis, 2000:5). This research theme is the first critical component identified by Seleznyov in authentic Japanese LS (Seleznyov, 2018:220). She describes a research theme as one that is embraced by the entire school and one that can extend for 2 or 3 years (Seleznyov, 2018:220). Almost all staff should be involved in establishing this school-wide research theme, tackling a school-recognised challenge that is evident in all classes (Takashi & McDougal 2016:515). The research theme should be short and memorable. It provides the motivation for staff to close a gap identified between what learners are achieving and what they hope their learners will achieve (Takahashi & McDougal, 2016:520).

After a research theme is established, a chosen topic should be identified for the specific research lesson. In his seminar on LS as a teacher development approach, Sekao recommended that the chosen topic and lesson goals should be linked to assessment results and data for a particular group of learners in a South African context. In this way, the planned research in the LS cycle will be remediating a specific deficit in lesson presentation and learner thinking (Sekao, seminar 12 September 2019). Whether establishing the overarching research theme or the lesson-specific goal, learner learning is the paramount educational value guiding LS goal setting. The emphasis on learner learning is one of the key factors that distinguishes LS from other approaches to PD (Bjuland & Mosvold, 2015:85). Goal setting, however, should not only identify what the learner should learn, but also what the teacher wishes to learn herself in the LS cycle. As LS is a research process, teachers should see themselves as researchers building on their personal knowledge and understanding (Bjuland & Mosvold, 2015:88-89).

#### **2.3.2.2 Lesson planning**

Secondly, Seleznyov isolates extensive lesson planning (*kyouzai kenkyu*) as a critical component of Japanese LS. This is a process whereby teachers detail their hopes for the lesson (Seleznyov, 2018:220). Teachers seek to find answers to questions like

“why do I need to teach this topic to my learners now, what are the key mathematical ideas that I expect my learners to develop through solving this problem, and what are the potential challenges that my learners have to overcome?” (Takahashi, Lewis & Perry, 2013:252).

Planning a LS research lesson is a collaborative and personal process of deeply reflecting on the required mathematical content of a lesson and on the ideal pedagogical approach to use. The balance between the two skill sets needs to be maintained throughout the LS process (Doig *et al.*, 2011:196).

Fujii conducted an in-depth exploration of three Japanese schools who were implementing LS and concluded that meetings around the planned lesson flow were structured proportionally according to the following criteria; 31% of the time spent on discussing the type of problem or task that would be presented, 29% on the anticipated learner responses, 31% on what learners would present and how learner thinking could be utilised and 10% on the lesson summary. In planning the lesson's flow, teachers should solve the problem task themselves and notice its multiple solutions and possible misconceptions. This unlocks the latent educational potential of the proposed plan (Fujii, 2014:80).

Lesson planning does not only incorporate an exploration of the proposed lesson's task and flow. Lesson planning can be viewed as creating a type of research proposal (Fujii, 2014:72; Khokhotva, 2018:251). As with most scientific research, this incorporates an extensive study of existing material on a topic, similar to an academic literature review (Takahashi & McDougal, 2016:520). This is a time-consuming process of reading through material like the prescribed curriculum standards and research articles related to the topic (Takashi & McDougal, 2016:515). Textbooks, previous lesson plans, LS reports and prior work of learners are also good sources to consult (Doig *et al.*, 2011:182). By reviewing literature and collaborative discussion between teachers, the research lesson can be situated within an intended learning trajectory for the subject, both in and across grades (Takahashi & McDougal, 2016:520). Having a clear understanding of the national curriculum and how a specific lesson fits into a learning trajectory, is also a necessity to prepare teachers to anticipate certain ideas and solutions from their learners (Fujii, 2018:15).

This kind of extensive planning occurs over a long period and could take several meetings. In some instances, it could even take as long as a half a year (Fujii, 2014:67; Takahashi & McDougal, 2016:516). Akiba, Murata, Howard and Wilkinson (2019:361) collaborate that the longer and more intense the time span over which LS occurs, the more positive the PD outcome.

### **2.3.2.3 Teaching and observing the research lesson**

The third component of authentic LS is that one member from the planning team teaches the research lesson to a class of learners while the other members of the planning team observe (*kenkyu jugyou*) (Seleznyov, 2018:220; Takashi & McDougal, 2016:515). This process has been acknowledged as a major strength of LS as a PD tool (Akiba *et al.*, 2019:354). Lesson teaching and observing “provides an opportunity to enact and investigate the team's hypotheses about high quality teaching and learning” (Lewis & Perry, 2014:np). The research lesson is the most perfect one that the planning team could create (Fujii, 2014:77). The other members become observers in a silent evidence-collecting capacity (Seleznyov, 2018:220). The observers focus on gathering information about the lesson's impact on learners and their learning (Cajkler, Wood, Norton & Pedder, 2014:511). This is particularly undertaken through the lens of the predetermined research theme and the content goals established in the planning phase of LS (Takahashi & McDougal, 2016:520). In her pioneering LS paper presented in 2000, Lewis isolates examples of data that are gathered during the observation of research lessons. Teachers are required to collect information about learners with diverse levels of knowledge; teacher interaction; learner drawings and explanations; learner eagerness and participation; gender differences; exclamations made under breath; learner initiative; and attendance to important aspects of the lesson plan (previously given to observing teachers). This wealth of data channels teachers to “learn to see children” (Lewis, 2000:14-15). In this way, observation centres on learner learning, which is again, a factor that sets LS apart from other PD methods (Bjuland & Mosvold, 2015:85). Thomson, Bell and Hendry (2015:1060) stress the importance of teachers remaining attentive to the purposes of observation, not merely the processes and documentation around observation.

In being attentive, teachers will themselves learn, deliberately or inadvertently, through observation (Bandura & Walters, 1977:5). In the research of Thomson *et al.* (2015:1061), 82% of teachers who entered into the activity of peer observation reported learning a new teaching strategy, and 95% applied what they learned by trying something new in their own classes. This is confirmed by Tenenbergh (2016:771) who posits that vicarious learning leads to behavioural change. He describes how this occurs through a sequence of three activities. The teacher initially compares her own classroom practices and professional viewpoint with what she is observing, establishing similarities of context. She then analyses learner behaviour and preceding teacher behaviour that is dissimilar to her frame of reference, to establish an understanding of cause and effect. It is often only through seeing a solution put into effect that a teacher notices a preceding problem. Thirdly, she applies her understanding of dealing with these problems back into her own context.

#### **2.3.2.4 Post-lesson discussion**

The post-discussion is this fourth critical component of authentic Japanese LS (Seleznyov, 2018:220) and occurs as soon as possible after the research lesson (Bruce & Ladky, 2011; Dudley, 2013:119; Takahashi & McDougal, 2016:520). Lewis describes how this post-lesson discussion begins with presentations by the teacher who taught the research lesson followed by comments by those who planned the research lesson. Thereafter, there is a time for open discussion and questions, and the commentary is concluded with the outside expert's remarks (Lewis, 2000:11).

In this stage, participants are engaged in LS for the purpose of learning something new and not refining a lesson (Takahashi & McDougal, 2016:515). LS post-discussion involves the professional development of a teacher's "knowledge, beliefs, norms, routines, and materials" (Lewis & Perry, 2014). The post lesson discussion also incorporates an analysis of the appropriateness of the task selected for problem-solving (Fujii, 2018:13), how the teacher managed the difficult phase of selecting certain learners to give feedback on their selected task-solving methods, and how she used the thinking and responses of learners to construct an understanding of new Mathematics concepts (Fujii, 2018:7). Post lesson discussion therefore promotes the learning of new knowledge through talk (Dudley, 2013:109). Dudley suggests that post-lesson discussion should embrace a comparative discussion on the learners'

performance against what was predicted; a discussion on what learners learned; the effect that teaching had on learner learning; and how teaching might be conducted differently in future (Dudley, 2013:110).

Caution must be exercised in the debriefing process to keep it teaching-focused and not teacher-focused (Fujii, 2014:75). In their research into the design features of collaborative learning processes, Akiba *et al.* (2019:360) concluded that a facilitated discussion placing emphasis on learner thinking is strongly associated with perceived changes in the teachers' knowledge, self-efficacy and expectation. When observers had access to lesson plans to study before observing a lesson, Fujii noted how post-lesson comments were more directed at teaching and learning and less critical of the teacher (Fujii, 2014:75). A further safe-guard against a teacher-focused colloquium can be implemented through inviting the presenting teacher to open the commentary. This creates a time for her to elaborate on disappointments she herself experienced with the lesson and avoid the unpleasantness of another pointing them all out to her (Lewis, 2000:11). That being said, embracing the Japanese cultural norm of inviting alternative perspectives and viewing critical comments about the lesson as opportunities for growth and development, is a key component for LS to be implemented successfully outside of the Japanese context (Doig *et al.*, 2011:196). Caution must also be taken to avoid using the post-lesson discussion as an opportunity focused solely on celebration and boosting teacher morale (Cajkler *et al.*, 2014:525). In post-lesson discussion, "participants must consciously learn to negotiate the delicate balance between politeness and critical honesty" (Chokshi & Fernandez, 2004:6).

#### **2.3.2.5 Using feedback to guide planning**

The fifth critical component of authentic Japanese LS involves the cyclic nature of gleaning knowledge from post lesson discussions to guide new lesson plans (Seleznyov, 2018:220). Bruce and Ladky (2011:248) describe the time following the research lesson debrief as "invaluable" for the designing of follow up lessons. Seleznyov describes how the Japanese do not revise or reteach the previous lesson, but rather use the knowledge gained from post discussions to feed into future lesson plans. In this way, the research theme can better be accomplished across several topics, within several lessons and across different grades (Takahashi & McDougal,

2016:522). Fujii (2014:76) also criticises the idea of re-teaching a lesson, likening this to treating a lesson as an inorganic system with parts that can simply be replaced. He emphasises that lessons are unique because of the unique characteristics of learners. With these differing variables, the same lesson cannot be compared when taught to different classes. Re-teaching a lesson implies that the first set of learners were “pawns” which is disrespectful of their right to have the best possible education (Fujii, 2014:76). The purpose of authentic Japanese LS is not to create a flawless research lesson. Its success is measured by “what you learned working with your colleagues on the way...” (Japanese teacher quoted in Lewis, 2000:33).

#### **2.3.2.6 The role of the knowledgeable other**

The skill of an outside expert, called a “*koshi*” or “knowledgeable other” in Japanese, is the sixth element required for authentic Japanese LS (Seleznyov, 2018:221). This expert may be an experienced teacher at the school (Takahashi & McDougal, 2016:520), but is often an outside expert, such as a mathematics educator in university or a supervisor from the board of education who provides fresh perspective, information on maths content and information on other LS groups (Fernandez, 2002:396; Fernandez, Yoshida, Chokshi & Cannon, 2001:18). This “knowledgeable other” also brings knowledge about recent research and the government curriculum to the table. They link theory and practice for teachers and help them to develop the skills for reflecting on teaching and learning (Takahashi, 2014:10). The function of the expert is not extensively detailed in LS literature and Takahashi (2014) is one of the few researchers who provides a rich insight into the role of the knowledgeable other. He describes these knowledgeable others as experts well-versed in the deeper content knowledge of the subject, the curriculum, how textbooks are structured and the appropriate pedagogy to utilise. In this way, the knowledgeable other will pick up on any ideas that are omitted in a lesson plan. Takahashi expounds that knowledgeable others should demonstrate an understanding of important topical information with concrete examples and give critique that is easily understood. This careful evidence-based correction requires extensive preparation by the expert. Furthermore, the expert’s comprehensive understanding of both textbook material and how the lesson plan fits into learning trajectories, will guide teachers in connecting various sections of the syllabus as well as into understanding the interconnectedness between grades. In



this way, his role is to develop the theoretical understanding of the participating teachers (Takahashi, 2014:11).

Knowledgeable others have the added beneficial role of modelling critical reflection, through their behaviour and through verbal articulation. They draw attention to pedagogical issues related to the “assumptions, beliefs and values that underpin classroom practice” (Yiend, Weller & Kinchin, 2014:479). It cannot be assumed that staff know how to engage in feedback that will result in the critical reflection of teaching practices, and these experts facilitate and guide beneficial feedback behaviours through their modelling (Yiend *et al.*, 2014:481).

Although Chinese LS encourages the knowledgeable other's involvement in all phases of LS (Huang & Shimizu, 2016:395), Watanabe (2005:1) advocates involvement only in the latter stages. He argues that this allows for a fresh perspective, rather than a perspective that is compromised by close continual involvement in the group. Watanabe (2005:3) expounds that knowledgeable others should deepen their own content knowledge; work on question phrasing that does not provoke defensiveness; develop a broader viewpoint on improving teaching; participate in as many open houses for LS as possible; teach; and collaborate with other knowledgeable others. In this way they can “strive to improve their crafts” (Watanabe, 2005:3). Takahashi describes how these experts should also possess knowledge about the main research theme of the school and assist teachers by suggesting ways to pursue this theme (Takahashi, 2014:12).

#### **2.3.2.7 Spreading the word**

The last component defining authentic Japanese LS is the process in which knowledge is spread amongst teachers and across schools (Seleznyov, 2018:221). This can be accomplished by inviting others not involved in the LS planning to observe and discuss the research lesson (Takahashi & McDougal, 2016:521). It is further suggested that the LS community compose a research lesson document incorporating their research and ideas. The importance of documenting the process of LS is emphasized by the statement “LS is more about engaging in the intellectual process that fuels its activities than it is about the isolated products of these activities. Therefore, it is important to emphasize the value of record-keeping” (Chokshi & Fernandez, 2004:5). These

researchers go further to describe how recording the process of LS allows the group to communicate their findings both within and without the group.

Record-keeping and sharing can incorporate personal reflections about learning that has occurred amongst research participants (Takahashi & McDougal, 2016:521). In Japan, teachers are expected to write booklets or extensive reports at the end of the school year to capture what they have reflected on and learned through the LS process (Fujii, 2014:67). The purpose of recording lessons is not to create a library of lessons ready to import into any classroom context, but rather to communicate the general teaching principles, tools and ideas and assessment strategies that were utilised (Chokshi & Fernandez, 2004:5). Passing on knowledge “can help to fix or cement the new knowledge by enabling teachers to reflect upon and publicly advocate their newly learned practices” (Dudley, 2013:119).

In her analysis of the seven above-mentioned critical components of LS, Seleznyov (2018:221) explores 97 LS studies in the US, UK and Far East. Her findings suggest that many countries digress from these core components. 33% did not have an overarching theme; 63% did not do extensive material studies when planning; 8% did not conduct live observations; 60% tried to reteach a lesson or focussed on lesson perfecting, 55% did not utilise an outside expert and 61% did not share the knowledge gained outside of their LS circle. She concludes that several distinguishing Japanese LS components are therefore absent in various international attempts at implementing LS. Absence of any of these components makes it difficult to distinguish LS as a research process from other collaborative PD methods (Seleznyov, 2018:223).

### **2.3.3 Facilitators as another important feature of lesson study**

Akiba *et al.* (2019:361) corroborates that deviations in the design features of authentic LS could account for more than half of the variation in the effectiveness of this particular PD process. Over and above the Japanese design features explained by Seleznyov (2018), their description of the duration of LS and the role of the facilitator as the conduit to directing focus on learner thinking, are newer components added to the growing body of understanding of effective LS design elements (Akiba *et al.*, 2019:353). The essential role of a facilitator in a professional learning community like LS has been suggested by the DBE (2015a:12). They describe facilitators as “gatekeepers”, providing both a supportive and regulatory role in professional learning

communities. Facilitators are an important component in guiding effective collaborative teamwork (Truijen, Slegers, Meelissen & Nieuwenhuis, 2013:66). Little research is available on the critical role of the facilitator in LS, but this role is examined in the work of Schipper, Goei, de Vries and van Veen (2017:297). Facilitators are required to manage the LS process and guide teachers into exploratory thought. “A LS facilitator seems to play a pivotal role by managing the LS process and stimulating the teachers to use theory and new insights in terms of pedagogical content knowledge” (Schipper *et al.*, 2017:299). Facilitators assist participants in planning, communication, gathering and arranging resources and in a time-monitoring capacity. Furthermore, facilitators provide LS participants with a theoretical basis for their research and with alternative models. Facilitators are also invaluable in their role of motivating teachers to participate in LS and overcome their innate reluctance to put in the extra work (Khokhotva, 2018:260). They therefore play a key role in guiding effective LS and without their specified role, the process is vulnerable to degenerating into something “fairly chaotic” (Schipper *et al.*, 2017:298).

#### **2.3.4 Advantages of lesson study**

In its original state, LS is neither a funded nor a mandatory form of teacher development (Doig & Groves, 2011:77). LS is a grass-roots approach to PD and an ideal vehicle for supporting change in teaching instruction. Its cyclical nature allows teachers to saturate themselves in new materials and to collaboratively explore classroom instruction approaches and learner cognition (Takahashi *et al.*, 2013:243).

In Lewis’s foundational LS work (2000), she documents the advantages of LS as described by Japanese teachers. She concludes that LS benefits teachers in the following particular areas: individual PD; their ability to see children; spreading content knowledge and developing new approaches; connecting micro-goal setting with school macro-goals; development through working out conflicting views; creating a thirst for improvement; impacting national policy; and honouring the role of teachers (Lewis, 2000:22). In her later work with colleagues Perry and Hurd (2009:287), Lewis introduces a model describing the advantages of LS. The researchers group these advantages into four broad categories, namely the impact it has on teaching instruction, teacher knowledge, professional community and teaching-learning

resources. In their research into the effects of LS in the North American context, Lewis *et al.* (2009) conclude that all four areas are positively improved through LS.

Similar findings are recorded in other international case studies (Cajkler *et al.*, 2014:526; Khokhotva, 2018:256; Lim, Kor & Chia, 2016:496; Ní Shúilleabháin, 2016:223; Lomibao, 2016:12). Both the content knowledge and pedagogical content knowledge of teachers improved in these studies. Dudley (2013:112) corroborated the idea of content knowledge and pedagogical content knowledge gains in his research in which he describes how LS improves the quality of teaching. These gains were retained for months after LS concluded. Studies also report how teachers develop a greater understanding of how learners actually learn. Teachers are able to think more from the learners' perspective (Lim *et al.* 2016:497; Ogegbo, *et al.* 2019:5) and see learners with "different eyes" (Khokhotva, 2018:257). This movement away from teacher-centeredness to learner-centeredness is listed as a paramount benefit of LS (Lim *et al.*, 2016:497; Norwich & Ylonen, 2013:165). In a comprehensive analysis of multiple studies on the effect and achievements of LS and Learning Study (a similar derivative of LS) in the period 2000-2010, Ming Cheung and Yee Wong (2014:145) concur that LS is a powerful tool for teacher self-reflection about teaching and learning. These researchers note that their preliminary studies "indicate the beginning of a radical conceptual change in teaching, that is, turning to the teaching and learning process" (Ming Cheung & Yee Wong, 2016:147). In a study conducted by Ní Shúilleabháin (2016:222–223), conclusions were drawn regarding LS and its effect on the pedagogical-mindedness of teachers. The longer the duration of LS research, the more teacher conversations became focused on pedagogical elements. Over the cycles, teachers noticed better, and improved in reflected on and anticipating the strategies learners would use.

### **2.3.5 Possible problems associated with implementing lesson study**

In their study of LS implementation in Australia, Groves and Doig (2010) isolate the possible challenges in adapting and implementing LS in countries outside of Japan. Their three areas of concern were broadly placed under the umbrella terms of cultural issues, school contextual issues and problems associated with the research lessons themselves.

### **2.3.5.1 Cultural constraints**

“Many teachers have observed me during my lessons, and I have asked them to give me comments and to criticize my lessons...Through these experiences, I believe that my teaching method has improved, I believe so.” (Japanese teacher in Fernandez, 2002:395). Culturally, researchers explain how the Japanese view teaching as a public activity, wherein a teacher’s class is regularly viewed and scrutinised by their colleagues (Groves & Doig, 2010:700). Researchers corroborate that this willingness towards collaborative vulnerability and an openness towards peer correction is not a common occurrence in non-Japanese cultures like Australia (Groves & Doig, 2010:700) or the US (Fernandez, 2002:398). Similarly, South African teachers view teaching as a private enterprise and are not familiar with the practices of cross-classroom observation or collaborative lesson discussion for the purpose of professional development (Coe, Frick & Carl, 2010:207; Jita & Mokhele, 2014:8; Ono & Ferreira, 2010:67). Peer classroom observation in South Africa has often been associated with the Integrated Quality Management System (IQMS) whereby teachers are evaluated on their performance to “determine salary progression, grade progression, appointments and rewards or incentives” (ELRC, 2003:1). Teachers criticise the apparently conflicting dual purposes of the IQMS as a grading appraisal and performance enhancement tool (Keshav, 2014:10). IQMS has also been criticised for its dishonest implementation by staff who blatantly cheat to increase their remuneration (Queen-Mary & Mtapuri, 2014:2). Evaluative models like the IQMS have the disadvantage of creating feelings of alienation, poor cooperation and oppositional attitudes in teachers (Fletcher, 2018:4). Owing to this fear of criticism, it is understandable that teachers are hesitant to engage in other peer-reviewing and innovative PD undertakings like LS (Khokhotva, 2018:258).

### **2.3.5.2 School context impediments**

Time constraints are often mentioned as a problem in the successful implementation of LS (Akiba *et al.*, 2019:354; Fernandez, 2002:398; Khokhotva, 2018:257; Ogegbo *et al.* 2019:6; Ono & Ferreira, 2010:70). Groves and Doig (2010:702) note how LS is such a well-established tradition in Japan, schools make flexible time arrangements for lesson observations and post-lesson debriefs. LS cannot be accomplished in a short time-span but requires several meeting over many weeks (Takahashi & McDougal, 2016:516). Fernandez (2002:394) describes how planning for one

research lesson typically involves 10 to 15 hours of group meetings over a month-long period. In spite of the impediment of time restraints, it is noteworthy that Lewis describes Japanese teachers as actually having less time for collaboration than US teachers. Their ability to carve out time for collaborative LS evolves out of external support for the method (Lewis, 2000:25). This is corroborated by Ono and Ferreira (2010:70) who claim that time-restraints can be overcome if teachers are motivated to participate in LS and the process is fully supported by school leadership.

A further probable impediment to the successful implementation of LS, is the extensive density and breadth of the South African CAPS curriculum (Dixon, Janks, Botha, Earle, Poo, Oldacre, Pather & Schneider, 2018:6; Du Plessis & Marais, 2015:121; Ogegbo *et al.*, 2019:6). Conversely, the Japanese Mathematics curriculum has been described as “frugal” and entails a longer and deeper exploration of a limited number of mathematical topics, allowing learners to develop greater skills and a better understanding of concepts (Groves & Doig, 2010:705). As noted by researchers of LS in a South African context, “if the teachers continue to develop lesson plans merely to complete the curriculum and do not pay attention to learners’ understanding of the content, achievement will not be improved. This will eventually lead to the downfall of LS” (Ono & Ferreira, 2010:70).

### **2.3.5.3 Problems related to the actual research lessons**

In accordance with the groupthink model of Janis (1982:174), the desire for consensus and conformity within a group can be a hindrance to the output performance of the group. By disallowing honest and fresh insight, collaborative groups may become victims of group products and processes that reinforce the groups’ concurrent thinking, without considering controversial or alternative thinking. Groups may also avoid realistic, contradictory appraisals of a situation in the effort to maintain group cohesion. McGrath’s input-process-output model (1984) implies that effective teacher collaboration may lead to the output of shared knowledge but requires an initial input of knowledge to be shared. Consolidating the joint ideas presented by the models of Janis and McGrath leads us to conclude that an original lack of quality input of content and pedagogical knowledge can be a drawback to the successful output of collaborative PD process like LS. Teachers may simply be working together to

reinforce their own status quo – without reinventing or improving teaching practice (Stanley, 2011:73).

The problem of limited quality teacher input knowledge can be remediated in the LS process through the guidance of a knowledgeable other (Ogegbo *et al.*, 2019:7; Takahashi, 2014:11) and through the utilisation of quality resources like rich textbooks and reference articles (Takahashi & McDougal, 2016:515). Both of these resources are less readily available outside of the Japanese context (Akiba *et al.*, 2019:355; Doig *et al.*, 2011:193; Khokhotva, 2018:258; Takahashi and McDougal, 2016:520). In their research on the implementation of LS in the US, Takahashi and McDougal noted that teachers in five of the research schools eventually gave up on their prescribed texts and utilised Japanese textbooks as resource guides instead (Takahashi & McDougal, 2016:520). A similar problem was also noted by Lewis and Perry (2014:np) in their research in the US on compiling an appropriate resource kit to support LS. Yoshida confirms that textbooks from other countries, particularly eastern Asia, may be necessary as reference guides, as they are better “grounded in strong mathematical content and pedagogical knowledge, are coherent and focussed, and in accord with the current reforms” (Yoshida, 2012:147). Consequently, the re-conceptualising of textbooks should be seen as a priority for countries wishing to implement LS.

Even if written resources are available, teachers may lack in their experience of studying curriculum materials to glean for the necessary mathematical content information or for an understanding of learner thinking (Takahashi *et al.*, 2013:252). Akiba *et al.* (2019:354) isolate teachers’ lack of familiarity with the research process as a possible obstacle to effective LS implementation. This implies both an inability to glean knowledge from written sources as well as an inability to utilise observational skills or effectively record learner learning (Khokhotva, 2018:257; Ono & Ferreira, 2010:67).

Knowledgeable others develop their expertise through their participation in LS, years of experience and by observing many lessons and final comments. A lack of “knowledgeable others” outside of Japan has also been described as a challenge to the cross-border implementation of LS (Takahashi, 2014:14). As an emergent method in our country, there are very few “knowledgeable others” available for LS assistance in South Africa. In addition to this, it is recommended that teachers wishing to engage

in LS should visit other LS sites before pursuing the process at their schools (Yoshida, 2012:145). Again, in South Africa's current context, this is an improbability.

Yoshida (2012:143-144) cautions that the effective implementation of LS in the US is hindered by two particular factors: an overemphasis on product (perfected lessons) over process (enhancing teacher knowledge), and a rushed implementation of LS without a prior analysis or understanding of its essential components. It would be wise for countries like South Africa to take stock of these challenges and begin planning ways of circumventing or minimizing them in any initial launch of LS as a PD tool.

### **2.3.6 Previous attempts at lesson study implementation in South Africa**

There are currently limited documented studies of LS in South Africa. By far the largest recorded undertaking involved the Mpumalanga Secondary Science Initiative (MSSI) launched in 1999 in the wake of the introduction of Curriculum 2005 (C2005) (Ono & Ferreira, 2010). At the behest of former President Nelson Mandela, the Japan International Cooperation Agency (JICA) conducted studies to determine an appropriate intervention to address the inadequacy of maths and science teachers in Mpumalanga. This investigation led to the MSSI inception, which was a joint initiative between the provincial department of education, JICA and the University of Pretoria. The purpose of the initiative was to improve the quality of mathematics and science education through improving the skills of in-service teachers. Although not officially inscribed in the project documentation, the overarching goal was to be accomplished through the school-based PD approach of LS.

In summary, the MSSI project was unsuccessful in its objective of institutionalising LS as a school-based PD initiative in Mpumalanga. During the first phase of implementation (1999-2003) it was noted that South African teachers struggled with providing effective critique in the post-lesson discussions. Ono and Ferreira ascribe this to a lack of ability in knowing what to observe during the research lesson, and how to record observations. Crippling time-restraints for LS, together with complications brought on by curriculum changes, became a second restrictive barrier. This resulted in the project's termination in March 2006. Japanese efforts to implement LS in Mpumalanga continued up to 2008. Mixed results were experienced together with several pitfalls. In addition to the initial lack of departmental endorsement and support of the method, researchers noted the constraint on teachers who felt pressurised to



push through their curriculums, often at the expense of their learners' understanding of the content. There appeared to be no time to pause and address learner misconceptions. The problem of time-management in the implementation of LS was already voiced when the approach was first subjected to international scrutiny, in the early work of Hiebert and Stigler (2000:25). Ono and Ferreira (2010:70) caution that the successful implementation of LS in any new context requires all stakeholders to investigate solutions to the problem of time-management.

A second recorded case of LS as a PD tool in South Africa, was celebrated as a success by researchers Coe, Frick and Carl in a rural primary school in the Western Cape in 2010. Like their predecessors, these researchers were aware of the concern of time availability for collaboration (Coe *et al.*, 2010:214). In addition to this, they were also aware of the potential problem of certain staff members showing reluctance to being exposed to peer criticism in the presentation of lessons. The largest concern they had, however, was that South African teachers might not possess the necessary skills for effective lesson research. They recommended that implementing LS incorporate support for teachers in acquiring these skills. In spite of these numerous concerns, this research undertaking was described as being contextually relevant and allowing the transfer of learning. It was also deemed successful in developing continuous support between the staff members involved. Participating teachers were successfully brought out of their apparent isolation. This isolation trend has been noted in South African schools where teachers have been described as “islands” who are unwilling to collaboratively share their “intellectual property” (Steyn, 2015:167). Breaking through this isolation barrier is a very real challenge in implementing LS in a South African context.

A third LS research was undertaken by Ogegbo, Gaigher and Salagaram (2019) in exploring the benefits and challenges of utilising LS as a tool for the PD of science teachers in South African highschools. The research undertaking was very small (2 pairs of teachers) and the research duration was limited (5 weeks). Several components of authentic LS were absent in the research, including an apparent lack of goal setting, an abbreviated planning stage (the planning stage of these lessons lasted 60-90 minutes), no live observations (video recordings were used as substitutes), the noticeable absence of a knowledgeable other, and no evidence of

teachers recording or sharing their findings. In spite of these limitations, the challenges of teacher workload, lack of resources and lack of support from management and unions were cited as limitations. Researchers did, however, believe that the process of LS was beneficial, even though the absence of an expert exacerbated the mutual sharing of poor content knowledge between the teachers (Ogegbo *et al.*, 2019:7).

The three documented studies into LS in a South African context focus on teachers of learners between the ages of ten and 18 years. Specifically, Ono and Ferreira researched the impact of LS on teachers of Grade 8 to 12, the Coe, Frick and Carl study incorporated teachers from Grade 4 to 6 and the Ogegbo, Gaigher and Salagaram study focused again on the Grade 8 to 12 band. None of the studies considered exploring LS for the PD of teachers in the early childhood phase, leaving a noticeable research gap in the literature.

## **2.4 THE IMPORTANCE OF PROFESSIONAL DEVELOPMENT FOR EARLY GRADE MATHEMATICS**

### **2.4.1 South Africa's current performance in mathematics**

In their study on PD for mathematics in South Africa, researchers note how South African mathematics education faces a myriad of challenges, including a shortage of qualified teachers, teachers who have not mastered subject knowledge or pedagogical content knowledge, teachers who perform poorly themselves in mathematics assessments and the language challenge of teaching mathematics in 11 diverse official languages and then switching back to English from Grade 4 onwards. Furthermore, on the whole, learner results are poor, learner discipline is lacking, resources are insufficient, teacher support and monitoring is insufficient and positivity for the teaching profession is on the decline (Kaino *et al.*, 2015:157).

Currently, the largest two international measures of accountability for South African mathematics performance are the Trends in Mathematics and Science Studies (TIMSS) and the Southern Africa Consortium for Monitoring Educational Quality (SACMEQ). SACMEQ conducts cross-national assessments to determine the educational standing of Southern African countries in the subjects of reading and mathematics. SACMEQ has conducted four such assessments to date, in 1996, 2000, 2007 and 2013. Accurate cross-national comparative results for the 2013 SACMEQ are not available, as certain participating countries have not released their findings.

However, in analysing the South African results in isolation, the country has demonstrated a noteworthy and encouraging upward trend, but still falls far short of the ideals for mathematical competence. 85.1% of participating Grade 6 learners could only apply their maths skills at a basic level, and total of 14,9% of learners fell into the non-numerate category. Teacher ability trends were also on the rise, but 32% of teachers remained unable to solve multi-step problems or engage in abstract problem solving (DBE, 2017:36).

In a report on South Africa's performance in TIMSS, analysts Reddy, Visser, Winnaar, Arends, Juan, Prinsloo and Isdale (2016:1) describe how the TIMSS comparisons begin with advantage of comparing South Africa's Grade 5 and 9 learners with those of Grade 4 and 8 learners from other countries. In spite of this apparently levelled playing field, South Africa still ranked in the bottom five of the 48 participating countries. 61% of Grade 5 South African learners could not attain a minimum competency level in mathematical knowledge, and only 1,3% displayed advanced knowledge. South Africa's national average for mathematics was decidedly below the TIMSS international benchmark.

On a more local scale, when considering the performance of South African learners in the matriculation results of 2018 (DBE, 2019:9), learners scored the lowest in mathematics out of the most commonly written subjects. 42% of matriculants failed to pass the subject at a pass mark of 30% or above, and 27.5% of matriculants failed to pass mathematical literacy at a pass mark of 30% or above. Further results gleaned from the Annual National Assessments (ANA) programme, rolled out in 2011 for the internal "measurement of the quality of teaching and learning below Grade 12" (DBE, 2012:3) describe how Grade 9 learners were attaining mathematics average percentage marks of 13% (2012), 14% (2013) and 11% (2014) (DBE, 2014:9). Less than 35% of all learners attained higher than 50% for mathematics across Grade 6 and 9, and across all three years (DBE, 2014:43).

In their discussion of the Grade 3 Systemic Evaluation of 2007, in which 2340 primary schools participated, Spaull and Kotze (2015:11) noted that "less than one in five (16%) Grade 3 students are performing at the Grade 3 level. That is to say that only the top 16% of Grade 3 students are performing at the Grade 3 level." The researchers expressed concern at the large learning deficits already existing at this young age, as

they believe that these trends would continue to exist at later stages in the participants' learning journey. They expressed concern that the majority of South African children were "starting behind and staying behind" (Spaull & Kotze, 2015:26).

In conclusion, both in international and local assessments, South African learners are exhibiting a poor understanding and ability in mathematics, which is particularly disconcerting, as mathematics is regarded as "a gateway subject to a large number of ... high-status, high-paying professions [and] also functions as a gatekeeper for the many who fail to learn and perform at the requisite levels or are failed by the education system concerning, as it is a vital subject for further studies" (Vithal, 2012:3).

#### **2.4.2 The importance of strengthening education in the younger grades**

Research has confirmed that intervention in early grade mathematics will positively impact the performance of learners in the later grades (Aunio, Mononen, Ragpot & Törmänen, 2016:6; Govender, 2012). Furthermore, learning deficits have a cumulative effect, particularly in the area of mathematics, where one concept lays the foundation for following concepts in each grade (Spaull & Kotze, 2015:5). Therefore "any intervention to improve learning in South Africa needs to intervene as early as possible" (Spaull & Kotze, 2015:26). The trend behind the increase of interest in the predictive power of early mathematical competence for later mathematical achievement lies in the reasoning that if these predictors can be isolated, and intervention strategies targeted, backlogs and deficits in later mathematical performance can be circumvented (Nguyen, Watts, Duncan, Clements, Sarama, Wolfe & Spitler, 2016:551).

There is a growing body of evidence which suggests that the above reasoning is both sound and applicable for later grade improvement in mathematics. In a longitudinal research into the importance of number sense (counting, number knowledge and operational knowledge) for mathematics achievement in the early grades, Jordan, Glutting and Ramineni (2010:86) compared the performance of pupils in their first and third grades, and successfully concluded that early number sense could predict later mathematics performance regardless of factors like the learner's language, spatial and memory abilities. Researchers also concluded that there was a strong relationship between early number sense and the learner's problem-solving application over time.

Mathematical ability remained relatively stable between preschool and Grade 3, unless specifically targeted by interventions.

Furthermore, researchers have concluded that the gains made in mathematical knowledge between the age of five and the end of the first grade (age seven) are an even stronger predictor of adolescent (age 15) mathematical performance, than exclusive school-entry mathematical knowledge (Watts, *et al.*, 2014:357).

## **2.5 CONCLUSION**

This chapter explored themes in the literature related to the intended study. Components of effective professional development of teachers were considered in the light of international and national studies, as well as the current trends in PD in South Africa. LS was expounded, exploring the elements of authentic LS. The advantages and challenges of implementing LS were probed as well as a brief foray into prior LS attempts in a South African context. I concluded the chapter with an investigation into the urgent need for early mathematics PD in a South African context.

### **3. CHAPTER 3: CONCEPTUAL FRAMEWORK UNDERPINNING THE STUDY**

#### **3.1 INTRODUCTION**

The previous chapter was an examination of the literature to illuminate the elements required for effective PD and how LS fulfils the requirements of a bottom-up collaborative solution for the PD of teachers in South African schools. The importance of early childhood mathematics education was discussed. In this chapter the conceptual framework underpinning this study is explored. LS as a PD method occurs in a social context. In the light of its naturally collaborative and educationally-oriented structure, the study is considered through the combined lens of various socio-educational theories. Three of these are more classical in nature, acclaimed universally for their invaluable contribution to the understanding of the teacher-learner relationship. Although developed with this relationship in mind, in the context of this study, their tenets are applied to a PD context. However, the integrity of the social and educational hypotheses for which they were originally recognised is maintained.

#### **3.2 JOSEPH MCGRATH'S INPUT-PROCESS-OUTPUT THEORY**

##### **3.2.1 Input variables and their reciprocal relationship with output variables**

In his conceptual framework for the study of groups, McGrath (1984) proposes that the elements of the group's functioning be taken apart, examined and then reintegrated to understand the group as a functioning whole. McGrath's model rests on the so-called "group interaction process", in which the "essence" of the group is defined by the relationship between its members (McGrath, 1984:12). In his model, the group's interactions are influenced by contextual factors that are brought into the group environment. These are referred to as the input variables of the group. McGrath isolates four particular input variables. The first of these being the properties of the participants e.g., their characteristics or talents. The second input is the group structure. This incorporates the relationship between the group members prior to their functioning as a group and their relational interactions and patterns during the group's functioning thereafter. The third input is the environment in which the group functions. This plays an important role in understanding the behaviour of people in groups. The environment can be both physical and social. Fourthly, McGrath considers the group's purpose or task, which incorporates a collective goal, and assigning subtasks to

various group members. These four input variables act as forces shaping the group's interactions. The interactions of the group then determine the group's outputs, which broadly refer to the accomplishments, impacts and changes that are wrought by the group's existence. The group's interactions and outputs have the reciprocal potential to impact the group's input variables in a cyclical pattern.

McGrath explains how the potential differences in the properties of group members, and differences in group environments can be infinitely vast. As a result, he suggests that any study into group functioning should begin by limiting and framing the properties under investigation. These properties should be "germane to the problem" being studied (McGrath, 1984:15). Overlaying his model on a study on collaborative PD in teaching implies that group interactions should be examined in the light of the input variables that the teachers bring into the collaborative study, and how the group's interaction processes impact the output variables of the PD group. The input-process-output model draws attention to certain questions like how are the individual teaching characteristics and talents of the participants evolving through the groups' interactions? What were the group's relational patterns prior to their interactions and how have they adapted on a professional level? What teaching environment existed before the groups' interaction began and how did participation in the group impact this environment? What goals or tasks existed at the onset of the groups' formation and how have these grown through the groups' interactions? In this way, McGrath's theoretical analysis of group functioning provides direction into observing the impact of a collaborative PD model like LS.

### **3.2.2 Group micro-interactions and their reciprocal relationship with input and output variables**

McGrath's analysis of the micro-level of group interaction is delineated into three components, namely the group's patterns of communication, their task performance patterns, and their interpersonal relationship patterns (McGrath, 1984:17). Different groups possess unique patterns. Each pattern impacts the other pattern within the group and also influences the group participants themselves. This again has a reciprocal effect on both the input variables and output variables of the group.

A study focused on the impact of a PD method should explore the existence of these patterns both prior, during and at the completion of implementation. It should also

explore alterations in these patterns as a result of the impact of PD. Figure 3.1. delineates these patterns and their reciprocal influence on the group interactions.

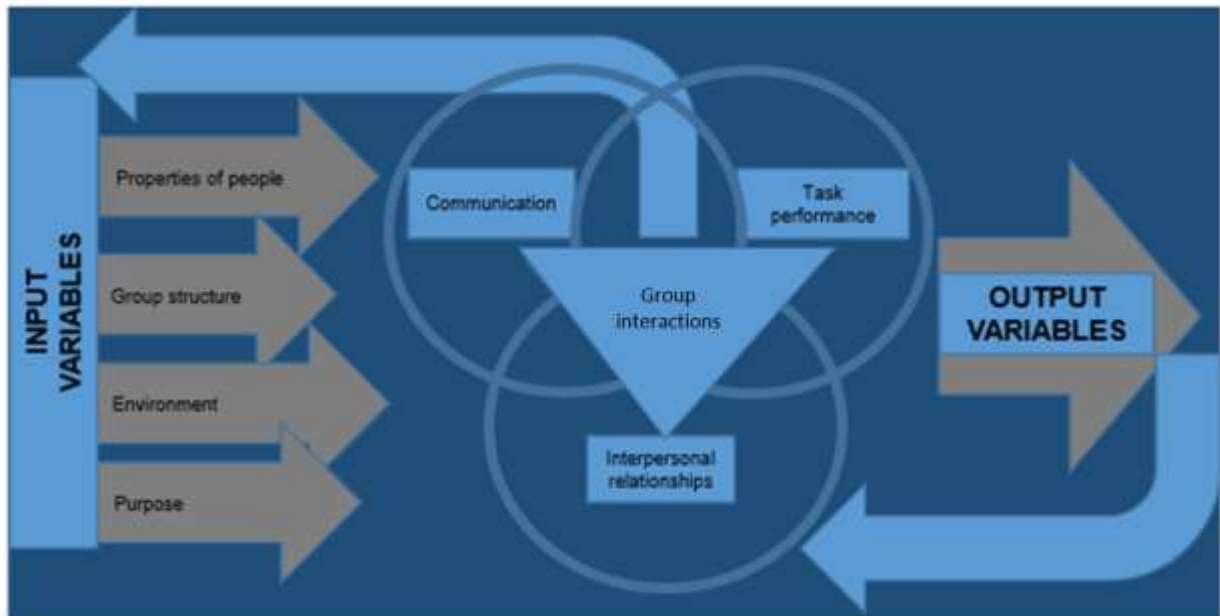


Figure 3.1: Interpretation of McGrath's input-process-output theory (compiled by author)

### 3.3 VYGOTSKY'S SOCIAL DEVELOPMENT THEORY

Vygotsky deviated from contemporary thinking of his day “in that he focused upon the historically shaped and culturally transmitted psychology of human beings” (John-Steiner & Soubberman, in Vygotsky, 1978:122). At the outset, it must be established that although much of Vygotsky's work pertains to the study and development of children, his viewpoints are universally applicable. In the words of John-Steiner and Soubberman (Vygotsky, 1978:128) “to view this great Russian psychologist as primarily a student of child development would be an error...there was, for him, no real distinction between developmental psychology and basic psychological inquiry.” In this research, the work of Vygotsky is viewed in its application to adult learners in an educational context (PD).

#### 3.3.1 Socio-cultural foundation for learning

Vygotsky attributed the development of human thought to the relational interactions that occur between individuals and the external world (Verenikina, 2010:np). In other words, learning involves a socio-cultural experience. Unlike Piaget who emphasised the biologically pre-determined and universal development stages of learning, Vygotsky emphasized changing social conditions in a marriage with biological factors



that guide human development and learning (John-Steiner & Soubberman, in Vygotsky, 1978:123). He believed that human consciousness was a means of organising behaviour (Verenikina, 2010:np) and postulated that higher psychological functions originate from sociocultural experiences (Vygotsky, 1978:46). The sociocultural process converts interpersonal processes into intrapersonal ones. “Every function in a child’s cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological), and then inside the child (intrapsychological)...all higher order functions originate as actual relations between human individuals” (Vygotsky, 1978:57). This emerges through a series of collaborative and developmental events. Vygotsky believed that the internalisation of historical and social activities was “the distinguishing feature of human psychology” (Vygotsky, 1978:57). In his commentary on Vygotsky, Davydov describes Vygotsky’s belief that the execution of all basic activities was initiated in a collaborative and social interaction assimilating historical, spiritual, cultural and upbringing values. “Individual consciousness is determined by the activity of the collective subject” (Davydov, 1995:15).

### **3.3.2 Signs and tools that mediate learning**

The second important tenet of Vygotsky’s theory guiding my conceptual framework is that “tools and signs” mediate learning, through directing human activities and consciousness (Verenikina, 2010:np). Human beings are regarded as “active, vigorous participants in their own existence” (Vygotsky, 1978:123) and they thrive and develop through the use of tools and signs, which “possess stable meanings formed in the course of cultural development” (Davydov, 1995:16). “Signs” are the products of social development and performing culturally specific tasks that exist in the individual’s consciousness. They are internal socio-cultural cognitive representations of reality. Their existence in humans is a result of humans’ active engagement in their creation (Vygotsky, 1978:54). Signs form the psychological link between stimulus and response in humans. “The system of signs restructures the whole psychological process” (Vygotsky, 1978:35). Vygotsky hypothesized that higher order functions like memories, or in our case e.g., new pedagogical approaches, are developed through and dependent on our thought processes and signs. These, in turn, are constructed through our social interactions (Vygotsky, 1978:51). In simplistic terms, the way in which we view and interpret our world is constructed by our social engagements.

### **3.3.3 Language and learning**

One obvious “sign” that Vygotsky honed in on, was the use of language. Vygotsky was an avid protagonist that language and learning are interrelated elements. He describes how “the unity of perception, speech, and action, which ultimately produces internalisation of the visual field, constitutes the central subject matter for any analysis of the origin of uniquely human forms of behaviour” (Vygotsky, 1978:26). He believed that practical and abstract intelligence originate from the moment that speech and activity converge (Vygotsky, 1978:24). This development of the interdependent systems of speech and learning can be practically observed when a child attempts to achieve his goals and verbalises his intentions. This typical egocentric speech eventually serves the function of helping the child to plan and prepare. The egocentric speech bridges external speech with the development of internal speech in which the child appeals to the inner self. “She plans how to solve the problem through speech and then carries out the prepared solution through overt activity” (Vygotsky, 1978:26). The implications of his theory are that the convergence of speech and action in a PLC context like LS will create a natural platform for prolific learning.

The subtle difference between tools and signs is that humans use tools to master their external environment, and signs to master themselves, through internal orientation. Using tools and signs simultaneously to perform a psychological activity is a product of higher psychological functioning. The mastery of the external environment and the mastery of internal behaviour are intertwined (Vygotsky, 1978:55). Vygotsky advocated that humans have a “transforming reaction on nature” through the use of tools (Vygotsky, 1978:61). Tools can be cultural, like written language, or other abstract objects that have no apparent relation to the task at hand. In order to gain an understanding of mental processes, one needs to analyse the tools and signs mediating them (Verenikina, 2010:np). An example of analysing signs in the context of this study would include analysing the internal speech of participants, possibly through their reflective journaling. Examples of analysing tools to determine the impact of a PD approach would include examining participants’ interpersonal communications within the collaborative group, and the emergent lesson plan, or the collaborative process itself as “a tool” for professional development. “The effect of tool use upon humans is fundamental not only because it has helped them relate more effectively to their external environment but also because tool use has had important effects upon

internal and functional relationships within the human brain” (Vygotsky, 1978:133). By analysing the emergence of these tools, we can have greater insight into the PD of teachers in a collaborative context.

### **3.3.4 Studying human behaviour**

A third, perhaps less well-known tenet of Vygotsky’s theory guiding the conceptual framework is that studying human behaviour should involve more than simply studying responses to input stimuli. Cognitive development is complex, irregular and a highly adaptive process (Vygotsky, 1978:73). Researchers are analysing a process and not a product, and processes are transitory. “Any psychological process, whether the development of thought or voluntary behaviour, is a process undergoing changes right before one’s eyes” (Vygotsky, 1978:61). Transitory human behaviour should not only be described. It is the researcher’s mandate to explain it (Vygotsky, 1978:62). Vygotsky criticised the phenotypical approach of categorising phenomenon according to external similarities. “Psychology teaches us at every step that though two types of activity can have the same external manifestation, whether in origin or essence, their nature may differ most profoundly...the kind of objective analysis we advocate seeks to lay bare the essence rather than the perceived characteristics of psychological phenomena” (Vygotsky, 1978:63). Vygotsky sought to understand the link between the environmental stimulus and internal processes guiding behaviour through studying the introspective descriptions of his subjects, together with looking into the historical development of the subject’s behaviour (Vygotsky, 1978:67-68). In summary of this point, in Vygotsky’s own words, “the aim of psychological analysis and its essential factors are as follows: (1) process analysis as opposed to object analysis; (2) analysis that reveals real, casual or dynamic relations as opposed to enumeration of a processes’ s outer features, that is, explanatory, not descriptive, analysis; and (3) developmental analysis that returns to the source and reconstructs all the points in the development of a given structure.” (Vygotsky, 1978:65). In the context of this research, our analysis should therefore not be limited to the observable outputs of PD approach. Using Vygotsky’s criteria, our analysis should include examining the development of behaviour and an attempt to find explanations for group interactions and collaborative behaviours. This requires examining the initial thought processes of participating teachers and reconstructing their personal journeys through the PD process.

### **3.3.5 Zone of proximal development**

The fourth relevant tenet of Vygotsky is his advocacy for learning and behavioural change occurring in a zone of proximal development (ZPD). He postulated that learning should be matched to the developmental abilities of the subject. The zone of proximal development refers to the difference between the subject's actual developmental level – the functions in which they have already matured and their existing products of development - and the level they are able to attain with assistance (Vygotsky, 1978:86). It is defined as “the distance between the actual developmental levels as determined by independent problem solving, and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978:86). A more contemporary definition of ZPD is that it is the space in which the individual moves forward from his current capabilities to a higher level of achievement within a socio-cultural context (Shabani, Khatib & Ebadi, 2010:238). The ZPD is the birthplace of what a person will be able to do unassisted in the near future (Vygotsky, 1978:87). The Vygotskian tenet of ZPD is often described concurrently with the idea of scaffolding, which is broadly defined as the “support that is designed to provide the assistance necessary to enable learners to manage on their own” (Hammond & Gibbons, 2005:9). Although often viewed synonymously with Vygotsky's work, Vygotsky himself never used the term. The notion of scaffolding was, in actual fact, coined forty years' prior by theorists Wood, Bruner and Ross (Boblett, 2012:2). Vygotsky's ZPD implies scaffolding in a social context, where “learning awakens a variety of internal developmental processes that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers” (Vygotsky, 1978:90). In a study on LS, the role of the knowledgeable other and more knowledgeable peers would simulate Vygotsky's child-adult collaborative relationship in this zone, in a joint effort to professionally develop teachers beyond their current levels of understanding within their socio-cultural context.

When combining the idea of ZPD and collaborative learning, Vygotsky proposed that every individual brings something to the table that is at the particular level of the individual. This is the departure point of true collaboration. It should not be a one-sided experience of learning, but rather a mutual process of assistance. Engaging in collaborative and cooperative speech allows participants to internalise, which then

leads them to organise and moderate their own performance. This collaborative relationship between participants is a catalyst for the internalisation of new information which is the precursor for independent achievement and professional growth (Verenikina, 2010:np).

### **3.4 DEWEY'S EDUCATIONAL THEORY**

#### **3.4.1 Learning through personal experiences**

John Dewey criticised the organisation of the traditional education system due to its methods of transmitting information and behavioural standards in a highly structured, unnatural environment completely unrelated to the realistic functioning of any other social institution (Dewey, 1938:18). Dewey negatively described traditional learning as the transmission of static and completed products of information in a world that is in reality dynamic and changing (Dewey, 1938:19). In response to these flaws, he proposed an alternative approach, namely learning through the construction of knowledge based on personal experiences, due to his belief that “there is an intimate and necessary relation between the processes of actual experience and education” (Dewey, 1938:20). All education should begin in the realm of the learner’s personal experience, rather than “facts or truths that are outside the range of the experience of those taught” (Dewey 1938:73). The selection of current learning experiences should be based on their impact on later learning experiences and should be enjoyable and ‘live fruitfully and creatively in subsequent experiences’ (Dewey, 1938:28). Experiential learning should be rooted in the learners’ past, with an eye towards progressively expanding their understanding through an orderly and organised experiential process directed at their present context (Dewey, 1938:74).

Contrasting Dewey’s views with a traditional stance towards education, laws of imposition should be replaced with expression, external discipline with freedom of activity, prescriptive content with learning from experience, drilling with making learning personally appealing, learning unrelated to the future to learning linked to present life, and learning based on static goals and texts with those adaptable to a changing world (Dewey, 1938:19-20). Although idealistic in his view, Dewey did not reject all the theoretical underpinnings of traditional education. He postulated finding alternative expressions of these fundamental principles. For example, progressive education should not ignore all forms of classroom organisation, such as the teacher’s

responsibility of organising educational experiences. Furthermore, like the traditional approach, effective education can involve the imparting of knowledge from a knowledgeable individual to a less knowledgeable one. However, in his search for the balance of new methods of education without completely disregarding traditional tenets, his “permanent frame of reference” remained “the organic connection between education and personal experience...” (Dewey, 1938:25). Dewey’s ideology is relevant in an examination of the education of both children and of adults. For education of either group to be effective, it should be based on the experience and frame of reference of the participants.

Dewey described the educator’s (or in the case of my study, the facilitator’s) role as that of determining “in what direction an experience is heading” (Dewey, 1938:38). In directing learning experiences, the facilitator must be able to judge what “attitudes and habitual tendencies are being created” (Dewey, 1938:39). The facilitator should understand the learners (in this instance – the LS participants) as individuals and have insight and understanding into what is happening in their minds. According to Dewey, these two requirements make the facilitator’s role more challenging than the traditional teacher’s role of imparting knowledge to passive recipients (Dewey, 1938:39).

### **3.4.2 The importance of contextual relevance**

In order for learning to be effective, it should be contextually relevant. Dewey describes how by compartmentalising subject-matter learning we are limiting the application of what is learned to use only in conditions that match those of when it was acquired and rendering it “not available under the actual conditions of life” (Dewey, 1938:48). Subject matter should be relevant to the social life and activities of the individual (Dewey, 1897:7). Education should “reflect the life of the larger society” and prepare individuals for real membership and productivity within society (Dewey, 2013:29). Dewey also advocated that collateral learning, in the form of “enduring attitudes, of likes and dislikes” towards a subject being learned, are more important for future learning than the particular thing being studied at the time (Dewey, 1938:48). He believed that “the most important attitude that can be formed is that of desire to go on learning” (Dewey, 1938:48).

In the context of this study, LS should be examined for its potential in transmitting content knowledge and pedagogical content knowledge that is contextually relevant.

Based on Dewey's premise, in order for teacher learning to be effective and enduring, the learning material should be adaptable, applicable and practical. Participation in effective PD should also manifest in a long-term motivation towards learning.

### **3.4.3 Active participation in learning**

In addition to advocating that education be contextually relevant and evoke positive attitudes, Dewey further explained that education should involve the process of active participation and not merely passive absorption (Dewey, 2013:31-32). Dewey criticised how traditional approaches to learning try to create uniformity in learners through designing a listening-based curriculum, with "uniformity of material and method", not allowing for "varying capacities and demands" (Dewey, 2013:22). Dewey rather advocated that education should involve an "element of common and productive activity" (Dewey, 2013:10), which corresponds with the basic human interests to converse, inquire, construct and express (Dewey, 2013:31) and "to make, to do, to create, to produce" (Dewey, 2013:18). Taking these tenets into a study on the impact of a PD tool, the effectiveness of that tool should be analysed in the light of its capacity to engage participants in contextually relevant, active manner that is rooted in reality and experiential learning. By its design, LS should advocate active participation through collaboration, observational learning and shared feedback.

### **3.4.4 Learning in a social context**

Psychological and social development work dualistically in the process of education, in that the child has innate psychological "powers" that are stimulated by the social demands of his environment (Dewey, 1897:3). Dewey maintained that objects do not possess meaning entirely on their own, but that meaning is constructed through "social activities and thinking" (Dewey, 2013:60). Effective education requires experiences created through interaction with the environment and with others, which implies that "education is essentially a social process" (Dewey, 1938:58). Dewey criticised traditional education for eliminating the collective, social motivation inherent in natural learning. Social goal-directedness as a powerful motivator has been replaced with social competitiveness and feelings of isolation in the process of learning. Like Vygotsky, Dewey's theory advocated education through a functioning community model. He envisaged a way of learning in which help from others, free communication and sharing of ideas and the mutual exploration of previous successes and failures

was the norm (Dewey, 2013:11), and where isolation was a “waste” of resources (Dewey, 2013:40). In this community of learning, the teacher would know and understand the participants as well as the subject-matter in such a way, that she can “enable activities to be selected which lend themselves to social organisation, an organisation which all individuals have an opportunity to contribute something, and in which the activities in which all participate are the chief carrier of control” (Dewey, 1938:56). The teacher assesses the “capacities and needs” of the learners and arranges the “subject-matter or content for experiences that satisfy these needs and develop these capacities” (Dewey, 1938:58). As the “mature” group member, the teacher is responsible for conducting group interactions and communications “which are the very life of the group as a community” (Dewey, 1938:58). In the light of research into a collaborative PD approach, the effectiveness of the facilitator can be measured against this ideal role of the teacher as described by Dewey.

### **3.4.5 Purpose-driven learning**

Dewey was a strong advocate of purpose-driven education. The learner actively participates in her education when there is buy-in regarding the purpose of the process. Strongly stated in his own words, “there is, I think, no point in the philosophy of progressive education which is sounder than its emphasis upon the importance of the participation of the learner in the formation of the purposes which direct his activities in the learning process, just as there is no defect in traditional education greater than its failure to secure the active co-operation of the pupil in construction of the purposes involved in his studying” (Dewey, 1938:67). Formulating an educational purpose requires an individual to be cognisant of his environment, have past experiential knowledge and foresight gathered from personal or others’ experiences in similar environments and then make a judgement call on what would be an appropriate activity based on these variables. This judgement call is translated into an action plan or method (Dewey, 1938:69). Purpose is more than the product of mere impulses or desires, but the intensity of desire is often the driving force behind achieving a purpose (Dewey, 1938:72). In PD research, emphasis should be placed on the role that purposes play in planning and motivating behavioural change.

In the light of the abovementioned tenets of Dewey’s theory, PD is more effective when there is active participation, collaboration and participant ownership. Figure 3.2. is an



interpretation of this effectiveness of learning in a measurable and visually simplistic format.

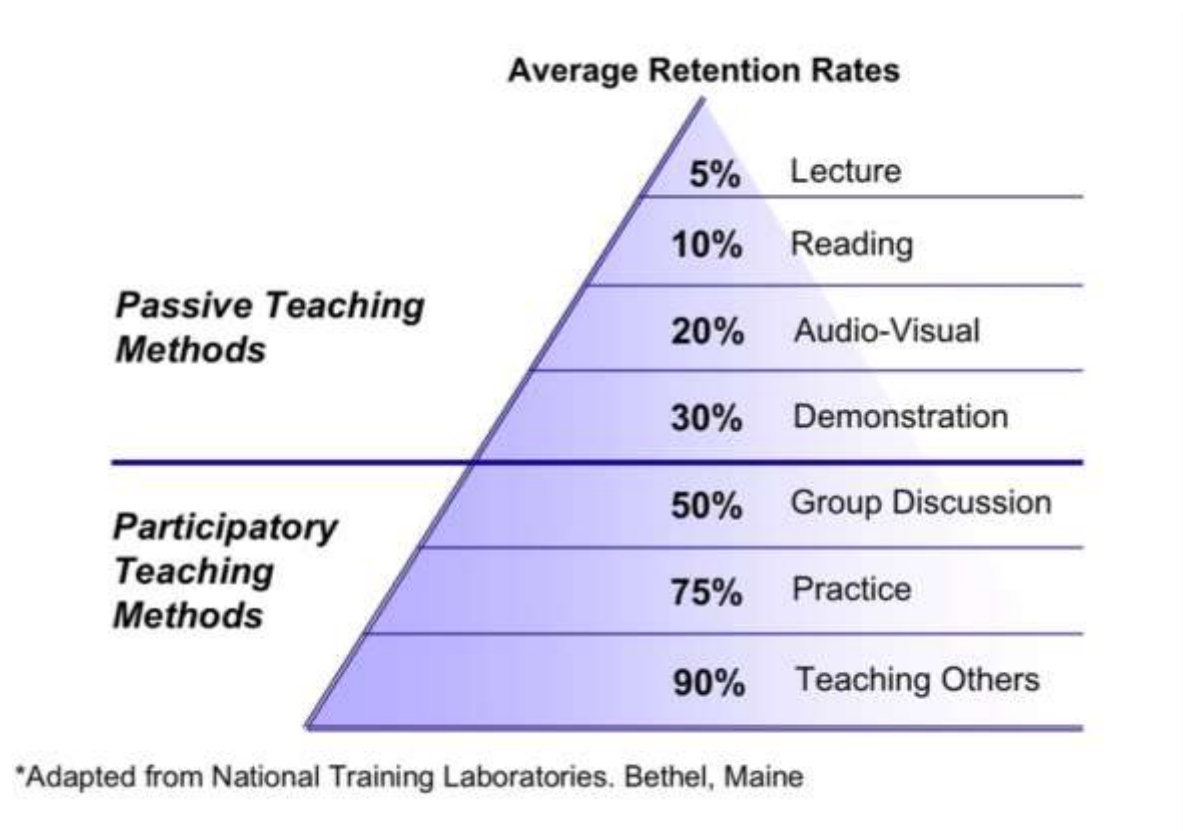


Figure 3.2: Potential learning retention based on Dewey's educational learning theory taken from National Training Laboratories (online)

### 3.4.6 Reflective thought

Dewey defined reflective thought as a process of deliberately seeking the grounds or basis for a belief (Dewey, 1997:1-2). Rodgers extrapolates four criteria from Dewey's work that characterise Dewey's understanding of reflective thought, namely that reflective thinking is the thread of meaning linking educational experiences. Secondly, it is a scientific way of thinking requiring discipline and rigour. Thirdly, reflective thought should happen in the social and interactive structure of a community. And lastly, reflective thought is only possible through valuing personal and intellectual growth in oneself and others (Rodgers, 2002:845). Reflective thought is birthed in a state of doubt or hesitation, which provokes investigation and a search for facts to "corroborate or to nullify the suggested belief" (Dewey, 1997:9). If a PD tool is to be impactful, it should provoke participants to engage in reflective thought about the nature of teaching and its outcomes. The reflective thought process begins and ends with

observation. Dewey describes how observation brings to light a difficulty or discomfort which provokes the thought process. Observation then determines the value of the conclusion of the thought process (Dewey, 1997:77). Observation and reflective thinking are key aspects of a study on LS that need further investigation to determine their role and place in the PD of teachers.

### **3.5 BANDURA'S SOCIAL LEARNING THEORY**

#### **3.5.1 Vicarious learning**

Although in existence before his time, Albert Bandura is credited with advancing the theory of learning vicariously through observation (Bandura, 1965:3). In response to classical behavioural theoretic of his day, Bandura advocated that a subject's behaviour was not only conditioned through direct shaping, but through "vicarious-learning experiences and response-guidance procedures involving both symbolic and live models" (Bandura, 1965:2). Bandura defined vicarious learning as an event "in which new responses are acquired or the characteristics of existing response repertoires are modified as a function of observing the behaviour of others and its reinforcing consequences, without the modelled responses being overtly performed by the viewer" (Bandura, 1965:3). Through analysing various experiments, Bandura proved that vicarious behavioural conditioning was possible, by observing the reward or punishment of another's behaviour (even symbolically), by receiving reward or punishment for another's behaviour or by simply observing or experiencing the emotional arousal triggered by another's behaviour (Bandura, 1965:36). Bandura experimented with scenarios of observational learning and concluded that although behavioural shaping through modelling is undisputable, the observer still exercises selectivity in the process. The observer is not a machine that "registers indiscriminately and stores cognitive representations of all modelling stimuli encountered" but discriminates based on "motivational and other attention-directing variables, associative and rehearsal processes, and numerous other factors" (Bandura, 1965:19-20).

#### **3.5.2 Self-efficacy and behaviour**

In addition to his work on observational learning, Bandura is known for his theoretical exploration into the development of self-efficacy (Bandura, 1977:191). "Self-efficacy is concerned with judgements of how well one can execute courses of action required to

deal with prospective situations” (Bandura, 1982:122). Bandura maintained that self-efficacy determines the behaviour, thinking and emotional responses of individuals (Bandura, 1982:123). The greater the perceived self-efficacy of an individual, the greater their accomplishments (Bandura, 1982:127). Bandura postulated that through persistence and subsequent mastery of activities, individuals experience an improvement in their self-efficacy. Furthermore, self-efficacy can be enhanced, albeit less powerfully, through vicariously observing others, being socially persuaded by others and through an alteration in one’s own physiological state or optimal emotional arousal levels. Self-efficacy developed vicariously is strengthened when outcomes are clear and unambiguous and a variety of models are used (Bandura, 1977:197). Social persuasion effectively improves efficacy when the subject views the communication as one coming from a reliable, trustworthy and credible source (Bandura, 1977:202).

Bandura acknowledged the role of cognitive processing in developing self-efficacy. Action, vicarious experiences, exhortation and emotion are filtered through the “social, situational, and temporal circumstances under which events occur” (Bandura, 1977:200). Bandura explored the impact of task difficulty and need for persistence on efficacy. He concluded that by experiencing setbacks but perceiving overall steady progress, subjects are more inclined to raise their levels of efficacy than those who succeed quickly but who perceive their performance as levelling off (Bandura, 1977:201). Lasting changes in self-efficacy are best achieved by methods “using powerful induction procedures initially to develop capabilities, then removing external aids to verify personal efficacy, then finally using self-directed mastery to strengthen and generalize expectations of personal efficacy” (Bandura, 1977:202).

Self-efficacy influences a subject’s choices; aspirations; the effort expended on an endeavour; willingness to persist in the face of resistance; aiding or hindering thought patterns; and stress and vulnerability to depression (Bandura, 1991:257). Higher self-efficacy translates into focused attention and effort, and higher motivation when facing challenges (Bandura, 1982:123). These factors will directly impact the type of learning environment a teacher creates and thereby the level of academic progress the learners achieve (Bandura, 1993:117). Bandura also posited that efficacy can also be developed collectively, whereby the efficacy of groups will influence their choice of goal, effort and staying power (Bandura, 1982:143).

### 3.5.3 Self-regulation and behaviour

Although self-efficacy plays a dominant role in human action, efficacy and desire do not solely determine behaviour. Behaviour can also be internally motivated and regulated, particularly through self-monitoring, self-judgement and emotional control (Bandura, 1991:282). Forethought, and the human ability to represent future events cognitively, guides human action (Bandura, 1991:248). Behaviour is therefore influenced by a process of self-regulation. Self-regulation is enhanced through observation and attention to one's performance, filtered through personal judgement. Personal judgement is impacted by one's personal standards, social comparisons, value attributed to activities and perceived performance (Bandura, 1991:253).

Based on these theoretical assumptions, a research on effective PD should explore the extent to which teachers develop self-efficacy and group efficacy through experiences like direct achievement, modelling, persuasion or emotional arousal. It should also consider the important role that self-regulation and feedback play in guiding the development of behaviour.

The effect of various inputs on learning and self-efficacy are delineated in figure 3.3. These inputs are filtered through personal introspection. Self-efficacy in turn impacts behavioural outputs, of which a person has self-regulation.

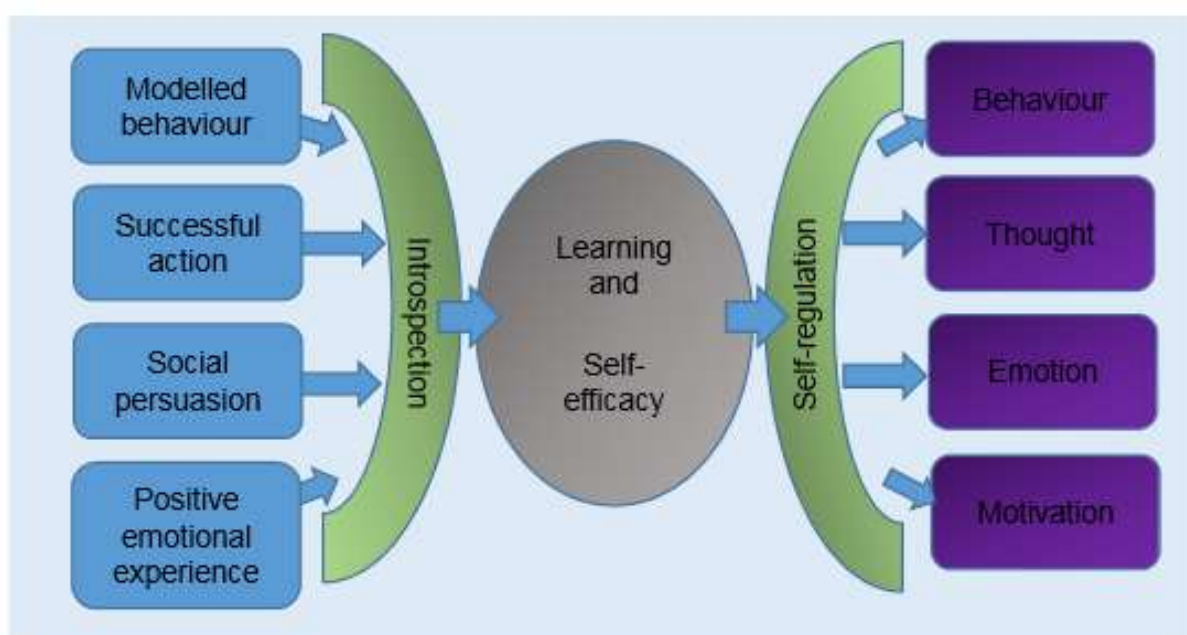


Figure 3.3: Interpretation of Bandura's social learning theory (compiled by author)

This chapter concludes with a table summarising the concepts from all four theories that guide the conceptual framework of the research.

**Table 3.1: Summary of concepts isolated for their relevance and contribution to the study**

| Theoretical framework              | Proponent                  | Concepts isolated for their relevance and contribution to the study of the impact of lesson study as a PD tool                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Input-process-output theory</b> | Joseph McGrath (1927-2007) | <ul style="list-style-type: none"> <li>• The essence of the group is defined by the interaction of its members.</li> <li>• Group interaction and output is influenced by the input variables, namely: the nature of the participants, the group structure, the environment and the group's purpose.</li> <li>• Group output impacts the input variables reciprocally.</li> <li>• Group interaction forms interdependent patterns around communication, the task and interpersonal relationships</li> </ul>              |
| <b>Social development theory</b>   | Vygotsky (1896 – 1934)     | <ul style="list-style-type: none"> <li>• Learning occurs collaboratively within a social context.</li> <li>• Tools and signs indicate and mediate learning.</li> <li>• Dialogue and discourse are vehicles of learning.</li> <li>• Studying human behaviour involves more than studying responses to input stimuli.</li> <li>• Learning involves a more capable individual/s socially mentoring a less capable individual/s through a scaffolding process within the zone of proximal development (ZPD).</li> </ul>     |
| <b>Educational theory</b>          | Dewey (1859-1952)          | <ul style="list-style-type: none"> <li>• Learning involves construction based on prior experiential knowledge.</li> <li>• Learning should be contextually relevant.</li> <li>• Learning requires active participation.</li> <li>• Learning is a social process.</li> <li>• Learning is guided by a facilitator who arranges experiences matching the learners' needs.</li> <li>• Learning must be purpose-driven.</li> <li>• Reflective thinking leads to examining and constructing core beliefs and ideas.</li> </ul> |
| <b>Social learning theory</b>      | Bandura (1925- )           | <ul style="list-style-type: none"> <li>• Learning can occur vicariously (through observation).</li> <li>• Successful action, modelling, social persuasion and positive emotional experiences influence the development of self-efficacy.</li> <li>• Self-efficacy impacts behaviour, thought, emotion and motivation.</li> <li>• Self-regulation is learning through introspection.</li> </ul>                                                                                                                          |

### **3.6 CONCLUSION**

This chapter considered the work of four theorists and their contribution to the conceptual framework guiding the study. Multiple theoretical and conceptual tenets are utilised as the process of professional development is innately complex. In order to guide the research, aspects of group dynamic, social learning, self-motivation and self-regulation are considered, as well as the manner in which PD content is presented. In the following chapter, the methodological process guiding the research is explored.

## **4. CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY**

### **4.1 INTRODUCTION**

The previous chapter explored the conceptual framework guiding the research. Attention was given to four particular theoretical frameworks and their contribution to a holistic study on the proposed professional development method of LS. This chapter is a discussion on the methodology undertaken in the study. The epistemological framework is explained, followed by the specific methods guiding the data collection, analysis and interpretation processes. The trustworthiness of the study is defended, and a description is given of the ethical considerations undertaken in the research.

### **4.2 EPISTEMOLOGY - SOCIAL CONSTRUCTIVISM**

Constructivism's foundation is the belief that humans construct their own world. This applies both to the construction of the self, becoming the people that they want to be, and to constructing the environment and their understanding thereof (Onuf, 2012:59). Constructivism does not see knowledge "as truths to be transmitted or discovered", but rather "as emergent, developmental, non-objective, viable constructed explanations by humans engaged in meaning-making in cultural and social communities of discourse" (Fosnot, 2005:ix). Knowledge is therefore not external, neither is it constant and objective. Knowledge is rather developed through the social and cultural negotiation between individuals (Fosnot, 2005:ix).

The foundation of constructivism can be attributed to the work of Mannheim who believed that society was the source of "human ideation" (Berger & Luckman, 1991:20). His work was developed further by Berger and Luckman (1991:211) who described "human reality as socially constructed reality". Constructivism gained further momentum in the work of Piaget who advocated knowledge as a product of our adaptation, rather than an accurate representation of reality outside of our thinking. Piaget viewed knowledge as a map of conceptual operations that proved viable through personal experience (Fosnot, 2005:4). Based on this aforementioned constructivist interpretation, the environment is viewed as subjective reality. Perceptions and thinking are not simplistically transferable, as they exist internally within the person's mind. This implies that people do not share the same exact constructs. Constructs may, however, serve similar functional purposes between

people, and are adapted to form a general compatibility of understanding (Fosnot, 2005:5-6).

Fosnot (2005:29) views constructivism as a “theory about learning”. Constructivists equate learning with the development process and not as a product of development. The pathway to learning is created by a disequilibrium between what is previously perceived and what is currently presented. This process is enhanced through reflection and rumination, creating a system of internally organised ideas. This organisation evolves through experiences and the subsequent re-adjustment of the organisation system in order to generalise across a variety of experiences. Learning is further enhanced through community dialogue, in that “ideas are accepted as truth only insofar as they make sense to the community” (Fosnot, 2005:30).

Within the realm of constructivism, two particular positions come to the fore. The one dominant stance is that learning is predominantly a cognitive adaptation process, and the other is that learning is a social consequence of community involvement (Cobb, 2005:35). However, these positions are not mutually exclusive and do coexist. Social interactions can be the source of cognitive dissonance spurring adaptation and learning. Conversely, individuals possess the cognitive capacity to organise their behaviour to meet cultural standards although behaviour is culturally transmitted through internalisation. Therefore, learning can blend cognitive self-organisation with enculturation (Cobb, 2005:45). Table 4.1. compares sociocultural constructivism and cognitive constructivism on the basis of various constructs.



**Table 4.1: Comparison between sociocultural constructivism and cognitive constructivism adapted from Cobb (2005:36-52).**

| Comparative construct                             | Sociocultural constructivism                                                                                                                         | Cognitive constructivism                                                                                                                                     |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Type of activity involved in learning</b>      | Culturally organised activity                                                                                                                        | Sensory-motor and conceptual activity                                                                                                                        |
| <b>Primary learning processes</b>                 | Social and cultural processes                                                                                                                        | Cognitive dissonance and adaptation                                                                                                                          |
| <b>Fundamental focus of theory about learning</b> | Conditions in which learning becomes possible                                                                                                        | What is selectively learned and processes through which learning occurs                                                                                      |
| <b>Definition of thought</b>                      | An action-based social process                                                                                                                       | A subjective process of conceptual reorganisation                                                                                                            |
| <b>Position of the researcher</b>                 | Qualitative understanding, thinking and learning within the socio-cultural context in which behaviour occurs                                         | Analyse thinking through interpreting an individual's activity                                                                                               |
| <b>Purpose of interaction</b>                     | Interaction is the mode of developing culturally organised practices                                                                                 | Interaction is a by-product of individuals attempting to coordinate their mental activities                                                                  |
| <b>Role of observation</b>                        | Observing others leads to an appropriation of behaviour                                                                                              | Observing others leads to the internal negotiation for accommodation or adaptation                                                                           |
| <b>Focus of research</b>                          | Find homogeneity within the community and signs of collective thinking.<br><br>Focus on the social and cultural foundation of individual experience. | Find heterogeneity in thinking and avoid social and cultural preconceptions.<br><br>Focus on the social and cultural manifestation of individual experience. |

A blend between cognitive constructivism (“the head”) and sociocultural constructivism (“the individual-in-social-action”) (Cobb, 2005:46) complement each other in PD learning processes. However, in the light of the predominantly sociocultural nature of LS, the research was undertaken primarily from a sociocultural constructivist perspective. This perspective “examines the understandings of the world that are

developed jointly by individuals” and how humans develop understanding, significance, and meaning “in coordination with other human beings” (Amineh & Asl, 2015:13).

Social constructivists view language as the primary catalyst of shared meaning (Walker, 2015:37). Understanding is dependent on both social artefacts and the “active, cooperative enterprises of persons in relationship” (Gergen, 1985:267). This accounts for the different global definitions of concepts like “early childhood education” or “teacher training” evident across cultures and times. The longevity of these socially accepted understandings is not dependent on empirical proof, but rather on the prevailing social climate and its changes. “Hard facts” within the world of science are in actuality a “potent array of social microprocesses” (Gergen, 1985:268).

#### **4.3 THEORETICAL PERSPECTIVE – INTERPRETIVISM OR NATURALISM**

The positivist approach has been criticised for its poor fit in understanding the complexity of real-life phenomena (Gillham, 2001:6). Real-life phenomena should be analysed in context, through inductive theorising. In this way the reasons behind the phenomenon can be uncovered. This is described as an interpretivist paradigm, whereby the researcher is often a subjective participant in the research and research is non-experimental. The interpretive researcher explores the processes that determine outcomes and seeks to find the contextual factors shaping behaviour (Gillham, 2001:8). Interpretivism is a qualitative form of research, allowing the researcher to investigate situations in which experimentation is ethically unjustifiable. It also allows the researcher to get into the inside workings of a group and to uncover the processes impacting the research results and not just the results themselves (Gillham, 2001:11). In Lincoln and Guba’s work (1985), they use the term “naturalistic” synonymously with interpretivist research.

The differences between interpretivism and positivism were extensively explored in the work of Lincoln and Guba in 1985. A summation of their findings is presented in table 4.2.

**Table 4.2: Comparative analysis of positivism and naturalism adapted from Lincoln and Guba (1985:37).**

|                                                   | <b>Positivism</b>                                                                               | <b>Naturalism/ Interpretivism</b>                                                                                                                                                                   |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reality                                           | Reality can be fragmented, isolated and is tangible. Reality can be predicted and controlled.   | There are multiple realities that are constructed. Reality should be viewed holistically. Reality may be understood, but not predicated or controlled.                                              |
| The relationship between the knower and the known | An independent, dualistic relationship exists between the two                                   | An integrated and inseparable relationship exists between the two                                                                                                                                   |
| Generalisation                                    | The purpose of research is to generate generalisable truth free from time or context restraints | The purpose of research is to develop working hypotheses that relate to a bounded context                                                                                                           |
| Causality                                         | A reaction is the product of a cause-and-effect principle                                       | A reaction is the product of multiple factors working simultaneously, making the linear cause and effect relationship impossible to determine                                                       |
| Role of values                                    | Research should be value-free and objective                                                     | Research is subject to the values selected by the researcher and is therefore subjective. The researcher determines the type of problem, the paradigm, the theory and the context guiding research. |

Naturalistic or interpretivist research possesses certain core features. Again, Lincoln and Guba (1985:39-43) were forerunners in elucidating these particular characteristics. Naturalist research is conducted in a natural context, as phenomenon need to be understood holistically as they naturally exist. These phenomena are influenced in multiple ways and not through a linear cause-effect relationship, the context is vital to understanding this influence. Naturalist research takes cognisance of the fact that human instruments are required to add meaning and evaluate the influences shaping the phenomenon. Tacit knowledge is utilised to investigate both that which can be felt or intuitively experienced as well as that which can be communicated through language (Lincoln & Guba, 1985:40). The natural context

implies that the researcher collects data face-to-face, through interaction, talking and personal contact (Creswell, 2014:185).

Interpretivism usually involves qualitative methods of data collection (although can incorporate quantitative methods), as these methods can accommodate multiple realities and seek to explore the relationship between the researcher and the phenomenon. The sampling is usually purposive, and samples are selected with the intent of controlling the conditions, impacts and values that constitute the focus of the study in context. Data analysis is mostly inductive in nature. The process uncovers multiple realities and ensures accountability and honesty in the researcher's relationship with the phenomenon. Inductive reasoning may be complemented with a measure of deductive analysis, as once themes emerge, the researcher re-examines the data to glean more evidence in support of the findings (Creswell, 2014:186).

In a naturalistic inquiry, this predominantly inductive data analysis results in theory generation (Lincoln & Guba, 1985:40). Predetermined theories may not have the complete capacity to encompass the multiple realities that may emerge through analysis. The research design is therefore often emergent and explorative, as the researcher does not have a sufficient understanding of the phenomenon before the investigation to determine a fixed design ahead of time. The results may be unpredictable as there are multiple shaping variables. Research boundaries fully emerge after the research focus becomes clear (Lincoln & Guba, 1985:41). The context, shaping influences and researcher's values emerge during the study. The criteria for trustworthiness are different to those of positivist research. As naturalistic inquiry does not focus on design stability or replicability, the validity, reliability and objectivity of the research are nearly impossible to establish. These measures of trustworthiness are replaced with concepts of credibility, transferability, dependability and confirmability (Lincoln & Guba, 1985:43).

In a research on human interaction, the interpretive inquiry often involves a mutual process of negotiating outcomes between the researcher and the subjects, based on the data analysis. The research participants are in an ideal position to interpret the influencing variables, create working hypotheses and verify the findings in their own contexts. The researcher can also focus on the meanings that the participants attribute to issues studied (Creswell, 2014:186).

A common format of interpretivist research is the case study design. This format encompasses a description of several variables, including the influence of the site and how this may bias the data. Case study research centres on a specific case, rather than a blanket attempt at generalisation. Data findings are dependent on differences in realities, values, shaping influences and site-based variables. The limitations of this design are that the findings may be relative to the unique blend of influencing variables which are difficult to duplicate elsewhere.

#### **4.4 METHODOLOGY – CASE STUDY**

When researching social phenomena through a qualitative lens, the researcher either adopts an extensive or an intensive research approach (Swanborn, 2010:2). In the former, the researcher is attempting to unearth the properties of a large number of research participants, for the purpose of correlating data or creating frequency distributions to explain or understand the phenomenon. The latter approach involves studying a phenomenon as an isolated instance, occurring in its own context. The phenomenon is studied in intensive detail. This approach is referred to as a case study. The extensive researcher attempts to make wide comparisons between different units of a phenomenon, while the case study researcher attempts to make deep comparisons within an individual unit (Swanborn, 2010:5). Case study research is defined as “a qualitative approach in which the investigator explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information (e.g., observations, interviews, audio-visual material, and documents and reports), and reports a case description and case themes” (Creswell & Poth, 2016:96-97).

A mixed-method approach has been advocated as the “standard approach in applied research projects” (Swanborn, 2010:5), generating more solid cases of trustworthiness through the triangulation of both quantitative (positivist) and qualitative (interpretivist) methods. Unfortunately, the topic of this specific study has not been sufficiently addressed in a South African context, which makes it difficult to do extensive or comparative quantitative research. The study is therefore exploratory in nature with a focus on obtaining a deeper understanding of a singular and particular case. This research can be viewed as a predominantly descriptive and inferential

attempt to uncover the meaning behind the evidence (Gillham, 2001:10). It is a study in which the participant researcher has minimal control over the unfolding events, and the focus is on exploring the professional development of teachers in a real-life context (Yin, 2003:1).

Swanborn (2010:12) delineates several features of case studies. Case studies are studies of social phenomenon occurring within the confines of one or more social systems. They occur when a phenomenon is studied for a delineated period of time in a natural context. The researcher focuses on describing or explaining the social processes that are occurring between participants, including descriptions of aspects like their values, attitudes and behaviours. When analysing the social interactions between participants in a case study, the researcher observes the meanings and interpretations participants attach to their social interactions as well as their diverse views of reality (Swanborn, 2010:15). Another feature of case study research is that the research is guided by broad research questions that are honed to become sharper only as the research unfolds. Case studies can include a variety of data sources e.g., observations and interviews. Participants are invited as stakeholders in the research to clarify and debate the conclusions drawn from the data analysis (Swanborn, 2010:14).

Case studies have multiple applications. They may explain perceived causal links between interventions and outcomes. They may also describe interventions and illustrate topics, explore contexts without clear outcomes, meta-evaluate studies and simply encapsulate individual cases as evidence (Yin, 2003:15). In case studies, more than one source of data is utilised to build deeper understanding. Generally, the data are analysed to generate case themes. These themes are then used to generate assertions regarding the case, which are typically general lessons about the case. Case studies generate assertions and themes but are also motivated by pre-determined theoretical underpinnings. This distinguishes case studies from other research methods like grounded theory or ethnography. A theoretical foundation may guide the researcher in data collection and analysis, and precedes the collection of data (Yin, 2003:28-29).

The intent of the case is delineated by the researcher, particularly if it is intrinsic or instrumental in nature. Intrinsic cases describe unusual or unique cases, while

instrumental cases attempt to explore a general issue, problem or concern in a specific bounded case. Instrumental studies are predominantly theme-based (McMillan & Schumacher, 2014:371). In this research undertaking, the case study approach adopted was instrumental in nature. My focus has been on a specific issue (the professional development of early childhood teachers through LS), and I selected a bounded case to illustrate this issue (Creswell & Poth, 2016:98). As LS is a vastly undocumented and little-researched field in an early childhood South African context, a single-case study design was selected as the best method for revelatory and exploratory research (Yin, 2003:42). Furthermore, a single case study has the advantage of providing intensive depth and to avoid dilution in the overall analysis (Creswell & Poth, 2016:102), which is particularly beneficial in an exploratory capacity. This study is an attempt to uncover the nature and applicability of LS in a relatively new social context. The primary question guiding this research is a “what” question, namely “what is the impact of LS on the professional development of early childhood teachers”. The “what” approach, Yin (2003:6) argues, further justifies an exploratory case study.

## **4.5 RESEARCH METHODS**

A case study employs a multi-method approach. In this way, different evidence, gathered through different techniques converge (Gillham, 2001:49).

### **4.5.1 Data collection overview**

#### **4.5.1.1 Semi-structured focus group interview**

The semi-structured interview is regarded as the most important form of interviewing in a case study research, yielding the largest cache of data (Gillham, 2001:65). Questions that are open-ended lead to discovery and provide largely unpredictable answers (Gillham, 2001:66). “Semi-structured” implies that although the interview questions are standardised, they are also flexible, providing unique data while covering common ground (Gillham, 2001:69). This involves the utilisation of two specific skills while interviewing, namely following a predetermined line of inquiry and asking unbiased conversational questions which ultimately serve the same line of inquiry (Yin, 2003:90).

Focus group interviewing has the advantage of uncovering issues that create conflict and “hidden complexities” within the group (Gillham, 2001:78). It allows for more than merely collecting group responses to questions, as it creates a platform for debate and argumentation (Maree, 2007:90). Focus group interviews have the added advantage of focusing directly on the topic that is relevant to the research and providing insight into probable causal inferences. Group participants have their memory jogged in a group setting and may feel safer disclosing information common to the group (Maree, 2007:90).

The disadvantage of focus group interviews is that participants may be subject to reflexivity, providing answers in accordance with what they perceive the researcher would like to hear (Yin, 2003:86). Furthermore, the focus group may run the risk of groupthink, and domination of discussions by a few powerful members. This masks the true opinion of quieter participants (Maree, 2007:91). In addition to these potential obstacles, the subjective filter of the interviewee while conducting the interview may compromise accuracy. Interviews are also more prescriptive and less naturalistic, providing less contextual information than observing behaviour in a natural setting (Creswell, 2014:191).

This study employed one semi-structured focus group interviews in the course of 14 weeks. This was administered in the first LS collaborative meeting.

#### **4.5.1.2 Questionnaires**

In the study, data was collected through two questionnaires. Research questionnaires are the most frequently used instrument in the field of educational research (Radhakrishna, 2007:1). The questionnaire’s advantage over the interview is that the respondent can complete the questionnaire in their own time. It also creates a safe space for respondents to answer questions honestly, without feeling embarrassed by answering in front of the group. This improves the reliability of the answers. In addition to this, the respondents are not influenced by interviewer bias, and the process is less time-consuming for the researcher than interviewing (Phellas *et al.*, 2011:182). Most of the questions in the questionnaire were open questions, allowing the participants to construct their own answers without being guided (Phellas *et al.*, 2011:195). Although the questionnaires were relatively comprehensive, the participants were motivated to



complete the questionnaires due to their belief in the research being relevant and benefiting them (Adams & Cox, 2008:19).

The first questionnaire was conducted 9 weeks into the LS research, and the second at the conclusion of the 14-week LS study process (consisting of three cycles). The spread schedule of questionnaires was deliberate to allow for the generation of data that could be analysed for exploring any progressive changes in the behaviour, attitudes and understanding of the research participants during the 14-week course of the research.

#### **4.5.1.3 Field notes**

“The overpowering validity of observation is that it is the most direct way of obtaining data” (Gillham, 2001:46). Field notes of all the activities occurring on site were recorded in both an unstructured and semi-structured way (Creswell, 2014:190). The information gleaned was descriptive and subjective, and the emphasis was placed on uncovering meaning. The process was largely informal and flexible (Gillham, 2001:52).

As a participant observer, I had the advantage of perceiving reality from within a group, which is arguably more accurate than external observation (Yin, 2003:94). A further advantage of participant observation included the opportunity for me to manipulate minor events e.g., selecting times for groups to meet, which provided a greater variety of opportunities for data collection. A final noteworthy advantage of this method was that the data collected through field noting was contextually relevant and related to real-time events (Yin, 2003:26).

Although being cognisant of the potential problem, and minimising its impact, I could not completely avoid the obvious disadvantage of potential researcher bias, as well as the problem of reflexivity or observer effect coming into play (Gillham, 2001:47; Yin, 2003:86). To minimise this complication, I took extreme effort to self-observe, reflect on, and record the possible effects that my participation may have had on the participants (Gillham, 2001:47). Another disadvantage of my role as participant observer, was that of committing myself to two tasks (both observing and participating) which may have compromised excellence in one task over the priority of the other (Yin, 2003:96). Furthermore, as expected, the approach was labour intensive and time-consuming.

Participant observation did, however, lead to the generation of extensive field notes. These notes incorporated running descriptions, points to remember later, ideas and emergent explanations, impressions and feelings and factors that needed further investigation (Gillham, 2001:54). I maintained field notes during and after each meeting with the research participants. These were detailed and accurate transcriptions of the research conversations, as well as nuances and contextually relevant details. I also recorded personal viewpoints and thoughts, as well as preliminary themes as marginal memos in the field notes. Furthermore, noticeable ties with the conceptual framework and literature review underpinning the study were recorded as marginal memos for later analysis.

#### **4.5.1.4 Reflective journaling of participant teachers and researcher**

The physical artefacts used for analysis were reflective journals. They were “tangible manifestations that describe[d] people’s experience, knowledge, actions and values” (McMillan & Schumacher, 2014:387). As physical artefacts they had the advantage of providing insight beyond my direct observation (Yin, 2003:96). In the reflective journals, notes were recorded of the teachers’ personal, subjective experiences, past and unfolding, and how this may have influenced the interpretation of the data (Creswell & Poth, 2016:229).

The primary teacher participants were requested to submit reflective journals after every group meeting and research lesson, in the form of a private email. The teachers were guided to reflect on the LS process in general and their likes and dislikes thereof. They were asked to make recommendations and provide honest criticism. They were also asked to describe areas of personal growth and personal reflections relevant to the research.

The additional advantages of the participant teachers’ reflective journals were that they were recorded in the teacher’s own words. The data could be interpreted and revisited several times. The information was a clear indication of what the participants were attending to (Creswell, 2014:192).

My personal reflective journal recorded the specific chronological steps of the data collection and analysis process, as well as the reasons behind any changes that were made in the research process. The details surrounding the specific steps taken and

possible explanations and challenges faced, were added to the artefactual information for analysis. My reflective journal also provided a platform for reflecting on my role in the study and how my biases, background and values influenced the interpretation of the data (Creswell, 2014:186). This reflective journal was submitted for peer auditing as part of an audit trail of evidence, strengthening the trustworthiness of the study.

#### **4.5.2 Research context**

Creswell and Poth (2016:97–98) recommend that a case study be bounded by a specific timeframe, place and type of participant. The research was conducted in an independent, non-subsidised school situated in urban Gauteng, Ekurhuleni North region. The community which the school serves borders an urban township in the outer city suburbs. The community could be defined as having a middle socio-economic status. The school has a demographic distribution similar to that of the general population of South Africa (74% African, 12% Indian, 9% White, 4% Coloured and 1% Asian). The school currently has 420 learners, of which 256 are early grade learners (Grade RRR – 3). The site was selected for the research due to its accessibility to the researcher, as an employee at the institute.

The group meetings were held after school on a Tuesday afternoon from 13h15 until 15h15, beginning on the 28<sup>th</sup> of January 2020, in a teacher's classroom for an initial 8-week period (almost two complete cycles). Thereafter, the research was interrupted by a 3-month compulsory government lock-down period due to COVID-19 restrictions. The research resumed on the 23<sup>rd</sup> of June for an additional 4-week period (one last cycle). As the meetings were held after school hours, the majority of data gathering commenced in a non-disruptive manner for the school programme. I acted as the facilitator of these meetings. Two research lessons were presented during the total 12-week period of the data gathering. We were unable to present one planned research lesson due to the lockdown and thereafter, curriculum changes and social distancing restrictions coming into play. The demonstration lessons of the first and third cycle were undertaken while the non-participating teachers and learners attended a school assembly, again ensuring minimal disruption to the daily school time-table. Research lessons were presented to Grade One learners.

### **4.5.3 Research sampling**

As is quite common in case study research, cases are not randomised (Silverman, 2013:58). As I work in a primary school environment, the non-probability sampling method of convenience sampling was utilised, particularly for the ease of access to willing participants (Silverman, 2013:58). Purposeful sampling was also employed in that the sampled teachers had to meet basic defining characteristics pertinent to the study (Maree, 2007:79) and assist in my understanding of the research problem and question as it pertained to early childhood teacher development (Creswell, 2014:189). They had to be full-time SACE-registered teachers of learners in the 0-9-year age category (early childhood).

Excluding myself as the participant-researcher, all of the 11 teachers who teach the early grades at Good Foundation Primary School (alias) were invited to participate in the LS research. This included all the teachers teaching from Grade RRR (3–4-year-olds) to Grade 3 (8-9 year olds). Five of these teachers were ECD teachers (Grade RRR to R) of which two had NQF level 7 qualifications, one a NQF level 6, and two with NQF level 4 qualifications. The remaining six Foundation Phase teachers (Grade 1-3) all had NQF level 7 or higher qualifications. The average number of years of teaching experience was 15 years per teacher, with the teacher having the least amount of experience at 1 year and the teacher with the most at 46 years. Three teachers in the proposed sample of qualified teachers did not specialise in the phase that they are currently teaching. All of the teachers were female and spoke English as their home-languages. Of the 11 that were invited, only 6 agreed to participate in the research. Participants had to sign informed, voluntary consent for their participation in the research. The demographics of the final participants are delineated in table 4.3.

**Table 4.3: Demographics of teachers electing to participate in the research**

| Participant number | Current grade of teaching | Years of teaching experience | Qualification level | Currently teaching phase in which she specialised? |
|--------------------|---------------------------|------------------------------|---------------------|----------------------------------------------------|
| 1                  | Grade R                   | 19                           | NQF 7               | No                                                 |
| 2                  | Grade R                   | 23                           | NQF 7               | Yes                                                |
| 3                  | Grade 1                   | 46                           | NQF 7               | Yes                                                |
| 4                  | Grade 1                   | 1                            | NQF 7               | Yes                                                |
| 5                  | Grade 2                   | 14                           | NQF 7+              | No                                                 |
| 6                  | Grade 2                   | 15                           | NQF 7               | Yes                                                |

LS often incorporates inviting outside observers from different grades in the school and even observers from surrounding schools to observe the final lesson presentation and the post-lesson discussion. This is an open invitation emphasising voluntary participation. Again, convenience and purposive sampling was utilised in this regard. Teachers from other grades in Good Foundation School were invited as secondary research participants, as well as early grade teachers from surrounding schools in the community.

Dr D.S. (alias) was purposefully sampled as an expert/ "knowledgeable other" for the lesson presentation, and the lesson de-briefing phase. He is an acknowledged expert both in early childhood mathematics and LS. As there are few such experts in South Africa in the field of LS, he was a purposively selected candidate.

#### **4.5.4 Personal role**

As the researcher, I assumed a participant-researcher role, gaining an emic perspective of the context (Maree, 2007:85) by taking part in the activities of the research as a regular group member (McMillan & Schumacher, 2014:376). Although strictly adhering to case study protocols that are recommended for improving the credibility of the findings, I could not eliminate all aspects of subjectivity as the "research instrument" in the data gathering and analysis process (Maree, 2007:79). I acknowledge that I was instrumental in intervening in the dynamics of the research

context, and inevitably altered these dynamics during the course of the research (Maree, 2007:85).

#### 4.5.5 Research timeline

The data collection phase of the research was planned over a 14-week time period. The time-frame adhered to is tabulated in table 4.4.

**Table 4.4: Timeline of data collection process**

|                                                       | Time    | Researcher collects data (observations and field notes, memoing, audio recordings, researcher reflective journaling and photographs) | Participant data submission through emailing |
|-------------------------------------------------------|---------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Lesson Study Cycle 1                                  | Week 1  | Introductory training on the LS method and a semi-structured focus group interview                                                   |                                              |
|                                                       | Week 2  | Pre-lesson discussion                                                                                                                | Reflective journaling                        |
|                                                       | Week 3  | Pre-lesson discussion                                                                                                                | Reflective journaling                        |
|                                                       | Week 4  | Pre-lesson discussion                                                                                                                | Reflective journaling                        |
|                                                       | Week 5  | Pre-lesson discussion                                                                                                                | Reflective journaling                        |
|                                                       | Week 6  | Lesson delivery and post-lesson discussion                                                                                           | Reflective journaling                        |
| Lesson Study cycle 2                                  | Week 7  | Pre-lesson discussion                                                                                                                | Reflective journaling                        |
|                                                       | Week 8  | Pre-lesson discussion                                                                                                                | Reflective journaling                        |
|                                                       | Week 9  | Questionnaire                                                                                                                        |                                              |
| <b>COVID-19 COMPULSORY GOVERNMENT SCHOOL LOCKDOWN</b> |         |                                                                                                                                      |                                              |
| Lesson Study cycle 3                                  | Week 10 | Pre-lesson discussion                                                                                                                | Reflective journaling                        |
|                                                       | Week 11 | Pre-lesson discussion                                                                                                                | Reflective journaling                        |
|                                                       | Week 12 | Pre-lesson discussion                                                                                                                | Reflective journaling                        |
|                                                       | Week 13 | Lesson delivery and post-lesson discussion incorporating outside teachers                                                            | Reflective journaling                        |
|                                                       | Week 14 | Questionnaire                                                                                                                        |                                              |

#### 4.6 THEMATIC ANALYSIS OF DATA

Data analysis was conducted according to a thematic analysis, which can be defined as “a method for systematically identifying, organising, and offering insight into

patterns of meaning (themes) across the data set" (Braun & Clarke, 2012:57). In addition to thematic analysis, a hermeneutics strategy was employed, in that the transcribed texts were examined as a whole as well as a summation of an in-depth analysis of the constituent parts. This helped to uncover hidden deeper meanings in the text (Maree, 2007:101). The practical steps taken in the analysis involved gaining familiarity with the data through managing and organising while transcribing and reading, followed by the generation of initial codes. Themes were uncovered and defined from coding, which required a combination of inductive and deductive processing skills. The final step involved the reporting back of findings. A holistic analysis of the case was presented, as is typical in exploratory research (Creswell & Poth, 2016:100).

Although various steps were undertaken in the data analysis process, these steps were interrelated and not clearly chronological (Maree, 2007:100). The analysis pattern was spiral in that the transcriptions and field-notes were often re-visited and examined.

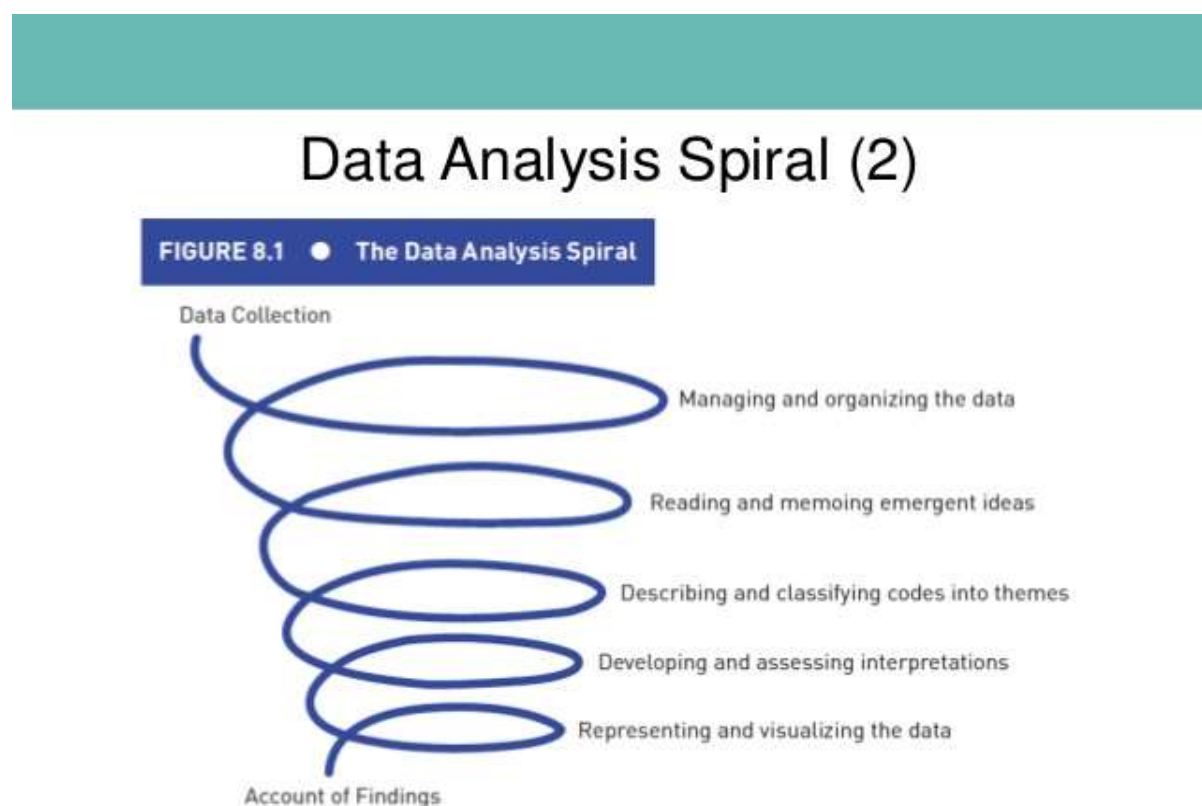


Figure 4.1: The data analysis spiral taken from Creswell and Poth (2016:186).

#### **4.6.1 Data management, transcription and organisation**

Recorded data were dated and stored chronologically in digital format. Field notes were dated and updated after each LS session and stored on the cloud. Transcription of the data commenced as soon as possible after collection (Gillham, 2001:71). Data were also labelled with contextually relevant memos for later analysis. These memos consisted of recording ideas, impressions and musings (Creswell & Poth, 2016:188, Maree, 2007:104). The memoing process was an imperative tool for the creation of the audit trail that was reviewed by a peer auditor.

#### **4.6.2 Reading**

The initial analytic strategy involved reading the transcription, re-reading and note-taking while reading. I made summaries of my field notes, as well as highlighted important observations and recordings (Creswell & Poth, 2016:184). In the recursive process of analysis, I repeated data reading and re-coding in the search for meaning (McMillan & Schumacher, 2014:405).

#### **4.6.3 Generation of codes**

This involved a process of identifying what was substantive and what was redundant in the data (Gillham, 2001:71). This was accomplished through assigning labels to small categories of information with sufficient evidence in the data. Initially, a limit of 50 initial codes was utilised, which were later combined and reduced into a smaller number of broader categories (Creswell & Poth, 2016:190). Transcriptions and field notes were re-read several times to allocate categories. The frequency of the categories listed, or the lack thereof, was also analysed to glean information about the meaning of the phenomenon (Gillham, 2001:71–72), but was not used as a means for measuring emphasis, as all codes were treated with equal importance to ensure fair representation of contradictory views (Creswell & Poth, 2016:193). However, the frequency of codes utilised did provide insight into the number of shared conceptual understandings between research participants (Maree, 2007:108). For the purpose of the audit trail, the codes were named, defined and inclusion or exclusion criteria were delineated where necessary (Creswell & Poth, 2016:191). The coding process combined *a priori* coding and open coding (Maree, 2007:99 & 106). The open coding involved a primarily inductive analysis of the data, allowing codes that were not prefigured to emerge. However, due to an extensive literature review and the



construction of a predetermined conceptual framework underpinning the study, certain *a priori* codes were also utilised.

#### **4.6.4 Generation of themes**

Silverman (2013:122) describes how the generation of themes is utilised to “flesh out the properties of a tentative category”. The generation of themes orientates the interpretation of the data in the light of the researcher’s view and that of pre-existing literature (Creswell & Poth, 2016:189) as well as the predetermined conceptual framework. Themes created were therefore “broad units of information that consist[ed] of several codes aggregated to form a common idea” (Creswell & Poth, 2016:194).

#### **4.6.5 Interpretation and report back of findings**

In following the analytic hierarchy of Lewis and Ritchie (2003:212), the findings of the research uncovered the data patterns and sought to apply the findings to wider probable theories. Theories were inductively developed as these patterns emerged during the data analysis process (Creswell, 2014:51). These patterns laid the foundation for “statements about relationships among categories” constituting “the ultimate goal of [the] qualitative research” (McMillan & Schumacher, 2014:406). The theory generation process required creative and critical judgement, and I had to be aware of alternative explanations or the emergence of findings contradictory to my expectations (Creswell & Poth, 2016:195; McMillan & Schumacher, 2014:406).

In this research, a conceptual framework combining various theoretical lenses was predetermined as a foundation for understanding of the research findings. This conceptual framework was not established for the purpose of testing any predetermined theoretical model as is common in a quantitative research undertaking (Creswell, 2014:67), but was rather established for the purpose of exploring possible modifications to this theoretical foundation. Analysed data was examined within the context of this foundation to bring richer understanding and corroboration to the study (Maree, 2007:111). The study therefore progressed towards the generation of new theory, all the while enriching and questioning pre-existing conceptual understanding (Maree, 2007:112).

Figure 4.2. graphically demonstrates the process I followed in data analysis, from the initial stages of managing the raw data, through to describing and explaining the applications of the emergent themes and patterns.

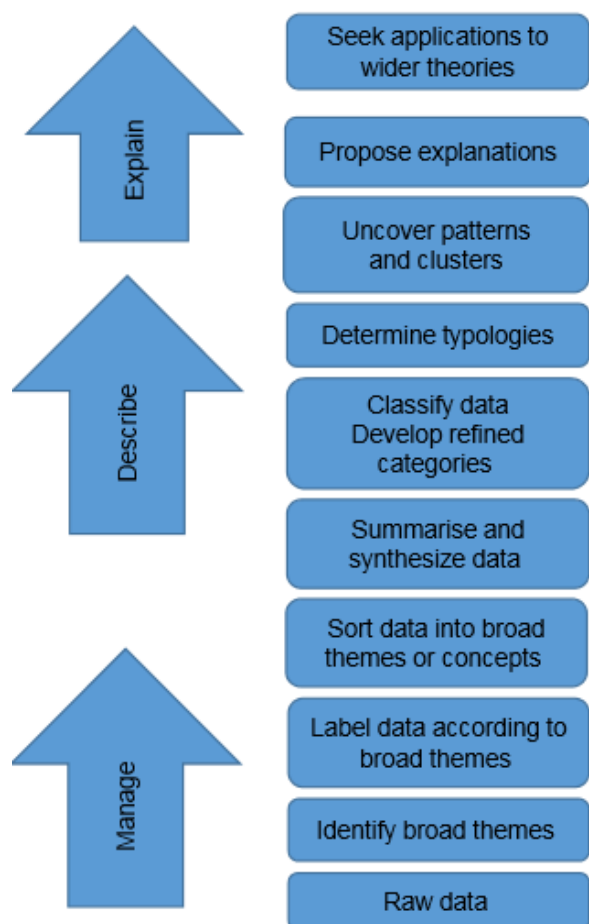


Figure 4.2: The hierarchy of data analysis applied to the data as suggested by Lewis and Ritchie (2003:212)

## 4.7 TRUSTWORTHINESS

Anything that threatens the presentation of a “true” picture of the phenomenon, is regarded as a threat to the validity of the research (Gillham, 2001:25). Researchers who do research with integrity constantly examine and scrutinise their findings to determine if they are true and not merely reflections of what the researcher “wanted to” find (Gillham, 2001:28). The trustworthiness of the research is determined by its truth value, its applicability, its consistency across findings and the neutrality of the research participants. These ideas are commonly expressed in the research terms of internal validity, external validity, reliability and objectivity (Lincoln & Guba, 1985:290).

However, in an interpretivist inquiry, internal validity, external validity, reliability and objectivity are replaced with the terms credibility, transferability, dependability and confirmability (Lincoln & Guba, 1985:300). The various steps I took to protect the integrity of these criteria are delineated in table 4.3.

**Table 4.3: Processes undertaken to enhance trustworthiness of the research**

| Criteria considered to enhance the trustworthiness of the research | Steps taken by myself as researcher to mitigate potential trustworthiness weakness                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Credibility                                                        | <ul style="list-style-type: none"> <li>• Prolonged engagement (minimum of 12 weeks) in data collection</li> <li>• Building trust with research participants</li> <li>• Persistent observation and out of the box thinking</li> <li>• Member checking</li> <li>• Triangulation and crystallisation of theories and data sources</li> <li>• Peer debriefing</li> </ul> |
| Transferability                                                    | <ul style="list-style-type: none"> <li>• Vivid, rich descriptions</li> <li>• Detailed reporting</li> <li>• Clearly bounded research criteria</li> </ul>                                                                                                                                                                                                              |
| Dependability                                                      | <ul style="list-style-type: none"> <li>• Full exploration of all phenomenon</li> <li>• Audit trail, peer auditing and auditor report back</li> <li>• Careful sample selection</li> <li>• Clearly specified procedures and operational measures</li> </ul>                                                                                                            |
| Confirmability                                                     | <ul style="list-style-type: none"> <li>• Reflexive journaling</li> <li>• Memoing</li> <li>• Crystallisation/ triangulation</li> <li>• Audit trail, peer auditing and auditor report back</li> </ul>                                                                                                                                                                  |

#### **4.7.1 Credibility**

Credibility is defined as “the trustworthiness, plausibility, and good character of a researcher and of his or her study, which impacts the believability of the research findings” (Tracy, 2019:289). Lincoln and Guba (1985:301) advocate that credibility can be enhanced through prolonged engagement in the research process. In this way, the researcher develops a deeper understanding of the cultural context of the research. The researcher also has sufficient time to explore conceptual misunderstandings and to build trust with the research participants. This trust is developed through a perpetual demonstration that confidences and anonymity will be respected, that there are no

hidden agendas in the research, that the interests of the participants hold equal value to those of the researcher and that the participants have input and influence in the research process (Lincoln & Guba, 1985:303). The data collection phase of the research extended over 12 weeks, but the repertoire-building process between me and the participants was of a far longer time-period. My role as a participant-researcher in my own school environment created the advantage of a research space in which the research participants were my colleagues, and we were well-known to each other.

Credibility can be further enhanced through persistent observation, which provides depth to the research. Rich observation and analysis of observed data requires creativity on the part of researcher. This includes the ability of the researcher to think out of the box while remaining true to the scientific process (Cope, 2014:90). Credible observation involves careful exploration of all observed features, whether atypical or typical, to determine their relevance. By utilising auditory recordings, together with field notes, credibility was added to my observation procedures. Research participants engaged in member checking (Maree, 2007:114). This is defined as the process whereby “analytic categories, interpretations, and conclusions are tested with members of those stakeholder groups from whom the data were originally collected” (Lincoln & Guba, 1985:314). In the context of this research, member checking was voluntary and informally conducted, and gave insight into the accuracy of the information and its intentionality. The process involved both the checking of raw data for transcription accuracy, as well as the checking of polished or partially completed analysis (Creswell, 2014:202). The participants were asked to correct errors and provide further or clarifying information. The added advantage of the member checking process was that it prevented the participants from refuting evidence at a later stage (Lincoln & Guba, 1985:316).

A third approach utilised to enhancing the credibility of the research was the process of triangulation (Lincoln & Guba, 1985:307), or the postmodern alternative, crystallisation. Where triangulation involves the process of using multiple sources of evidence to garner a broader understanding of the issues being investigated (Yin, 2003:98), crystallisation incorporates cross-referencing methodologies and theories together with data sources (Tracy, 2019:289). In this study, crystallisation permitted

different research angles with their own strengths and weaknesses, to converge and strengthen the research findings (Gillham, 2001:13). This was achieved by utilising a broad conceptual framework to guide the research, as well as utilising a variety of data collection sources (Lincoln & Guba, 1985:307).

Credibility was further enhanced through a process of peer debriefing (Lincoln & Guba, 1985:308). A peer assisted in probing and exploring my interpretations and biases. The peer selected for this study was a Senior Primary English teacher. The peer was considered my intellectual and social equal and was knowledgeable in the area of research and the methods being utilised. I met weekly with the peer to debrief and hash out the working hypotheses. As predicated by Lincoln and Guba (1985:308), this debriefing process was cathartic, allowing me to gain clarity outside of emotional entanglements which could have negatively influenced any sound judgement.

#### **4.7.2 Transferability**

The transferability of the case study research was checked by the boundaries pre-established for the study. This case study was situated in a specific place and timeframe, incorporating a specific sample group of participants (Creswell & Poth, 2016:97). Nevertheless, transferability is possible “when readers intuitively believe that research findings correspond to something significant in their own world” allowing a sense of “resonance” to be attained (Tracy, 2019:279). Transferability is a measure similar to that of external validity in conventional research. In a naturalist inquiry, the researcher cannot specify the external validity of the research as it is context-specific. As “the goal of qualitative research is not to generalise” (Maree, 2007:115), it is the naturalist researcher’s task to provide rich, detailed and thick descriptions of the research process, thereby allowing the reader to draw their own conclusions regarding the transferability of the findings to their own context (Lincoln & Guba, 1985:316). Cope (2014:90) describes the richness of reporting as “vividness”, which is the capacity to capture depth in the data. Cope also advocates thoroughness in fully exploring the breadth of the phenomenon. This includes congruence in reporting, linking the various components of the study.

Yin (2003:37) argues that case studies provide sets of results that can only be generalised to theories rather than to other cases in the population. These theories, in turn, help the investigator to identify other possible cases to which the results may be

generalisable. The findings that developed out of this case study should ultimately be tested with other case studies. If direct replications occur, the theoretical findings presented will gather support. This is similar to the replication logic of conducting repeated experiments in quantitative research.

#### **4.7.3 Dependability**

Guba argues that dependability and credibility are mutually dependent, and that evidence of credibility implies dependability in the research (Lincoln & Guba, 1985:316). As a result of the naturalistic, emergent approach of the study, and the case study being quite specific and bounded, the recommendation of multiple inquiry teams to enhance dependability was not practically possible. It was highly probable that multiple researchers would digress in their lines of inquiry and muddy the waters of the highly bounded single case. An alternative solution presented itself in the recommendation of Guba (Lincoln & Guba, 1985:317) of conducting an inquiry audit. In this study, an objective auditor was selected to examine the process of data collection and analysis. The auditor scrutinised the fairness and accuracy of the process, to enhance the dependability of the research.

Dependability was further enhanced by clearly delineating the sample selection process. Yin (2003:35) explains the importance of construct validity as a component for establishing the dependability of case study research. To enhance the construct validity of this research, the operational measures undertaken in collecting the data were also clearly delineated. Furthermore, the changes that would be studied, particularly in relation to a study's objectives, were determined and expressed beforehand.

#### **4.7.4 Confirmability**

Confirmability refers to the rigor of the research and implies an adequate amount of distance between the observer and observed (Watkins, 2012:157). Confirmability was established through the aforementioned audit trail in which the auditor determined if the data analysis and findings were adequately data-supported and coherent, and if the research theories and assumptions could be accepted (Lincoln & Guba, 1985:318). The audit trail included information like the raw data (field notes, audio recordings with transcriptions and reflective journals), analysis and reduction notes,

reconstruction and synthesis products, notes regarding processes, notes regarding personal intentions and dispositions and all the information pertaining to the data collection instruments (Halpern, in Lincoln & Guba, 1985:319-320). The audit trail was complete, comprehensible and useful for the auditor to determine the research credibility and dependability. It was also truthful, accurate and explicit (Cope, 2014:90).

Confirmability was further ascertained through processes like reflective journaling and triangulation (Lincoln & Guba, 1985:319). Through reflective journaling, I developed an awareness of potential personal assumptions and predispositions, which if unchecked, could have had an impact the research findings (McMillan & Schumacher, 2014:407). All these records of thinking and decision-making provided enlightenment and a clear audit trail for the auditor to assess. My reflective journal incorporated information regarding the research schedule and logistics, a personal diary and a methodological log (Lincoln & Guba, 1985:327, Maree, 2007:114).

In conclusion, Lincoln and Guba (1985:329) described how trustworthiness can never be “unassailable” in a naturalist inquiry. Evidence of credibility, transferability, dependability and confirmability can merely persuade the consumer that the results were noteworthy but cannot compel the consumer to believe in the absoluteness of the findings. I employed multiple strategies to enhance the truthfulness of the research, but the subjective nature of a qualitative inquiry will always leave a small measure of uncertainty in the mind of the reader. It has been my sincere quest to minimise this uncertainty to the greatest extent possible in the study.

#### **4.8 ETHICAL CONSIDERATIONS**

Approval was obtained from the University of Pretoria’s ethic’s board before any field research commenced. Approval from the Provincial Department of Education was also obtained before research commenced. All research participants were fully informed of the research scope and requirements, before giving their signed consent to participate in the research. They were also notified that they could decline participation in the research at any time during the course of the project, as well as withdraw without negative repercussions at any stage.

Teachers were invited to participate in the research in a staff meeting in which the study parameters and the commitment requirements of the participants were

explained in depth. Before giving informed consent, sample teachers were provided with a full understanding of a fiduciary agreement that would be put in place to protect all research participants. In this relationship, the fiduciary implies that the researcher is a person who "...under circumstances which require total trust, good faith and honesty... has greater knowledge and expertise about the matter being handled." Within this capacity, "a fiduciary is held to a standard of conduct and trust above that of a stranger or casual business person. He/she/it must avoid 'self-dealing' or 'conflicts of interest' in which the potential benefit to the fiduciary is in conflict with what is best for the person who trusts him/her/it. Basically, one person has an obligation to act for another's benefit" (Rodgers, 2018). In this promised fiduciary relationship, teachers were guaranteed equal treatment in the research process. Their dignity, confidentiality and opinions, particularly when diverse from my own, would be treated with the highest respect and would be given impartial recognition in the data collection and processing stages. The fiduciary agreement implied that participation in the research, or lack thereof, would not translate into any consequences, positive or negative, outside of the research scope.

In keeping with good case study practice, I revealed the purpose of my research without describing the expected answers or results (Gillham, 2001:53). Trust is imperative for accurate research, and much will be accomplished towards this end if researchers are "reasonable, straightforward, and sympathetic" and expend themselves in creating an honest, open and equal relationship with all members of a case study group (Gillham, 2001:53). Much effort was extended in this regard, and contradictory or conflicting viewpoints were welcomed throughout the research process. Cognisance was taken of the Hawthorne effect, as the "behaviour-modifying effects of being the subject of social investigation, regardless of the context of the investigation" (Scott, 2014:298). Hawthorne effects were mitigated by recommendations proposed by Oswald, Sherratt and Smith (2014:59), in that a rapport was established with the research participants, and effort was made to keep my perceptions non-threatening. This required exercising a relaxed body language, using discretion in changing topics and in linking topics to areas of research interest. The participating teachers were asked to make a completely autonomous decision to participate.



Participants in the research were guaranteed protection from harm or disclosure (Creswell & Poth, 2016:182). All participants, both primary and secondary, and their schools were protected with aliases to avoid identification in the data analysis. Multiple perspectives of the participants were presented in the findings providing an unbiased representation of the case (Creswell & Poth, 2016:183).

As the research also involved learner participants as secondary research participants, I took care to respect the dignity and rights of these young participants. In 2011, a partnership was formed between the Centre for Children and Young people at Southern Cross University, UNICEF Office of Research Innocenti, Childwatch International Research Network and the Children's Issues Centre at the University of Otago, which resulted in the launch of the Ethical Research Involving Children (ERIC) project (Graham, Powell, Taylor, Anderson & Fitzgerald, 2013:26). One of the ERIC resources freely available is an International Charter for Ethical Research Involving Children (Graham *et al.*, 2013:27). This is a statement of commitments that should be undertaken in research involving children, protecting their dignity, rights and wellbeing. They propose that maintaining a high standard of ethics in research involving children is everyone's responsibility. Respecting the dignity of children is core to ethical research, and all research involving children must be just and equitable. Children involved in the research process may never be harmed, but in contrast, should benefit from it. Ethical child research must always include obtaining the children's informed and ongoing consent, and should be a process in which the researcher engages in ongoing ethical reflection. This research respected all the criterion mentioned in the ERIC charter and considered respecting the rights of the young participants as paramount. Learners were asked to give their assent to participate. I utilised the family consent model in which parents were provided with the necessary information regarding the research and could make an informed consent with regards to their children's participation. Even with parental consent, learners were given the opportunity to not participate in a non-discriminatory and safe manner. Non-participating children were sent to the school assembly to join the other learners who were not purposefully sampled for the research lesson.

## **4.9 CONCLUSION**

This chapter expounded the methodology guiding the research. The epistemological framework of social constructivism guiding the research was explained, followed by an explanation of the specific methods of qualitative case study procedures utilised in the data collection, analysis and interpretation processes. The context and sampling process of the research was explained, together with my role as the researcher. The trustworthiness of the research was defended, and a description was given of the ethical procedures which were followed in the research process.

## **5. CHAPTER 5: RESEARCH FINDINGS**

### **5.1 INTRODUCTION**

My project officially commenced with a staff meeting held at the school in November 2019. The meeting was held in the same venue and at the same time as the school holds its scheduled staff meetings, on a Thursday morning. Only 11 teachers were invited, including all the Grade RRR to Grade 3 teachers at the school. The meeting agenda was an invitation to join a LS research the following school year (2020) both as a personal professional development approach and as a research project. I explained the basic LS cycle using a 40-minute PowerPoint presentation. I also elucidated the expected merits of LS, as explained by previous international research projects (Cajkler, Wood, Norton & Pedder, 2014; Dudley 2013; Lewis, Perry, Friedkin & Roth, 2012; Hunter & Back, 2011). The expected time commitments towards the project were also explained. A short, edited video clip was shown to expound on the process and its values.

### **5.2 CODING PROCESS**

All meetings and interviews held with the research participants were transcribed. These transcriptions, together with my field journal, the participants' weekly journals and questionnaire answers were initially coded in Microsoft Word. I met weekly with a research auditor who read through all my transcriptions and initial coding. In these meetings, coding was analysed, theme developments were discussed as well as the emergence of links to the conceptual framework guiding the research. Thereafter, the transcriptions were re-coded deductively using AtlasTi software. The generated output reports were again authenticated by the research auditor.

It is through this repetitive process of inductive and deductive analysis that a large number of codes and themes emerged. These were whittled down dramatically using the research questions as a guide and limiting the resultant discourse to the research parameters.

The following table is a summary of the themes and codes (see 4.6.3.) that were selected in the analysis.

**Table 5.1: Codes and themes used in data analysis**

| Emerging themes                            | Codes used                                                      | Number of pertinent quotes/dialogues selected in coding process |
|--------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|
| Motivation for participation               | Motivators and de-motivators                                    | 39                                                              |
| Content knowledge                          | Confidence in own knowledge                                     | 9                                                               |
|                                            | Lack of content knowledge                                       | 35                                                              |
|                                            | Improved content knowledge                                      | 18                                                              |
| Pedagogical content knowledge              | Dependence on worksheets/ textbook type teaching                | 23                                                              |
|                                            | Different focus of teaching outcomes                            | 30                                                              |
|                                            | Following/giving instructions                                   | 11                                                              |
|                                            | Grouping                                                        | 15                                                              |
|                                            | Improved pedagogical content knowledge                          | 10                                                              |
|                                            | Maths and language                                              | 39                                                              |
|                                            | Maths happens without planning/ incidental                      | 33                                                              |
|                                            | Maths is genetic                                                | 5                                                               |
|                                            | Method/ method-teaching                                         | 42                                                              |
|                                            | Movement                                                        | 7                                                               |
|                                            | Moving from unknown to known, or known to unknown               | 28                                                              |
|                                            | Problem-solving                                                 | 32                                                              |
|                                            | Skills objectives of Grade 1 teachers                           | 13                                                              |
|                                            | Teaching tips                                                   | 10                                                              |
|                                            | Teaching-learning link                                          | 13                                                              |
|                                            | Under-expectation/ over-expectation                             | 37                                                              |
| Teacher learning/ professional development | Creativity                                                      | 4                                                               |
|                                            | Deeper understanding/meaning                                    | 7                                                               |
|                                            | General growth                                                  | 4                                                               |
|                                            | Impact of LS outside of LS (including coffee pot conversations) | 56                                                              |
|                                            | Learner-centred teaching                                        | 51                                                              |
|                                            | LS as a PD tool                                                 | 6                                                               |
|                                            | Observation of teacher                                          | 7                                                               |

| Emerging themes                                                      | Codes used                                                      | Number of pertinent quotes/dialogues selected in coding process |
|----------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|
|                                                                      | Observation of learner                                          | 27                                                              |
|                                                                      | Resources – concrete vs worksheets                              | 5                                                               |
|                                                                      | Resources                                                       | 48                                                              |
|                                                                      | Self-confidence                                                 | 25                                                              |
|                                                                      | Self-reflections                                                | 30                                                              |
|                                                                      | Self-study                                                      | 10                                                              |
|                                                                      | Willingness to be vulnerable                                    | 10                                                              |
|                                                                      | Willingness to change                                           | 7                                                               |
| Affective and physical impacts on participants<br>(Negative impacts) | Boredom                                                         | 4                                                               |
|                                                                      | Disillusionment                                                 | 10                                                              |
|                                                                      | Exhaustion                                                      | 9                                                               |
|                                                                      | Fear of participation                                           | 13                                                              |
|                                                                      | Fear of presenting                                              | 41                                                              |
|                                                                      | Inadequacy/ lack of confidence                                  | 10                                                              |
|                                                                      | General negative emotions                                       | 11                                                              |
| Affective and physical impacts on participants<br>(Positive impacts) | Curiosity                                                       | 22                                                              |
|                                                                      | Enjoyment                                                       | 39                                                              |
|                                                                      | Enthusiasm                                                      | 18                                                              |
|                                                                      | Fun                                                             | 6                                                               |
|                                                                      | Motivation                                                      | 12                                                              |
|                                                                      | Motivation to continue LS                                       | 6                                                               |
| Inter-grade cooperation and relationships                            | Flow of knowledge between grades and poor inter-grade knowledge | 63                                                              |
|                                                                      | Disrespect between grades                                       | 16                                                              |
|                                                                      | Inter-grade cooperation                                         | 10                                                              |
| Impact on collaboration                                              | Collaboration                                                   | 67                                                              |
| Impact on curriculum development                                     | Planning curriculum                                             | 24                                                              |
|                                                                      | Intergrade flow of curriculum                                   | 63                                                              |

| Emerging themes | Codes used              | Number of pertinent quotes/dialogues selected in coding process |
|-----------------|-------------------------|-----------------------------------------------------------------|
|                 | Spiral vs block         | 22                                                              |
| Challenges      | Clashing goals          | 36                                                              |
|                 | Communication           | 11                                                              |
|                 | Goal setting            | 27                                                              |
|                 | Mixed starting points   | 10                                                              |
|                 | Role of presenter       | 16                                                              |
|                 | Role of the facilitator | 48                                                              |
|                 | Time-table              | 3                                                               |

The following shorthand table is a key to interpreting the aliases and transcriptions presented in the findings. The shorthand may be followed by a date e.g., 4/6 (the 4<sup>th</sup> of June) to allow for easy referencing to the transcriptions to this dissertation.

**Table 5.2: Key for interpreting the shorthand used in the findings**

| Code | Interpretation                                                                                                                 |
|------|--------------------------------------------------------------------------------------------------------------------------------|
| T1   | Grade R teacher. Age 39 years. 19 years of teaching experience at time of research. NQF level 7. White and English-speaking.   |
| T2   | Grade R teacher. Age 48 years. 23 years of teaching experience at time of research. NQF level 7. White and English-speaking.   |
| T3   | Grade 1 teacher. Age 24 years. 1 year of teaching experience at time of research. NQF level 7. White and Afrikaans-speaking.   |
| T4   | Grade 1 teacher. Age 68 years. 46 years of teaching experience. NQF level 7. White and English-speaking.                       |
| T5   | Grade 2 teacher. Age 41 years. 14 years of teaching experience at time of research. NQF level 8. White and English-speaking.   |
| T6   | Grade 2 teacher. Age 65 years. 17 years of teaching experience at time of research. NQF level 7. White and Afrikaans-speaking. |

| Code | Interpretation                                                                                                    |
|------|-------------------------------------------------------------------------------------------------------------------|
| T7   | Researcher. Age 42. 23 years of teaching experience at time of research. NQF level 9. White and English-speaking. |
| II   | Initial interview                                                                                                 |
| RJ   | Researcher journal                                                                                                |
| Q    | Questionnaire                                                                                                     |
| PLD  | Post lesson discussion                                                                                            |
| PM   | Planning meeting                                                                                                  |
| PJ   | Personal journal                                                                                                  |

The following table is a brief summary of the focal point of each Lesson Study meeting and demonstration lesson as it emerged during the research process. Each meeting and lesson is dated e.g., 4/6 (the 4<sup>th</sup> of June) to allow for easy referencing to the transcriptions to this dissertation.

**Table 5.3: Briefly summary of the content of LS meetings and demonstration lessons**

| Cycle number | Date | Summary of content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1            | 28/1 | <b>Group interview</b><br>Introductory group interview with a view to establishing the participants' previous experiences with PD and expectations regarding the LS process.                                                                                                                                                                                                                                                                                                                                                             |
| 1            | 2/2  | <b>Lesson Study Meeting</b><br>Broad discussion on topics taught in the Grade 1 syllabus and the transitioning of topics between early grades.                                                                                                                                                                                                                                                                                                                                                                                           |
| 1            | 11/2 | <b>Lesson Study Meeting</b><br>Allocation of topics discussed in previous meeting to year-long teaching calendar. Discussion included the order in which topics should be taught as well as debate on a spiral or block approach to teaching various topics. Specific topics were selected for three Lesson Study demonstration lessons. Inconclusive discussion ensued on possible lesson goals for first demonstration lesson (patterning) as well as a discussion on a variety of lesson ideas and resources for teaching patterning. |
| 1            | 18/2 | <b>Lesson Study Meeting</b><br>Discussion on patterning. Participants introduced new goals and brought random lesson ideas to the table. Participants engaged in patterning activities themselves. Conflict between participants became evident regarding lesson                                                                                                                                                                                                                                                                         |

| Cycle number | Date | Summary of content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              |      | <p>ideas. Conflict was also apparent in selecting the ultimate goal for demonstration lesson.</p> <p>Construction of a skeletal lesson plan based on random participant ideas.</p> <p>Discussion of flow between ideas.</p> <p>Selection of presentation teacher.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 1            | 25/2 | <p><b>Lesson Study Meeting</b></p> <p>Facilitator introduced a written conceptual summary (mind map) integrating patterning concepts explored in previous meetings, namely:</p> <ul style="list-style-type: none"> <li>• Patterning as a free expression of creativity</li> <li>• The vocabulary of patterning</li> <li>• Patterning with different elements: number, colour, shape, direction, height, size</li> <li>• Patterning on progressively deeper levels, using two or more elements combined</li> <li>• Fixed looped patterning e.g. 2,5,7,2,5,7,2,5,7</li> <li>• Fixed non-looped patterning e.g. 2,4,6,8,10,12, etc.</li> <li>• Variable patterns that are increasing e.g. 1,2,4,7,11 etc.</li> <li>• Variable patterns that are decreasing e.g. 100, 90, 81, 73, 66 etc.</li> </ul> <p>Participants discussed the lesson ideas in the context of a conceptual framework. Session continued with a final selection of lesson activities and a discussion on the flow of lesson. Teacher instructions were discussed and a resolution of the lesson goal was reached.</p>                                                                   |
| 1            | 3/3  | <p><b>Demonstration lesson and feedback session</b></p> <p>Goal for this lesson: To develop an understanding that a pattern can be found in different forms, but it is a rule that makes something happen over and over again.</p> <p>Three planned activities that were presented:</p> <ol style="list-style-type: none"> <li>1. Children were given the problem of completing an incomplete pattern (fixed, 2-level pattern incorporating repeating pictures and colours). Children explored the completed pattern physically by matching body movements to pictures.</li> <li>2. Children were given number charts and instructions on blocking out certain numbers in a fixed pattern e.g. every third number. Children were encouraged to explain the number patterns that emerged.</li> <li>3. Children were given egg boxes and coloured discs with numbers 1-5 drawn on them. After two teacher-directed activities exploring basic patterning with the resources given, children were encouraged to create their own patterns, preferably demonstrating consistent, looped patterning on 2 different levels (colours and numbers).</li> </ol> |
| 2            | 10/3 | <p><b>Lesson Study Meeting</b></p> <p>Facilitator directed the session more towards conceptual understanding prior to encouraging discussions on lesson ideas. Session began with participants discussing the following posed questions:</p> <ol style="list-style-type: none"> <li>1. How many different ways can you ask a subtraction problem?</li> <li>2. How many different methods do you think a child could use to answer a subtraction problem?</li> </ol> <p>Facilitator gave a handout of an article expounding the conceptual understanding of forms of subtraction problems e.g. comparison vs part-whole. Participants discussed various approaches using examples from their own teaching and problems that their children have encountered.</p> <p>Two potential goals were established for the demonstration lesson.</p>                                                                                                                                                                                                                                                                                                              |



| Cycle number | Date | Summary of content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2            | 17/3 | <p><b>Lesson Study Meeting</b></p> <p>Participants took turns presenting their ideas to accomplish the two goals set in the previous meeting. Several creative ideas were explained with each teacher taking a turn to present.</p> <p>Participants selected the final lesson goal as: children will understand subtraction sums (1-10) given in a part-whole format where a part is provided of a whole, and they are required to calculate the missing part. The secondary lesson goals established were: for children to be able to write the subtraction sum of a part-whole problem, and for children to use various methods to calculate part-whole subtraction problems, possibly concluding that inverse addition (by noticing the missing element of a bond triad) is the quickest method for subtraction (1-10).</p> <p>Participants selected lesson ideas they found most applicable and effective to accomplishing the goals. Three possible activities were selected and a skeletal lesson plan was created.</p>                                                                                                                                                                   |
| 2            |      | <b>Compulsory government lockdown (CoVid19)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 3            | 23/6 | <p><b>Lesson Study Meeting</b></p> <p>Prior to the session, the facilitator asked participants to research the conceptual understanding of introductory multiplication. Participants took turns explaining various methods they had researched. Discussion also centred on the flow of understanding between the represented grades.</p> <p>There was general agreement on the process of encouraging children to develop their own strategies to solving posed problems.</p> <p>The lesson goal was selected as: For children to understand that there are more strategies to solving a multiplication-type problem than counting up in 1s.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 3            | 30/6 | <p><b>Lesson Study Meeting</b></p> <p>Participants spent time explaining their own lesson ideas for accomplishing the lesson goal.</p> <p>Ideas most suited to accomplishing the lesson goal were selected through a voting process.</p> <p>A skeletal lesson plan was created, selecting the order of activities and flow between activities.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 3            | 7/7  | <p><b>Lesson Study Meeting</b></p> <p>Each activity in the skeletal lesson plan was discussed in depth. Phrasing of instructions and questions in the lesson were discussed, as well as expected learner responses. Participants made resources together.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 3            | 11/7 | <p><b>Demonstration lesson and feedback session</b></p> <p>The initial goal established (see 23/6) was maintained as the lesson goal.</p> <p>Four planned activities were utilised:</p> <ol style="list-style-type: none"> <li>1. Learners folded socks into pairs. Pairs were tossed into a basket. Learners calculated the total number of individual socks tossed (not pairs) after each round.</li> <li>2. Children were given buttons and white boards and asked to solve questions like, "If I have 6 buttons, how many holes are there?" Questions become progressively more abstract e.g. "If I have 8 elephants, how many ears would they have?", and learners were eventually asked to solve without using the buttons.</li> <li>3. Children were given squares, triangles and pentagons. Similar problems were posed as the button activity above, but in multiples bigger than 2. E.g. "How many corners are there in 4 pentagons? Was there a way I could work that out without counting each corner?"</li> <li>4. Children were given different colour-coded boxes. Each box of a particular colour had the same amount of sweets inside e.g. all the blue boxes had 2</li> </ol> |

| Cycle number | Date | Summary of content                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              |      | marshmallows inside or all the red boxes had 3 jelly sweets inside etc. All the children with a certain coloured box were asked to stand and reveal what was inside their box. The teacher asked the class to use their white boards and to solve how many of that particular sweet there was altogether.<br>5. Children left the class e.g. 5 at a time. The teacher asked the remaining children, "How many ears left the class?" The game continued until all the children left. |

### 5.3 FACTORS MOTIVATING TEACHERS TO PARTICIPATE IN LESSON STUDY

Of the 11 teachers who were extended an invitation to participate in the LS research, only five initially accepted. Four of the teachers who declined gave no explanation, while two of the youngest applicants listed the busyness of life. In a conversation with one of the participants who declined, she explained, *"I wouldn't be involved. No. Because I would think of the time and what I would do in my time, the admin I would do, the marking I would catch up"* (T3 II 28/1). She was moving to a new house and was concerned about lack of funding should her paid afternoon job (After Care) be compromised by LS. She also felt overloaded with administrative and preparatory work without the extra pressure of attending a professional development programme. It was only after the school management offered assistance (appointing a substitute for her After Care post and providing a teacher assistant to help her with administrative work) in removing some of these perceived barriers that she was willing to consider participating in the research. The time commitments were also a deterrent for a second participant, T5, who had a young baby and stated, *"Committing to two hours every week is a lot and not everyone has the time to do this"* (II 28/1).

Once some of the perceived barriers were removed by school management, six teachers agreed to participate. Their motivation to do so was quite diverse. One research participant believed that LS was a vehicle for improving other teachers through her input and experience, *"[I want to] see if we can improve South African education lessons and if this can work as an alternative...it mustn't be just for us... I just felt I had a social responsibility to do more for the education system before I retire. Because, flip, I'm nearly fifty and I am interested ...in fruits, and long-term fruits, and broader reaching fruits... I'm a problem-solver. I see there is a problem in education. Who doesn't!? But I've got a chance to do something about it! ..."* (T2 in II 28/1).

Two teachers were motivated by the appeal of collaborating with teachers from different grades. The novelty of participating in a university research project was a motivating factor. T3 and T6 both indicated that being part of an academic research was an honour. According to T5, her participation in the study was more personal because her son would be entering the first grade and through LS, she envisaged being able to assist her child. She also wanted to develop professionally as an educator in the early grades. Her second reason for participation was the belief that it would assist her professionally. T4 stated that her reason for participation was the appeal of collaboration. *"[I like] the concept of getting together and maybe gain extra knowledge" (I1 28/1).*

Only three research participants, T4, T5 and T6 mentioned being motivated to participate because of their interest in the LS process itself. T6 was particularly motivated by its potential for generating learner-centred teaching. Her initial thoughts were quite expressive, *"When you did your talk my 'bek het oopgehang' (my mouth hung open), and I thought, yo, this sounds interesting. Then you showed us that little bit, uh, of a video, and then I went and watched more. You know, trying to find out more. And it appealed to me because I saw what happens in the classroom. And how they...the teachers, without teaching, a subject, elicited, I want to say 'understanding' from the kids."* (I1 28/1). T6 was also curious about the facilitation process of LS and listed this as a motivating factor.

T3 and T6 were both motivated by the novelty of doing something new. Interestingly, the notion of self-improvement was not the primary objective of most participants. Only T1 commented about this aspect as one of her motivators. However, when participants were presented with an analogy of the LS process and a discussion ensued, personal motivation towards self-improvement became more apparent. An example of this is expressed in T5's desire for *"going towards greater knowledge!"* (I1 28/1).

#### **5.4 FACTORS DEMOTIVATING TEACHERS TO PARTICIPATE IN LESSON STUDY**

Conversely, the participants were vocal about reasons why LS was not appealing to them or their colleagues when initially presented. These reasons were diverse, including aspects like the potential of LS to exacerbate poor pre-existing interpersonal relationships. This was apparent in the following private conversation, *"You know I*

*nearly never joined... Because I thought what the hell would be the point if we all just come and sit here and have someone's opinion forced down our throats?" (This private conversation between T2 and T7, was recorded while the recording devices were still running directly after the other teachers had left a LS session. Permission was obtained after the fact from T2 to include this conversation in the research).*

Fear of presenting a lesson for peer review was a formidable de-motivator and was listed several times by different participants as a reason for not wanting to participate in the research. Teachers believed that they would be *"criticised"* (T1 in II 28/1) and *"judged... about how we do things here"* (T4 in II 28/1). This made them feel *"uneasy"* (T6 in II 28/1) and *"afraid"* (T5 in II 28/1). Self-doubt was a particularly demotivating factor for T3 who *"felt worried about not being able to contribute something worthwhile to the group."* (II 28/1). Furthermore, unwillingness to participate may have been affected by the grade level at which the LS research was pitched, as my research journal reflects *"The Grade 3s and Grade RRs and RRR are too far removed from Grade 1 research"* (RJ 28/11).

#### **5.4.1 Recommendations for reducing aversion to participation**

Participants gave recommendations for improving the appeal of LS. Although the positive potential outcomes of LS were elucidated in the initial presentation to the staff, it was reiterated by T5 that this had to be an essential motivator for canvassing new participants.

The importance of voluntary participation was also expressed as an essential motivator by T1 and T2 in the initial research interview. However, later on in the research, T2 consented that *"It should be made compulsory, as the teachers who need it, often don't feel that they do"* (Q 4/7).

#### **5.4.2 Demotivation of surrounding schools**

In addition to the challenge of motivating teachers from the sample school to participate, it was also difficult to engage surrounding schools to participate as observers of the demonstration lessons. In the initial LS cycle, seven schools were invited with three emails and a personal phone-call each, and in the first demonstration lesson, only two schools sent representative teachers as observers. In the last cycle, ten schools were invited with two emails. Again, only two schools sent teachers to

observe (these were different schools from the first cycle). One school stated, *“our programme is simply too full” (in a phone-call with deputy principal of the school)*. This resistance was evident even though I tried to accommodate visiting schools by scheduling demonstration lessons at the end of a school day (12h00).

(Email excerpt from invited school, declining their participation in the research)  
Unfortunately, [the demonstration lessons] occur during our teaching time and it would be very disruptive if both our Grade One teachers were away during the school day. If some of your teachers would like to deliver a demonstration lesson at our school, they would be most welcome.

In the first report back session after the first demonstration lesson, the visiting teachers were complimentary and praised the fruits of the LS lesson, acknowledging the value of the process. However, when pressed to determine if they would be willing to mirror the same process in their school the teachers' response was divided, *“I say yes, she says no! (referring to teaching partner sitting next to her)” (PLD 3/3)*.

## **5.5 THE IMPACT OF LESSON STUDY ON THE IMPROVEMENT OF CONTENT KNOWLEDGE IN MATHEMATICS**

### **5.5.1 Confidence in content knowledge**

Most teachers began the LS research with high levels of confidence in their own understanding of the mathematical concepts that they teach. T4 repetitively expressed confidence and pride in her training and years of experience *“I truly am very proud and confident in my training as a Junior Primary teacher... so early grade math and math content was an integral part of our training” (Q 4/4)*. These sentiments were shared by most of participants who stated in the initial interview (28/1), *“I’ve got a good understanding of math” (T6)*, *“I think I am there. I think I have been teaching Grade 2 for many years” (T5)* and *“I wouldn’t say that I’m NOT confident...” (T3)*

### **5.5.2 Deficits in content knowledge**

In spite of this initial confidence, deficits in content knowledge for mathematics teaching were apparent during the research. One such deficit centred on the poor content knowledge of the participants concerning the South African CAPS documents. T4 and T3 admitted that they had briefly read through the CAPS document but retained little, and T5 acknowledged that she had surveyed the document *“...many years ago... I think 6 or 7 years ago” (II 28/1)*.

These deficits became more apparent in the LS meeting aimed at establishing broad curriculum goals. For example, T4 believed that Grade 1s should only be “*counting objects to 50*” (PM 4/2) unlike the expected outcomes put forth in the CAPS document. T6 was also unaware that the Grade 1s were expected to do addition and subtraction up to 20.

When discussing the benefits of spiral and block curriculums, T5 acknowledged “*I’m trying to think what we do? I don’t even know what we do!*” (PM 4/2). Further examples of general mathematical content knowledge deficits became apparent in several LS conversations. In one example, the basic vocabulary of analysing shapes was unknown. “*How many edges or is it artifices? Or something like that. I don’t even know the term*” (T7 in PM 4/2). The concept of place-value and its mathematical definition was lost to T4, who also argued that Grade 1s should not do addition and subtraction with more than two numbers. “*You see now I was told that mathematically this is wrong!... I was just told that I mustn’t teach it like that!*” (PM 4/2). When the topic of “patterning” was first selected as a research lesson topic, scepticism was expressed by T5 due to her lack of conceptual understanding and a concern that she would not be able to bring conceptual richness to the table. “*Ja, I don’t know how much we are going to contribute about patterning (said with scepticism)... but ja (worried laughter)*” (PM 11/2). During the succeeding sessions of exploring patterning, the notion of teaching a pattern as a mathematical rule of repetition at a Grade 1 level was clearly misunderstood by T4, who wanted to explore and appreciate random artistic patterns in the environment.

(PM 11/2)

*T4: How about making them aware of patterns in nature? Like a flower.*

*T7: That’s not the same patterning as what we’re doing here.*

*T4: Okay*

*T7: You’re right, there are patterns in nature (drawing in the air a circular spiral)*

*T6: We’re talking fractals here.*

*T7: Ja, I was about to say ... we're going to digress...we want them to see the difference between here and there (spacing using hands), and here and there, and here and there, and if I take them outside to see patterns in nature, it's random at the moment.*

*T6: You want to link it to numbers!*

Further general poor mathematical content knowledge was evident in other LS conversations. One such example centred on the topic of subitising. T5 and T4 acknowledged that they had not heard of the concept before. *T4: "Is that got something to do with Sundays? (T3 laughs) What is subitising?" (PM 4/2).* In a later session, when discussing multiplication strategies and potential pitfalls, T1 admitted *"I do not have enough knowledge of this phase of multiplication to give comment" (PM 23/6).*

### **5.5.3 Realisation of deficit**

Through the study, some teachers expressed the realisation that their content knowledge could be improved on. *"I continue to see how little we know about the phase that each of us teaches, and the bank of knowledge that we do indeed have... I had to go and research all of the terms for subtraction, whereas they seem to come automatically to others" (PJ of T1 17/3).* This realisation was echoed by T6 who recorded, *"Now that I have been exposed to the LS process, I came to the shocking conclusion that I need to look at different ways of teaching mathematics. I also need to learn more about the content that we teach... Certain aspects of the content proved to be more or wider than what I have realised before" (quotes taken from both Q 4/4 and Q 4/7).* The same concern was shared by T1 and T3 who stated, *"I think there is a lot more to maths than we realise" (T1 in Q 4/4)* and *"What has surprised me the most is how much I am still learning about maths" (T3 in Q 4/4).*

### **5.5.4 Improvement of content knowledge**

There were several clear examples of how the LS process contributed to the improvement of content knowledge in the participating early grade teachers. The teachers' vocabulary of mathematics was improved as seen in these two sample conversations about patterning terms and multiplication arrays.

*(PM 18/2)*

*T7: What's the difference between a term and an element then?*

*T6: Those are the actual objects.*

*T4: The objects that you use. It could be a, a, pencil, a pen, a...*

*T1: A term would be each repeat then, would it not?*

*T7: No, because that would be, that would be the core.*

*(PM 23/6)*

*T2: An array? What is, what does that mean?*

*T6: If I say that I plant so many rows, of so many trees in each row...*

*T2: Oh, okay*

In addition to vocabulary improvements, the combined experiential knowledge of the teachers brought new content knowledge to light in areas like working with number lines, “Okay, I’ve never seen multiplication done on a number line before. I understand what you’re explaining, but I’ve never seen it before.” (T7 in PM 23/6), intersections, “It’s an interesting way, I mean it’s the first time I’ve seen it.” (T6 in PM 23/6) and subtraction “I also learned a lot more about different ways we could ask questions when we do subtraction... I think my Maths content knowledge improved because I saw different aspects of certain operations that I didn’t think of before” (T6 in Q 4/4). As T5 eloquently summarised, “My knowledge of patterning, subtraction methods and multiplication methods has increased exponentially (and it’s not only head knowledge - the use of practical problem-solving ways to approach the topic made me internalise this knowledge and I believe it will be readily available for me to draw on when I teach these areas)” (Q 4/4). LS therefore had the power to highlight deficiencies in the content knowledge of the teachers and simultaneously provide an appropriate platform for the betterment of these deficits.



## 5.6 IMPACT OF LESSON STUDY ON PEDAGOGICAL CONTENT KNOWLEDGE OF TEACHERS

The research indicates that LS positively impacted the pedagogical content knowledge of the participating teachers. Initially, the study revealed diverse pedagogical approaches to teaching maths amongst teachers. These views were argued and sometimes altered by the LS process. There were several examples where teachers shared teaching tips and methods that made the teaching of mathematics more attainable and interesting for their colleagues. Ultimately, evidence suggests that LS participation elevated the teachers' expectations of their teaching outcomes.

### 5.6.1 Pre-existing didactic approaches

It became apparent that some of the participating teachers had a very structured outlook towards teaching mathematics. Their teaching style can be described as more dependent on worksheets and on factors like meticulous handwriting, developing fine motor control (e.g., through colouring in), emergent literacy skills and the careful laying out of work. Other participants seemed to be less focused on these aspects and more concerned about teaching more exclusively for mathematical concept development, particularly through play. These conflicting views caused some frustration and tension between teachers, and the dichotomy was particularly prevalent between the Grade R and Grade 1 teachers. These contradictory views were not noticeably resolved through the LS process, but were rather merely uncovered. In the following example, T1 (a Grade R teacher) laments over the poor concept knowledge of one of her learners, *"We've got that one kiddie now... colours in beautifully, draws beautifully, can write his name beautifully, can do all this beautiful written, but ... can't tell you...things! It's like he's got all this book knowledge, but if you hold up a something, he can't tell you that shape"* (I/ 28/1). This contrasts with the views of T3 and T4 (Grade 1 teachers) who attributed the slow progress of their mathematics curriculum in the beginning stages of Grade 1 to the laborious process of children learning to form their digits perfectly and with the correct pencil grip. This is evident in the following excerpt from a planning meeting (4/2), which concludes with T2 (a Grade R teacher) expressing her concern over the didactic orientation of the teachers.

*T4: You take out the chalk boards, now make a 1. Hold it up and show me. Make a 2. Hold it up. And that's where you go back, and you help the child*

*that is making it the wrong way around. Really, it's a very, very slow process....*  
*They "sommer" [just] start the 2 at the bottom.*

*T3: Ja, so many of them start it from the bottom. And I'm thinking, how? Where did you come from that you even did that?*

*T4: I know for a fact that the Grade R's are doing pencil grip and show the kids. I'm not lying, you must come and see.*

*(The conversation continues about pencil grip and handwriting)*

*T2: Can I just say that I do think writing the numbers and understanding the numbers is actually two different things!*

*T2 was particularly frustrated after this session, "Did we spend 20 minutes talking about how they reverse their numbers?... I understand the concept (referring to the correct number formation), but you know I'm just pointing out...it's visual memory and spatial, it's actually not really a maths thing. I mean, yes it helps... but if you still write 4 million and the 326 or whatever and your 4's flipped over that way...it's still the same number..." (Private discussion recorded directly after PM 4/2 while recording devices were still running. T2 gave her permission for comments to be used in the research.)*

### **5.6.2 Views on textbooks and worksheets**

The need to develop lessons based on textbooks and worksheets was debated. Teachers had diverse opinions regarding the value and assistance of textbooks or worksheets for teaching. Their varied opinions could also be attributable to scepticism regarding the quality of South African textbooks which were deemed "*inappropriate*" (T1 in II 28/1) and unable "*to cover all the concepts you teach the way you want them to be covered*" (T7 in II 28/1) nor able to "*satisfy all your needs*" (T4 in II 28/1).

LS impacted the way in which some, but not all, of the participating teachers viewed their dependence on worksheets for lesson planning and teaching. It would appear that the outcome was a greater aversion to worksheet-based teaching and an awareness of alternative didactic approaches. This was commented on by T1 who is a Grade R teacher, but was previously a Grade 4 teacher, "*There are definitely more creative and hands-on ways to teach than just worksheets – again though, I think this*

*change in [my] mind-set is a combination of moving down to a lower grade and LS, but it's been very interesting to see how using recycled and made materials can effectively be used with older children, because of our LS approach. Interesting how we left the idea of worksheets 'til the last activity in each lesson and they weren't our first approach" (T4 in Q 4/7). This was confirmed by T3, T5 and T6 in the same questionnaire. "I prefer to do more concrete work and physical teaching than the use of workbooks / worksheets. Through LS my thoughts about this have increased and I try to use less worksheets / workbooks even now" (T3 in Q 4/7). "[After LS] I now want to use less worksheets. By doing more problem-solving lessons more learners will be reached (as they can learn from each other) and I may reach learners who think differently to the norm and motivate them more as they are given more control... I still feel worksheets have their place as consolidation activities (so a teacher can assess and see if work was understood). I want to first see what children know before I do worksheets. I am finding that LS has helped me after lockdown learning (as we have not had the children in our class for a while) and I don't feel the need to cover all of my worksheets now" (T5 in Q 4/7), and "Worksheets and workbooks cannot replace teaching. That became more evident to me during the LS process" (T6 in Q 4/7).*

### **5.6.3 Reinforcing the link between teaching and learning**

The LS process opened conversations and thinking that reinforced the link between teaching and learner understanding. These conversations were non-confrontational yet provoking. In a discussion on the perceived obtuse thinking of learners and their parents, T7 commented, *"Are we exacerbating the problem [of poor learning]?... don't you feel that if we're a lot more logical as teachers, we can help?" (PM 4/2).* This notion was also expressed by T6 later in the same session *"You know... I sometimes wonder, T5, when we are complaining about the kids struggling, that is, what are we doing different, to come out of the struggle?"* Ultimately, T3 described how LS empowered her in better understanding her role in the teaching-learning link, *"[Through LS] I have gained a lot of new experience and respect for others and myself when it comes to teaching Maths and how I teach as well as the impact my teaching has on the children I teach" (T3 in Q 4 4/7).*

#### 5.6.4 What is the best way to teach mathematics to the young?

The apparent differences in the teachers' ways of structuring lessons were not only evident in areas like worksheet-guided teaching versus play-guided teaching or teaching focussed more on literacy development (careful handwriting, layout and reading skills) versus teaching focused on mathematics concept development. Other evident differences influencing pedagogical-content knowledge manifested in three broad schools of thought that emerged through the study and were often debated. The first being that mathematics ability is genetically determined and as such, is an incidental outcome of casual classroom exposure that cannot be "taught". The second was that method-teaching should be used as a traditionally tried and tested approach. Thirdly, problem-solving is a new and challenging approach that holds unknown potential. Through LS it was often argued as to whether, or how, the problem-solving approach and method teaching approach could be integrated.

##### 5.6.4.1 Genetically determined and incidentally taught

The school of thought that mathematics is an incidental outflow of an inherent genetic potential was particularly adhered to by T1 and T4. Examples of T4's thinking can be viewed in her quotes T4: *"No, you were never taught, because the child automatically, naturally works is out. If we go to our class now, and we say, 'How did you get to it?', we will find three or four or five different ways of how they got to the answer" (PM 4/2). "They told us that you're not supposed to teach a child a method of doing things, because every child when they do maths find their own method of reaching the answer" (PM 18/2). "You only do that in the middle of the third term, you don't do it early, and even then, like you get like some children that are born mathematicians... the others that are never, it doesn't matter what you do, they're not ever going to like maths. As soon as they can drop it..." (PM 18/2). "You're going to find that the brighter ones, or the ones with the mathematical brain, they don't even, they can't even tell you how they know, but they just know the answer. Chiff-chaff like that (said with a hand clap). And they'll, I'm sure they were like three when they knew that answer, um, because it just comes naturally to them... Then we're going to find the other ones, they're going to be...and really think (pulls face)...and have to...(counts on fingers)" (PM 10/3). T1 was less vehement in her belief, but held a similar conviction by stating, "I'm sorry, my children are not born mathematicians. Can I just put it on record?" (PM 18/2) and by vocally agreeing with T4's views when expressed in the quotes above.*

However, a significant portion of the LS meetings was spent in debating the latter two schools of thought (method teaching versus problem-solving teaching) as being more pedagogically appropriate. Most of the teachers enjoyed exploring different methods of teaching through LS, but the question of practically blending a “method-teaching” approach with a “problem-solving” approach was a difficult one to resolve. The emergent demonstration lessons after the LS sessions blended these two approaches. The problem-solving approach was clearly a very new idea for the participating teachers. Nevertheless, it was regarded as an inspiring and valuable challenge.

#### **5.6.4.2 Method-teaching approach**

Evidence of how LS provoked thinking surrounding methods and the method-teaching approach can be seen in the following excerpt:

*(PM 10/3)*

*T4: Um, are you thinking that we should teach all these methods?*

*T7: I don't know T4.*

*T1: Yo - not in Grade 1. Not in Grade 1.*

*T4: Because, I just look at it and this will confuse a kid that possibly could get the answers right. He's going to just say, "Pff, I don't understand this".*

*T7: Ja, most probably. I can understand that. I am not telling, telling you what I want, at all. I'm just saying, "Have you ever thought about what you're doing when you're subtracting?"*

*T1: And different ways of doing it?*

This type of method-oriented discussion was commented on in the journals of the participants. T6 journaled, *"Today's session was once again an interesting one in the sense that I learned to look at the different methods, or rather the types of questions we ask, when we do subtraction...It made me stand back and rethink what I am doing in my own classroom. I realised that I need to separate the different 'methods' and work from the easiest (fly away) through part-whole (counting forward, backward, and inverse addition) working towards the more complex method (comparing)" (PJ 10/3).*

Similar ideas were expressed by T3, *"I am looking forward to this lesson and never realised how many methods there were for subtraction. Nobody ever taught me or told me what different methods there are"* (PJ 10/3), and by T2, *"I support the idea of children being taught a variety of methods, in order to give them tools to choose from, which they can grasp most easily"* (PJ 23/6).

#### **5.6.4.3 Problem-solving approach**

The final school of thought, that problem-solving was a new but exciting teaching approach, was regularly discussed in the LS sessions. Initially, it was met with a measure of scepticism, particularly by T4. *"In [my] class I sit with 26 different children, and if I'm one of those children and the teacher says, 'Here, solve that problem' (pulls a shocked and distraught face)... I suck! I have experienced that in a scrap-booking lesson...I mean for me as an adult to feel like that, then there are children in my class that feel like that...Maybe it's the way I was taught? Um, that maybe if I grew up with 'There's the problem, solve it!' I'd be more...I don't know?"* (PM 17/3). Through discussing and utilising problem-solving in the LS process, the teachers were willing to embrace it as an experimental and probable way of improving the independent thinking of their learners. Teachers began to consider that problem-solving could be developed and taught and is not a genetic predisposition. In debating the untapped potential of problem-solving, T2 stated, *"Is their IQ lower because they haven't been stimulated by us from a young age? And that they haven't actually needed to utilise their brains very much because everything has been supplied for them?"* (T2 in PM 17/3).

Problem-solving became a regular and provoking theme in the private journaling of the teachers after LS sessions. The self-reflections of T6 highlighted an awakening of the lack of problem-solving in her didactic approach. *"The other thing that I came to realise from the process is the shocking fact that we do not allow problem-solving in our Maths classes. We rather teach a method to get to the right answers quickly"* (PJ 17/3). T1 began to view traditional method-teaching in antithesis to problem-solving as an indoctrination that needed reviewing. *"But back to subtraction, and I found more interestingly, the problem-solving side of this. I see this from being deeply indoctrinated as a South African teacher and having the method way of teaching being the only one that you are exposed to. I don't think we have been exposed to enough*

*other ways of teaching and this is intimidating for us... We're too scared and don't trust that if we give our kiddies a situation, that they will indeed find a method and solution on their own, we need to work towards changing this mind-set, and this is the exciting part of this process" (PJ 17/3). T3 expressed initial misgivings regarding problem-solving, due to her default method-teaching approach. "When we started talking about problem-solving and the aim to be not teaching methods but teaching problem-solving, I really thought I had no idea what was going on or what to even do. I realise teaching a method is easier than asking a child what to do or what method they used to solve a problem especially with the little ones. It makes more sense to teach them different methods instead of letting them almost run free with it. It is harder for me to wrap my brain around problem-solving than teaching kids different methods to use" (T3 in PJ 17/3). LS inspired T5 to try out problem-solving, "This meeting has made me think about how I teach and that too often I give a method... I however want to try (in my own classroom) to use a more problem-solving approach in one or two lessons and see what the children come up with" (T5 in PJ 17/3).*

In the final research questionnaire (4 July), participants were asked if LS had altered their outlook towards the best pedagogical approach to teaching mathematics. The answers listed below provide evidence of a definite shift towards a problem-solving approach, albeit with a blend of method-teaching.

*T2: More emphasis on getting more methods from the children, instead of providing methods from the onset.*

*T3: I do believe children should be taught through problem-solving and be guided to develop their own methods, but also I feel that in some cases children should also be taught different methods where they might not develop it themselves... I do believe that through LS I have changed my mind and do think that teaching through problem-solving a child is able to figure out for themselves what works and what doesn't work for them instead of being taught one or maybe two ways that they might never be able to do or with struggle with forever. Through method teaching we limit children whereas through problem-solving a child is able to explore more for themselves and benefit more through this.*

*T4: I think I was at the perspective that [children are born mathematically inclined or they aren't] at one stage... thinking that some children will just never get it. I am now at the stage where I want to try problem-solving approaches in maths.*

*T5: I moved away from only focussing on method teaching and want to try incorporate some problem-solving lessons into my planning. I want to especially try problem-solving when I introduce new math concepts.*

*T6: The fact that I realised that we need to focus more on problem-solving and allowing the children to try to solve a problem in their own unique ways, was a wake-up call... The LS process exposed me to seeing the value of allowing the children to find solutions to problems and encouraging them to share how they came up with solutions.*

#### **5.6.4.4 Further self-reflections on pedagogical-content knowledge**

LS also provoked self-reflection on broad teaching approaches and a curiosity and willingness to try and adapt methods of teaching mathematics to find a more pedagogically appropriate fit. The process inspired deep contemplation and self-reflection in teachers regarding their general pedagogical content knowledge and didactic approaches. Teachers repetitively expressed how LS provoked these reflections for several days after the sessions. This is evident in these two sample quotes taken from the journals of T5 and T6. *“I am thinking more about maths outside of LS (when I am doing a maths lesson with the class and I see certain children struggling I am looking at what I am doing and how I can apply it or teach it in different ways. I am finding that solutions or other ways of teaching an area are coming to light during the lesson - I suddenly get aha moments and go with them)” (PJ of T5 11/2),* and *“I am also definitely thinking more about my own teaching. When I prepare myself to teach a particular concept, I am actively seeking different ways of teaching it. I also look for a variety of resources which others with more experience have designed, to gauge whether I am on the right track” (PJ of T6 14/2).*

#### **5.6.5 Thoughts on grouping learners**

Beyond these didactic debates, LS provoked a lot of thought and discussion regarding other practical lesson aspects. One of which was the best grouping possibilities for



teaching young students. The theme of grouping learners, for which purpose and the size of the groups, often emerged during the LS discussions, and provoked teachers to consider the classroom arrangements of their own classes. The advantages of group and paired work became apparent in the lesson planning, *“But it might be overwhelming for certain children, to do it individually, with everybody watching”* (T5 in PM 11/2) and *“Also they learn a lot from each other when they’re in groups of two or three”* (PM of T4 23/6). The grouping arrangement was enjoyed by visiting teachers, one of whom stated *“I loved the group work. The way, especially with the numbers, the number charts, they were helping each other, ‘This is the next number’, I loved that”* (PLD 3/3). The impact of grouping learners differently spilled over into T5’s classroom arrangement, *“Before, I was a bit hesitant to do work in pairs due to the noise level, but I found that (before social distancing) I was more successfully using work in pairs”* (Q 4/7).

#### **5.6.6 Working from known to unknown**

The need to work from known content to unknown content was a theme that was reiterated in the LS sessions. This did not emerge as an outcome of the LS process per se but seemed to be an inherent trait or pre-existing outlook that the teachers brought to the LS table and repetitively agreed on and reinforced amongst each other. T6 and T7 stated *“Do we want to first shake their memory, from Grade R, about what patterning is?”* *“Ja, re-visiting what they already know!”* (T6 and T7 in PM 11/2), which is reiterated by T3, T4 and T5 in other instances, *“Makes more sense to teach it that way to the little ones and just recap every time on the previous concept and connect them all at the end”* (T3 in PJ 10/3). *“I’d like to start with something that they know, because then they’ll be more free to take part in the lesson. Um. Otherwise, they’re just going to freeze up”* (PM 18/2). *“Start from known to unknown”* (PM 30/6) and *“I liked that we structured the lesson from known to unknown, easy to more difficult and that we went from concrete (using the board, and physical buttons) to abstract – if the buttons were ducks, how many legs etc.”* (T5 in Q 4/7).

#### **5.6.7 Giving clear instructions and considering the relationship between maths and language**

In discussing the pedagogically appropriate manner in which lessons could be presented to the learners, the need for clear and concise instructions became

apparent. This theme emerged as the teachers themselves grappled through giving each other instructions and the confusion that emerged when unclear instructions were given in the lesson planning meetings and presentation lessons themselves.

This need for giving clear instructions was further acknowledged in the post lesson discussion after the first demonstration lesson. One child was observed placing patterning variables from left to right instead of continuously around an egg box carton. Although the presenting teacher instructed the learners to ‘follow the arrows’ (drawn on the egg box), T6 commented that *“the numbers actually confused them (numbers drawn on the coloured discs being patterned in the egg boxes). Because there was a different instruction...”* (T6 in PLD 3/3), making it apparent that mixed instructions were confusing and more clear instructions were required for the young learners to successfully complete the required task. In the same demonstration lesson, several children also failed to grasp an instruction given as, ‘explain what is happening by counting the spaces’. Many proceeded to tally the open spaces in the pattern, rather than discover that the spacing was consistent and therefore an integral part of repeating the pattern. This was yet another example of poor teacher instruction-giving that became a point of discussion between research participants. Doctor DS (alias) who visited as the LS expert made the following observation on this point, *“Language has a way of interfering with mathematics, and I think there’s a lot written about that...eh, the idea of mentioning the word ‘empty’. Because when I look at this thing, the numbers are there, they are not empty. It’s just that we’re saying that in relation to the colours, but there are other numbers there, so one cannot say its empty. That is what actually confused them”* (PLD 3/3).

The need to use clear instructions as well as the fact that maths requires a careful consideration of language did impact the thinking of the research participants. T4 states *“I have learnt that it is very important to be precise, brief, clear etc.”* (Q 4/7), and T2 concurred *“This led me to another question I ask myself: does the success of the learner depend on their ability or the clarity of communication i.e., is this a Maths problem or language barrier?”* (PJ 17/3).

#### **5.6.8 Teaching tips**

Another spontaneous pedagogical knowledge outflow of the collaborative LS sessions was the abundant sharing of “teaching tips”. These ranged from ways of expressing a

problem attractively to children, to teaching hacks and sharing cute games successfully being used in participants' classes. An isolated example of such a tip was T3 explaining how using the school badge on the children's shirts was a perfect reference to helping them learn left to right reading and writing skills.

#### **5.6.9 Great expectations**

The LS sessions impacted the level at which demonstration lessons were pitched, provoking higher thinking and problem-solving skills and creating lessons that were quite challenging for the learners. An example of this was when T2 demonstrated a potential but particularly difficult patterning concept for a lesson, incorporating the spatial arrangement of manipulatives while patterning. This was met with enthusiasm and appreciation by participants T7: *"Clever girl!... You could do that if you wanted them to think a little bit deeper"* T1: *"That's a challenge" (said in a malevolent whisper) (PM 18/2)*. The high standard of lessons was noted by visiting teachers, *"I know you spoke about some of the things that you thought was too difficult, but I thought it was interesting that you also introduced that to them. Higher order questions to the children that needed a bit more (touches head to indicate thinking)..."**ek het dit hier geskryf" (I wrote it down here), to the stronger ones. You challenged the stronger ones..."*. Doctor DS (alias of visiting expert on LS) agreed with this assessment in his comment: *"That is what popped out for me. That actually at that level, they can do three things at once... And, the other thing, in terms of learners, seeing those boys and girls being able to create their own patterns, my word! And, and believe me this lesson was pitched at the very high level... To have two patterns under one roof. It can never be easy. Actually, at the beginning I was like I just want to see how these boys and girls are going to do it?" (PLD 3/3)*.

The aim towards teaching at a higher standard not only impacted the teaching level of the LS presentation lessons, but was an interesting outflow of the LS process, impacting the thinking and lesson preparation of some participants outside of the LS context. T2 described her awareness of this in her journal entry, *"Do our low expectations of children, prevent them from achieving more? Has our own narrow-minded education, limited our ability to expand children's minds? Is it possible to reboot our brains after so long? (PJ 17/3)*. T5 stated *"I think I am under-estimating our children a bit. It also comes from our society of spoon-feeding them" (Q 4/4), "I am*

*definitely expecting more from the children now... some of the content I teach is too basic or too fixed on a particular method” (Q 4/7). T3 and T6 concurred, “LS definitely impacted what I expect from myself as well as from the kids. I definitely do more research on topics I teach, I expect more from my children...” (T3 in Q 4/7) and “I am expecting more of myself after LS. If I manage to leave old ways behind and allowing the kids to explore different ways of doing Maths, I will expect more of them” (T6 in Q 4/7).*

It is interesting to note that the inspiration to teach at a higher level or to expect more from the children after the teachers participated in LS was not shared by the Grade R teachers, who felt that their curriculum was already aimed at a very high level, as noted in their comments, *“I felt that the content in my grade is unnecessarily complicated, when I see what is being built on it...I felt that I needed to ease the pressure I had been placing on myself and the children after LS” (T2 in Q 4/7) and “I think that we are pushing our little ones very hard... I think the preschool is underestimated...”(T1 in Q 4/7).*

#### **5.6.10 Movement in lessons**

The collaborative contribution of all of the teachers made the group more inclined to bring movement into the LS presentation lessons. This was recognised as a very successful aspect in one of the presentation lessons. In the first post lesson feedback session (3/3) I asked, “What was enjoyable about the lesson you observed?” A visiting teacher responded: *“The actions (referring to an activity requiring learners’ movement of the body). The actions were very clever. I think they all enjoyed that. That was very good!”*

The use of movement had an impact on one teacher’s approach to mathematics teaching outside of LS, as noted in her comment *“It has impacted my use of movement, as I have made use of songs and actions to teach doubles” (T3 in Q 4/7).*

### **5.7 IMPACT OF LESSON STUDY ON OTHER AREAS OF TEACHER LEARNING AND PROFESSIONAL DEVELOPMENT**

In the preceding discussion, the data suggests that LS had a noticeable impact on the content knowledge and pedagogical content knowledge of participating teachers. Additional general professional growth was further evident in the self-reflections of the

participants, who made comments about their perspectives *“being stretched”* (T1 in PM 11/2), their *“growing professionally”* (PJ of T6 11/2), having their *“eyes opened”* at the *“great learning curve and experience”* (PJ of T3 10/7) and expressing amazement at *“how much a person learns at these LS sessions!”* (PJ of T4 23/6).

Participants noticed growth in each other too, as seen in this comment made by T2, *“I’m impressed with your change in thinking, T5. I really am. It’s not condescending...I just see how, ja, just how you’ve changed and evolved...”* (PM 30/6).

### **5.7.1 Creative thought**

*“I was amazed at how many ideas came up and that we had a hard time selecting what we could do!”* (PJ of T5 30/6) Participation in LS was a stimulator of creative thinking in the participants. Participants were expected to present creative lesson ideas for the LS sessions, stimulating them to *“think a lot about the LS topic, to come up with creative ideas”* (PJ of T4 11/2) as well as creatively adapt each other’s ideas to design a collaborative product.

The creative ideas were celebrated and enjoyed during the LS sessions and were often regarded as a highlight of the process, as noted in comments like, *“I’m loving these ideas! Carry on!”* (T5 in PM 30/6), and *“I really enjoy the LS project and it has broadened my horizon and I realise that prep and sharing of ideas (new and old) stimulated my creativity...I have certainly become stimulated to try out new ideas and to reinvent the old ones”* (T4 in Q 4/4).

### **5.7.2 Thinking about mathematical concepts outside of sessions**

The process of professional growth was not limited to the time period of the planning sessions, demonstration lessons and post lesson discussions. These sessions became the seeding ground for in-depth thinking about teaching mathematical concepts in the days after the LS sessions. The journals of the participants are rife with examples of continued mathematical thinking, as seen in the following journal excerpts from T2, *“More thoughts like including directionality and objects from nature... have been occurring to me, so it has definitely stimulated more thought processes in me”* (PJ of T2 11/2) and *“Driving home, I was thinking of different comparison activities, which I would like to try for my own enrichment...”* (PJ of T2 17/3). T3 experienced similar lingering mathematical thoughts, claiming *“I do think*

*more about the ways I teach maths in non-LS times and try new things more with regards to teaching maths in my class” (PJ of T3 18/2), as did T6 in, “I am definitely thinking more about Maths, especially when I am preparing to teach new concepts” (PJ of T6 11/2) and T4 in “I think of the math more during non-LS time.”*

### **5.7.3 General self-reflection on teaching**

This self-reflection was not limited to mathematical concepts, but to teaching as a whole. LS provoked deep self-reflection regarding teaching, particularly in the Grade 2 teachers. T5 claimed *“I had never sat down and thought what type of teaching I do (block vs spiral) or how I work out a sum - so I am learning about my own teaching preference” (PJ of T5 4/2)*. She further explained how LS made her question her own lessons to determine *“how [to] change them to tap into the hidden strengths of children that traditional teaching methods do not uncover” (PJ of T5 3/3)*. The other Grade 2 teacher, T6, was provoked into thinking about the children’s learning processes too, in her comments, *“It made me think.... shouldn’t we maybe interfere less and let the children’s creativity take its course? Does everything a learner does ALWAYS have to be correct? Are we stifling learning because of our focus on being correct? Are we forgetting that learning is a PROCESS and not a steamrolling through heaps of content (CAPS!)? Are we overlooking UNDERSTANDING?” (PJ of T6 3/3)*. She also describes how *“I found once again that by questioning myself with regards to how I teach, I can focus more on the children’s understanding of the work rather than just flying through the syllabus and ‘training’ them to pass tests” (PJ of T6 23/6)*.

### **5.7.4 New classroom practices**

There were claims of these self-reflections and deep thought processes spilling over into new classroom practices, creating a potential evidential link between LS and improved teaching in the classroom. T5 explained how LS created what she dubbed *“aha moments”*, stimulating her to *“finding solutions and other ways of teaching...during [her] lesson[s]” (PJ of T5 11/2)*. She explained further how LS provoked her to *“try use different things in [her] own lessons (instead of always just using pictures and the white board or counters/ ice cream sticks)” (PJ of T5 10/3)*. LS impacted the preparatory work of T6 who claimed that since participating in the research, *“When I prepare myself to teach a particular concept, I am actively seeking different ways of teaching it. I also look for a variety of resources which others with*

*more experience have designed, to gauge whether I am on the right track” (PJ of T6 11/2).*

Similar changes were noted in T3 who attributed a more concrete approach in her teaching style to her participation in LS. *“My approach to maths teaching in the classroom has also definitely changed, as I am spending more time explaining concepts concretely than before... I have also noticed that I take a deeper look into the way I teach other subjects and not just maths” (Q 4/4).*

### **5.7.5 Self-confidence**

The research indicated that LS impacted the self-confidence of participating teachers. Confidence levels were enhanced through teacher participation in collaborative discussions and through their participation in, or observing of, demonstration lessons. This was a reciprocal process as through contributing, participants felt affirmed and in return, felt motivated to contribute further and attempt to implement new learning in classroom practices. *“I have more confidence in my ability to contribute to learner and teacher development. The knowledge that I faced my fears and pushed through...” (T2 in Q 4/4).* T5 explained how her confidence gradually grew as she *“shared [her] own ideas more” (T5 in Q 4/7).* She further explained how contributing allowed her to *“grow” and “trust [her] own ideas and instincts as a teacher.”* Before LS she *“would not always readily share them as [she didn’t] always believe in [her]self” (T5 in Q 4/7).* Her conclusion was, *“I think I am now overall less scared (and more confident) to try approach lessons in a new way and to try something new” (T5 in Q 4/4).* T3 was another participant who noted a general improvement in confidence, particularly after watching the demonstration lesson. *“I definitely will try more patterning in particular in my class and feel more confident in teaching it after today’s [demonstration] lesson” (PJ of T3 18/2).*

### **5.7.6 Learner-centeredness**

LS developed an awareness of learner-centred teaching rather than teacher-centred teaching. Topics were often discussed from the perspective of how the learners would enjoy them, how to best reach the learners and if an idea was appropriate for their level of understanding. *“[LS is] reminding me that our more traditional lessons do not allow the skills and strengths of each learner to necessarily emerge... Hence we need*

*to look at changing our lessons to make allowances for children who think differently to the norm” (PJ of T5 3/3). A similar idea was expressed by T6. “I think LS is a way of changing our focus from mere giving the children stuff to thinking about how we are going to present the work so that they understand” (T6 in Q 4/4).*

Lesson plans were adapted to the enjoyment and perceived capabilities of the learners, taking cognisance of their size, *“So you’re going to have to lower everything [for their height]?... That’s lovely. I like that” (T2 in PM 23/2)* and their interests, *“I liked the crayons [lesson idea]... because we deal with that daily (laughter). Daily. Something the kids can relate to (T4 in PM 23/3).*

### **5.7.7 Teaching for deeper understanding**

In addition to learner-centeredness, the data suggests that LS provoked discussion amongst the participating teachers on teaching for deeper understanding and meaning. One example of such a discussion was centred on bonds. The teachers argued that the teaching of bonds may be negatively impacting the understanding of the process of addition and subtraction, limiting their deeper understanding of *“what it means...” (T1 in PM 18/2)*. The topic of teaching addition and subtraction for deeper understanding was re-visited again in the journal of T5 where she expressed her hope that through teacher awareness and change wrought through LS, learners would *“be able to master and know bonds until 10 with better understanding too (and without needing fingers to do  $4 + 2$  for instance)” (PJ of T5 18/2).*

### **5.7.8 Use of resources in teaching**

LS inspired discussions on the type, size, colour and the use of a large variety of resources. Teachers felt challenged to think of novel, recyclable and attractive resources that would best serve the purpose of teaching mathematical concepts. In the first cycle, the teachers used discarded egg trays and pre-cut circular counters. They also used magnetised pictures, numbered discs of different colours and laminated sheets with 1-100 drawn on them. For the second lesson, they planned to use large-scale dice, a large, scaled box of crayons, and number cards with hidden flaps. The third lesson utilised socks, buttons, coloured shapes and ‘folded mystery boxes’ with sweets in them. A large portion of each cycle was dedicated to the discussion on these resources and their practicality. Resources were viewed as the



vehicles for introducing concepts in a concrete manner, before proceeding into more abstract thinking. Once again, the impact of using more creative resources was not only noticeable in the presentation lessons but in the thinking and implementing of new resources in class activities outside of the LS lessons. *“I have also started looking at more concrete ways in which to teach concepts... my approach to maths teaching in the classroom has also definitely changed, as I am spending more time explaining concepts concretely than before”* (T3 in Q 4/4). T5 commented, *“I have always used practical apparatuses in Maths but am looking at how to use those apparatuses in other ways too so that I can reach as many learners as possible”* (PJ 11/2), to which T6 added, *“I learned a lot about different types of apparatus we could use and it dawned on me that I normally do not put enough thought into ‘designing’ the things that I use in my class to bring a message across. I am definitely going to work on this!”* (PJ 17/3).

### **5.7.9 Learning through observation**

#### **5.7.9.1 Observing learners**

The LS demonstration lessons provided teachers with opportunities to observe learners while they were learning. Teachers were placed in situations where they could practice their observation skills and view learning from a new perspective. This was an enjoyable process for the participants. T7 described how *“I enjoyed it. I enjoyed watching the kids, I enjoyed their patterns coming out”* (PM 25/2). T5 *“really enjoyed being an observer and seeing how the children behaved and worked together. Usually as a teacher you don’t get to just observe. Your focus is different then as you are an ‘insider’ and are intent on helping your learners grasp the content. Now I saw things from a different perspective”* (PJ 3/3). T3 also commented, *“I also enjoy seeing how the children cope and experience this lesson as well as their behaviour during this time with having many other teachers watching them. I also enjoy seeing the children work and trying new things”* (Q 4/4).

Pertinent points of observation were made regarding the thinking of learners, particularly the learners who behaved differently from the norm. There was occasionally the reward and excitement of seeing a learner who would normally not respond well to mathematics, contributing and participating in the lesson with comprehension, or the teacher’s disappointment of seeing a learner struggle.

*(PLD 3/3)*

*T7: Did anybody watch Abraham (alias)?*

*(Unanimous “yes” from LS teachers)*

*T7: He could do it! Did you notice that...*

*T2: Yes, yes, yes!*

*(PLD 10/7)*

*T1: Waldo (alias) was nearly in tears because he couldn't get the baggie open!*

#### **5.7.9.2 Impact of observing teachers**

Through practicing observation in the LS process, teachers had the opportunity to learn from the teaching styles of the teachers in the demonstration lessons. By observing a colleague teaching, participants noted certain teaching habits that they expressed an interest in emulating or avoiding. This was deliberately not explored as a topic in the post-lesson feedback sessions to protect the dignity of the presenting teacher but was nevertheless evidenced in the private feedback of the research participants. The following four quotes are in response to the questionnaire 4/7, in answer to my question “What was learned through observing another teacher?”

*T2: Maybe to avoid staying too long on one activity...*

*T3: The use of praise is also important as well as correcting where they might have gone wrong... I would avoid lingering on a specific activity for too long... it is okay to adapt the lesson plan according to the needs of the children and time.*

*T5: I also liked how T4 foot-tapped them to congratulate them instead of high fives (due to COVID-19) and I will be doing that.*

*T6: What stood out in both these lessons was the praise given to the children on an ongoing basis. I could do more of that.*

### 5.7.10 Provocation to self-study

Involvement in the study, particularly from the second cycle onwards, provoked the participants to conduct their own research. This was often instigated by the need to present ideas on a particular topic at my request (as the facilitator), or to search for activity ideas for an upcoming session. Teachers resourced “YouTube videos” (T5 in PM 17/3), “Google” (T3 in PM 17/3), other online videos (PJ of T6 17/3) and “Pinterest” (T4 in PM 30/6). I as the facilitator presented academic articles twice for discussion. T4 regularly expressed amazement at the number of resources that were available to teachers online, implying that this was an exciting new venture for her.

### 5.7.11 Teacher perceptions on lesson study as a professional development tool

Although the study provided objective evidence of the professional development of the participants, the teachers themselves were given the opportunity to provide their subjective opinions on the impact of LS as a professional development tool, particularly in the context of its comparative value to other forms of professional development. This data was collected in the final research questionnaire (4/7). All of the participants felt that LS was more beneficial than previous professional development courses that they had attended. T2 was impressed with the “*practical ideas and teacher input (unlike a 1-hour course lecture where you mostly switch off, when nothing is really required from you)*”. T1 felt it benefited her by requiring “*FAR more interaction and [being] personalised, not just sitting in a lecture that is so general.*” She also mentioned the advantage of being “*far more personally invested in the input and outcome of this exercise*”. The personal investment notion was confirmed by T5, “*with LS because you are actively involved in the process and more emotionally drawn to it (because of the work you put into it), you internalise and remember what is discussed a lot more.*” T3 also felt that the benefit of LS as PD tool lay in that it provided “*more practical work that I can use in my class, compared to workshops or courses that I have attended, listened to a lecture and walked out with no practical knowledge or knowhow to take into my class and use again.*” T5’s knowledge base was expanded more through LS than workshops because “*It becomes part of your easily accessible knowledge and you don’t have to recap it. You will be in a lesson and suddenly remember an idea or a way of doing something and hence implement it*”

– *this is why I was doing more work in groups in class. I find I retained a lot more information than I did in other courses.*”

### **5.7.12 Predisposition towards change**

In the discussion on the impact of LS on the professional development of the early grade teachers, mention should be made of the evidence demonstrating that the participating teachers were reasonably open and willing to change during the process. T4, the oldest and most experienced participant was recorded saying “*We can only try! We can only try*” (PM 4/2) and expressing her willingness to remove all her classroom furniture for a demonstration lesson so children could sit on the floor (an unprecedented event in the history of her teaching at the school). T3 also admitted her personal openness, excitement and willingness to “*change [the] syllabus around to what suits us best*” (PJ of T3 4/2). This openness and willingness to change could be attributed to an atmosphere of collaborative consensus rather than prescriptive enforcement, as explained by T2, “*I have enjoyed the guided academic discussions, which I feel have more chance of inspiring an intrinsic willingness to change and try new things, from a place of empathy, than being forced to adopt other approaches from an outside authority, as I experienced in the government system*” (Q 4/4).

## **5.8 AFFECTIVE AND PHYSICAL IMPACT OF LESSON STUDY ON PARTICIPANTS**

This study had an emotional impact on participants, both positively and negatively, as well as an impact on their physical energy levels.

### **5.8.1 Negative impacts**

The initial expectations for change and growth were sometimes met with disillusionment and in one particular participant’s case, occasional boredom. T2 states her boredom on three separate occasions. “*Although the first part of planning the syllabus was a bit boring to me, I did appreciate having the lessons put in context for me*” (PJ of T2 11/2), “*I’m actually getting bored*” (PM 18/2) and “*I battled with the irritation of spending lengthy periods of time discussing what I wasn’t interested in*” (T2 in Q 4/7).

General disillusionment was also noted after the last presentation lesson, in which the expected lesson goals were not completely met. T2 described how she was “*just so*

*disappointed*” (PJ 11/7). T1 and T3 euphemised their disappointment as *“It just didn’t run like I thought in my head that it would...”* (PJ of T1 11/7) and *“I don’t think the goal of the lesson was really met as hoped by everyone, but so we learn”* (PJ of T3 11/7).

#### **5.8.1.1 Stressors**

Negative emotions were repeatedly expressed by T2 in the research. Upon further analysis, this can be attributed to two particular factors, namely a mismatching of lesson goals (to be discussed under goal setting section 5.12.1.) and the difference of teaching objectives between Grade R and Grade 1 teachers (discussed under the impact on pedagogical content knowledge section 5.6.1.). Her negative emotions were particularly evident in her description of having *“chest pains”* from being *“so angry”* (recorded in a private conversation after the PM 4/2 when the recording devices remained running. Permission was obtained from T2 for using the transcripts in the research). In my own research memos, I record several instances where T2 exhibited negative body language in the sessions. These observations were followed by journal entries from T2 that elucidated her thinking and the stressors causing her to experience and demonstrate these negative emotions. *“Today’s LS felt mostly like a waste of time. After thinking that we had a lesson strategy in place i.e. problem-solving by completing a familiar shape/colour pattern, as an introduction, and then building on that to progress to number patterns, it was like no discussion had taken place”* (PJ of T2 18/2) and *“after the previous week, my frustration level was so high, that I wanted to quit the group, due to a lack of progress in my opinion”* (PJ of T2 25/2). As the stressors became less provoking in cycle 2 and 3, T2’s negative responses decreased both during the sessions and in her private journaling.

#### **5.8.1.2 Exhaustion**

The LS process demanded long periods of participation and concentration in collaborative meetings. This often left participants feeling exhausted and drained during and after the sessions. The majority of the participants, on separate occasions, mentioned their tiredness and the physical drain of the LS process. *“My dislike of the process is how draining it is (I am exhausted at the end of it and then have to still do the everyday things - homework, looking after baby etc). I would find this a difficult thing to do all the time due to time constraints and life pressures”* (PJ of T5 4/2). T1 and T3 also admitted, *“I have found today to be probably the most draining session of*

*all, my brain is absolutely fried, to the point where I don't actually think I contributed much at all in terms of meaningful content" (PJ of T1 18/2) and "Putting the lesson together and deciding what activities to do and how long as well as the making of apparatus sometimes felt very long and draining" (T3 in Q 4/7).*

#### **5.8.1.3 Fear of participation**

An emotion that became very apparent through the research was that of fear. Teachers expressed their fear when it came to participating in the actual sessions for two particular reasons, the first being a fear attributable to feelings of personal inadequacy and secondly, the fear of speaking in front of others in the planning meetings while being unprepared. These feelings of personal inadequacy can be attributed to feeling worried about *"not being able to contribute something worthwhile to the group"* (T3 in II 28/1) or having ideas that *"didn't meet the criteria"* (PJ of T2 17/3). T2, T5 and T3 expressed fear and embarrassment when being put on the spot in planning sessions to give feedback as they could possibly *"answer wrong"* or not know *"what to say"* (T3 in Q 4/4, PJ of T2 4/2 and PJ of T5 11/2). Furthermore, participants expressed fear and concern over *"not know[ing] enough to participate"* or thinking that *"others might think that"* (PJ of T3 11/2).

#### **5.8.1.4 Fear of presentation**

Even though steps were taken to alleviate the stress-provoking factors associated with presenting, fear was also repeatedly expressed at the idea of presenting a lesson in front of other teachers. The steps that were adhered to, to help alleviate some of this anxiety, included creating consensus amongst collaborators to stake ownership of the lesson, followed by providing the presenting teacher with a clear collaboratively constructed lesson plan. Observing teachers were given clear directions when observing and were instructed to focus their attention on the learning process and not on the presenting teacher. The presenting teacher was given an opportunity to open the floor herself for post-lesson discussion, thereby giving her the opportunity to broach any noticeable shortfalls before they could be publicly addressed by others.

In spite of this concerted effort, presenter stress and fear of presenting remained a demotivator and topic of concern between participants throughout the study. In her journal, T2 mentioned that she volunteered, *"In all honesty, not because I'm a hero,*

*but because I am afraid. I would prefer not to have a previous lesson to be compared to and to teach concepts I am currently dealing with...* (PJ of T2 11/2). Her fear was also expressed in the post lesson discussion in which she describes how she *“did have to take nausea pills this morning, okay.”* (PLD 3/3). T4 did not volunteer to present the last demonstration lesson but was asked by myself to do so. She experienced the same fear as T2 as described in her words, *“I was not confident that I could do it, as I thought that perhaps other teachers will look at it as a crit’ lesson”* (PJ of T4 7/7). This was a noteworthy comment, as she had the most teaching experience out of all the participants, and still experienced acute presentation fear, echoed further in her words, *“The presentation was stressful to me with so many teachers present. I found that as soon as I looked at the teachers, my mind would go blank!”* (PJ of T4 10/7).

This fear seemed to be inherent in most participants, even when they did not present during the research. This was evident in statements like *“Even though I know that we all come up with a lesson and just one teacher presents all our ideas, I am still too scared to actually present a lesson (I don’t even like a student teacher or fellow teacher in my class as it makes me nervous – fear of being judged) ... I would not enjoy presenting the lesson – would be very hard on myself and very nervous... I still would not want the pressure of being the one doing the actual presentation”* (T5 in Q 4/4), *“It scares me a bit to think that I might have to present a lesson, because I cannot stick to a script”* (T6 in Q 4/4) and *“I do not enjoy getting up and teaching a lesson in front of other teachers... be it from the same school or other schools. I find it intimidating and it is not really in my personality”* (T3 in Q 4/4).

## **5.8.2 Positive impacts**

Although the LS process impacted participants negatively in their experiences of boredom, exhaustion, inadequacy and fear, evidence suggests that LS also had the capacity to produce positive emotions and responses in participants. One such emotion was enthusiasm.

### **5.8.2.1 Enthusiasm**

The participating teachers demonstrated enthusiasm in or after each session of LS, with ample evidence of this in their journaling, providing comments like *“I’m excited for the next one!”* (PJ of T1 3/3), *“Wow! What an experience!... Overall, it was an excellent*

*learning experience for me and I am grateful to be part of it” (PJ of T6 3/3), “Keen to experience the unfolding of the lesson!” (PJ of T4 10/3) and “I am excited to continue this and do more and have more fun with Maths in the future!” (PJ of T3 10/7)*

#### **5.8.2.2 Curiosity**

LS also provoked the positive emotion of curiosity. T5 was curious *“to see the lesson... to see the final lesson...and the final brainstorming session of constructing the lesson...”* and also to witness the impact that LS would potentially have on the children she would teach the following year (PJ of T5 18/2). T1 expressed curiosity at attempting LS later on in the year to determine the *“success rate”* it would have (PJ of T1 25/2). T4 expressed curiosity at which method children would naturally select in problem-solving, believing that those results *“would be very interesting”* for her (PM 23/6). Ultimately, LS had the emotional impact of making the teachers *“curious to find different ways to do [their] work”* (T6 in Q 4/7).

#### **5.8.2.3 Enjoyment**

Most of the participants regularly referred to their enjoyment of the LS process and the fun that they were having in spite of the emotional and physical strain required. T1 expressed this in her statement, *“Building a lesson together today, I thoroughly enjoyed”* (PJ of T1 11/2), the sentiments of which were concurred in the statements of T5, *“I am enjoying the LS. I particularly enjoyed doing the patterns so I could visually see and apply it”* (PJ 18/2), T4, *“I truly love the concept of LS! (It is like having a daily bath! You feel clean, refreshed and eager to go!)”* (Q 4/4) and T3, *“I really enjoyed yesterday's LS”* (PJ 23/6).

The LS sessions themselves often had moments of fun and participants were regularly laughing and bantering. This was appreciated by the teachers and T5 explained, *“I like that we laugh in the LS meetings and can be ourselves too”* (Q 4/4).

Herewith some excerpts transcribing these light-hearted conversations:

*(PM 18/2 – teachers are making patterns using buttons, straws and other bric-a-brac)*

*T3: (Looking at T7's) I've spaced mine out.*



*T7: I've put down (counts) 12.*

*T2: You were supposed to have put down 9!*

*T7: Well, I'm a special child*

*T1: Overachiever!*

*(Laughter)*

*(PM 23/6)*

*T7: "Switcheroo" sounds nicer than "the associative property of addition"*

*(Laughter all around)*

*(PM 30/6)*

*T4: Okay. Then this is a round circle*

*T6: I'll bring a square one, tomorrow. Or a triangular circle?*

*(Laughter)*

#### **5.8.2.4 Feeling motivated**

Except for sporadic cases of disillusionment, particularly evident in the initial stages of the first cycle and the conclusion of the last cycle, feelings of motivation were a more dominant outflow of the LS process. T6 describes how LS made her motivation levels "*super charged*" (Q 4/4), an outflow shared by most participants in their journaling with comments like "*last week's session had me excited and motivated*" (PJ of T2 4/2) and "*suddenly a person feels keen to try out forgotten strategies!*" (PJ of T4 23/6). T3 stated how LS impacted her motivation to teach, search and experiment, as expressed in her comment, "*Before we started the research, I was not specifically very motivated in teaching maths as I didn't have a clear idea or guideline as to what I was doing. Since doing the research where we have unpacked specifically the Grade 1 syllabus and certain concepts and done more research, I feel more motivated to teach mathematics.*"

*I am more motivated to search and experiment and read up about concepts and mathematical content than before and I am enjoying it more” (Q 4/4).*

### **5.8.3 Motivation to continue with the study**

Although the participants exhibited some misgivings at the onset of the study, they all remained committed to process right through to its conclusion. Reasons given for this were, once again, diverse.

#### **5.8.3.1 Personal growth**

Some of the participants valued the personal growth experience of participating in the research. T3 acknowledged that LS developed her in the *“experience [she] gained from other colleagues”* and *“the way [her] views and teaching changed”* which motivated her to continue (Q 4/7). T5 also wanted to continue through the research, *“because I was growing as a teacher and learning a lot... It also made me evaluate my own teaching and introspect (which is where growth happens) ... I learnt a lot more than I thought I would and my motivation increased as the lessons and meetings progressed”* (Q 4/7). Teachers were also motivated to continue through the personal reward of engaging in *“something new”* (T1 in Q4/7).

#### **5.8.3.2 Positive affective experience**

The sheer enjoyment of the process was a motivator for two participants. T3 expressed her excitement with the process and how she wanted to *“do more and have more fun with Maths in the future!”* (PJ 10/7), and T4 explained how she chose to complete the research *“as I really enjoyed it!”* (Q 4/7).

#### **5.8.3.3 Curiosity**

Three participants expressed curiosity as a motivator for their tenacity. When asked what motivated her to continue in questionnaire 4/7, T2 listed *“my curiosity as to whether any impact was being made...”*. Similarly, in answering the same question, T4 was motivated by *“curiosity and fear of missing out...”*

#### **5.8.3.4 Benefits of collaboration**

The value of collaboration was noted as a motivator by T1. She appreciated *“an opportunity for my colleague and I to get more on the same page with certain things”* (Q 4/7).

#### **5.8.3.5 Seeing the product**

The lessons themselves became a motivator for T5, who described how *“motivation also increased in each cycle”* as she and her colleagues felt a sense of *“responsibility and ownership over the lesson”* (Q 4/7).

#### **5.8.3.6 Personal ethic and desire to make a difference**

The last contributing factor for participants to complete the research was T2’s *“self-respect and commitment ethic”* and a more global desire to contribute *“towards a positive change in education”* (Q 4/7).

### **5.9 THE IMPACT OF LESSON STUDY ON INTER-GRADE COOPERATION AND RELATIONSHIPS**

LS provided a platform for collaboration between grades within the school. This was a novel experience for most of the participants. The process was not without its rewards or conflicts.

#### **5.9.1 Evidence of poor inter-grade knowledge of teachers**

This case study highlighted that the teachers lacked knowledge about the content covered in the grades succeeding or preceding theirs’. Several discussions commenced during the sessions in which teachers were *“fascinate[d] about how little one phase knows about what happens before or after their particular grade”* (PJ of T1 18/2).

The teachers admitted at the onset that they did not know *“to what extent they go deeper into stuff”* (T6 in II 28/1) from one grade to the next, and that they were not *“fully aware”* (T4 in II 28/1) of how far the preceding grades delved into topics in their curriculums. Some admitted to knowing *“absolutely nothing about what was taught in those grades and it's not through anyone's fault.... Just a general ignorance that is probably school wide...”* (PJ of T1 11/2)

The Grade R teachers were particularly fascinated about *“how little one phase knows about what happens before or after their particular grade”* (PJ of T1 18/2) and were also *“surprised to find out that the other grades weren't achieving more with their kids, when they have such a good grounding... some teachers didn't know as much as I thought they would”* (T2 in Q 4/4). It became apparent that the higher grades were

often ignorant of the extent that mathematics was being covered in Grade R. An example of this was a discussion on skip counting. The teachers realised that the Grade 1 learners had not done counting in 3s as a part of their syllabus, but the Grade R's had already done so, albeit informally with physical movement (PM 7/7).

### **5.9.2 Poor consecutive construction and flow of knowledge between grades**

In addition to highlighting the ignorance of the teachers with regards to each preceding or succeeding grade's syllabus, the study created a realisation that content is often repeated by teachers from grade to grade. It was discussed that this does not always facilitate the best learning for children, who by being exposed to the basics repeatedly do not gain extensive depth in their understanding from one grade to the next, as noted by T6 in, *"We know that whatever they learn in Grade 1 they learn in Grade 7 as well"* (II 28/1). For example, when it came to examining the topic "shapes" and their depth the curriculum and how the same aspects get repeated each year, T5 complained *"Ja, we're the same (covering the same content in Grade 2). We don't explain further."* (PM 4/2)

The reason for the repetition of similar content from one grade to the next was also attributed to the learners' inability to retain information between the grades. This was a regular complaint, where teachers made comments like, *"You wouldn't say they learnt all [this] maths in Grade R"* (T4 in PM 10/3) and *"They've forgotten it all over December ..."* (T1 in PM 10/3). T4 concluded that learners *"need lots of repetition of new/ same concepts year after year!"* (T4 in Q 4/4)

### **5.9.3 Feelings of disrespect between teachers of different grades**

The poor understanding between the grades regarding the mathematics content covered, occasionally resulted in feelings of disrespect and frustration. T2, a Grade R teacher, believed that there was an unacknowledged imbalance of work expectations between Grade R and Grade 1. She complained about the mathematics work in Grade R being *"too much and too fast and lots too difficult, but Grade 1 too little, too slow, too easy"* (T2 in Q 4/4) resulting in *"little expected of our kiddies coming from pre-school"* making teachers underestimate *"what our kiddies can actually do"* (PJ of T1 25/2). Subsequently, both Grade R teachers felt disrespected in their professional capacity mostly because the Grade 1 teachers did not acknowledge the amount that

was being accomplished in Grade R. Both Grade R participants described the other teachers' attitudes as "*condescending*" towards them (T1 in Q 4/4 and T2 in Q 4/7) as well as feeling that they were underestimated professionally (T1 in Q 4/7). T1 voiced her perceptions by stating, "*I feel that we are seen as being of lesser intelligence and less capable of coping with older kids, so we took the easier way out. Schooling has changed since years ago when kiddies were arriving at school raw and not being exposed to a teacher and formal environment, we have definitely moved on from there. [LS] is the perfect forum for other staff to realise what we do and how much we do, that it is not just playing*" (Q 4/4).

Although the Grade R teachers felt disrespected, there was no evidence in the data suggesting that the higher-grade teachers were cognisant of or agreed with their perception. T2 (a Grade R teacher) did, however, acknowledge that participating in LS had the potential to improve perceived disrespectful relationships. "*Despite numerous frustrations, I feel that it improved my relationship with some other teachers in the group, as more communication takes place than previously. Maybe that I am seen as a person instead of a nursery rhyme moron*" (T2 in Q 4/4). The Grade 1 and 2 teachers also acknowledged an improvement in their respect for other grade teachers through participating in the study, even without acknowledging an awareness of the abovementioned undercurrent problem to begin with. T3 stated, "*LS has definitely created new feelings of respect for the teachers from the other grades in seeing what they teach and how they teach... LS has given me more feelings of respect knowing that they work just as hard or even harder to teach their content even from a young age such as grade R even without worksheets*" (Q 4/7). T5 and T6 concurred with her assessment in, "*I have more respect for the colleagues of other grades and find that we are communicating more outside of LS. I am amazed at how much they cover in Grade R*" (T5 in Q 4/7) and "*The LS process afforded me the opportunity to hear what the other grades are doing before their children get to my class. I gained a lot of respect for some of my colleagues because of their experience and creativity*" (T6 in Q 4/7).

#### **5.9.4 Lesson study's impact on intergrade cooperation**

Despite the above-mentioned initial deficits in intergrade cooperation, the data provided examples of LS's ability to bridge knowledge gaps between grades and improve intergrade awareness regarding curriculum flow. Sessions were punctuated

with comments like *“So they’ve been introduced [to this concept] when they come to us?”* (T6 in PM 11/2), *“We’ll do half, third, quarter”* (T4 in PM 11/2 referring to a discussion on which grade introduces fractions) and *“No, leave that to us!”* (Grade 2 teachers discussing the correct stage for introducing the multiplication symbol) (T6 in PM 23/6).

This inter-grade bridging outcome of LS was noted and deeply valued by the teachers. T1 commented *“I think that LS between phases has been very useful, seeing what comes before and after you, [discussing aspects with those who] have had your kiddies for a year, has been the most beneficial part of this process for me”* (Q 4/4). T3 and T5 used very similar words in their journals describing their enjoyment of the intergrade cooperation through LS. Both teachers *“like[d] the sharing”* aspect, and commented that LS gave them this opportunity, *“which is not often possible to do”* (PJs of T3 and T5 4/2). The Grade 2 teachers were particularly intrigued with the preceding grades’ curriculums and the flow from these grades into theirs. *“I wasn’t too sure of the math they did in the preschool – even though my son went through it and I had the syllabus of Grade R math. It was the practical applications I was unfamiliar with and how all the math games worked. In listening to the preschool teachers, it has been interesting to see how they go about doing the math games. So, I am now more aware of everything they do. It has also been fun to see some of the games put into practice... It has also been great to plan the grade 1 math content and what will be covered in each week. This will help me in Grade 2 as I will know what they have covered before and what will be new to them”* (T5 in Q 4/4) and *“[LS] helped me a lot to have heard what the grades before me are teaching. I now understand better what foundations they are laying for the concepts they are teaching”* (T6 in Q 4/7).

Therefore, the evidence suggests that LS created a potential platform for building respect through collaboration and bridging knowledge gaps between grades. Teachers lauded LS as an effective tool for improving inter-grade knowledge and understanding.

## **5.10 THE IMPACT OF LESSON STUDY ON COLLABORATION BETWEEN THE TEACHERS**

### **5.10.1 Pre-existing need for collaboration**

The teachers acknowledged the need for an improvement in collaboration between themselves at the school. This excerpt describes their longing for a collaborative space to discuss matters like classroom experiences or curriculum flow.

*(II 28/1)*

*T6: But it would be, professionally in school, it would actually be nice to have more structured ummm...*

*T1: This! (indicating the group)*

*T6: Ja. This kind of thing. But a little more structured and regular. Just to be able to say, "Jong, I had a success this week with so-and-so. I did this differently", or whatever.*

T5 described how, prior to LS, she experienced non-collaboration and *"a selfishness amongst the teachers"* (Q 4/4). She used the example of how she found her colleagues unwilling to share resources and quoted an instance when a teacher would not allow her to photocopy a worksheet, because the experienced teacher felt she ought not to share something that had taken her years to perfect. This non-collaborative attitude was also commented on by T3 who stated, *"I feel we as teachers often like to keep things and lessons to ourselves or often don't have any new and fresh ideas for lessons and teaching..."* (Q 4/4)

### **5.10.2 Enjoyment of collaboration**

LS opened the door for numerous collaborative conversation between teachers. Even with occasional interpersonal conflicts, this collaborative process was viewed as a highly enjoyable experience. *"I enjoy how the teachers are keen to share about how they teach a certain concept! Love it! That is how we learn"* (PJ of T4 4/2). The enjoyment thereof was attributed to garnering new learning through *"sharing our different ideas and knowledge and experience"* (PJ of T3 4/2). T3 commented how the differences between the teachers, particularly with regards to their diverse personalities allowed the collaboration process to be *"more enjoyable and interesting"*

(PJ 25/2). The teachers “love[d] the sharing of ideas, various interpretations of examples etc.” (PJ of T4 30/6), particularly as the collaborative process contributed “towards a shared goal” (PJ of T5 17/3).

### **5.10.3 Learning through collaboration**

In addition to the sheer enjoyment of the collaboration process, the teachers were positively impacted by the “wealth of knowledge” (PJ of T5 17/3) that they could tap into through sharing. For example, in the first cycle, when the topic of patterning was thoroughly explored, teachers were intrigued at the collaborative knowledge they gained from each other in this hitherto unspoken about topic. “I liked learning something new and different way of teaching patterning with the help of collaborating with the other teachers from the different grades. It gave me a lot of insight and guidance” (PJ of T3 18/2). The second cycle hinged on the topic of subtraction, and the teachers particularly enjoyed the teaching ideas that were brought to the table. “I enjoyed today’s session, as a collaboration of ideas with everybody having something to contribute. I like getting new ideas to try and apply” (PJ of T2 17/3). Teachers commented how collaboration had “a lot of value [which LS] highlighted tremendously” (T6 Q 4/7).

## **5.11 THE IMPACT OF LESSON STUDY ON CURRICULUM DEVELOPMENT IN THE EARLY GRADES**

### **5.11.1 Curriculum flow within the grade**

The LS process extended the research participants’ opportunities to examine the Grade 1 curriculum as a whole and how various parts fit within that whole. They discussed the flow between parts of the curriculum and a reasonable time frame to allocate to each part. This process was quite time-consuming as each topic was discussed before determining a reasonable number of units to be allocated to each topic. There were also extensive discussions around the logical order of presenting these topics. The following excerpt illustrates this process:

(PM 18/2)

*T6: Addition and subtraction, um, is the basis of bonds. It’s what goes together to make a 10 or what do you take away, and what’s left over. So, it makes sense to me to have addition and subtraction...*



T7: First

T6: First. Before bonds. And it's, it's actually a way of teaching bonds.

The conclusion of these discussions was a skeletal curriculum plan that had the dual purpose of providing general curriculum clarity for the Grade 1 teachers and grounding the LS demonstration lessons as a progressive part of the year plan. T3 expressed her appreciation in a questionnaire, *“since we have changed and discussed specifically the Grade 1 syllabus, it now makes more sense to me and I feel that I have a better understanding of which concepts are to be taught together, which concepts automatically intertwine and which concepts need to be taught separately and with more detail”* (T3 in Q 4/4).

### **5.11.2 Curriculum flow across the grades**

This study also lent itself to a greater awareness of intergrade connectivity and flow in curriculum planning. This was discussed under the section “LS’s impact on inter-grade cooperation” (Section 5.9.4).

### **5.11.3 Spiral versus block approach**

The challenge of presenting mathematical concepts in a spiral curriculum or in a block curriculum was rigorously debated. The conclusion in this study was that certain concepts were better taught in a block approach and others needed re-visiting throughout the year in a spiral approach. Some teachers were initially opposed to a spiral approach altogether, believing it to compromise the teacher’s ability to teach in depth. *“When you’re trying to think of a little bit of this, a little bit of this, a little bit of this, it feels as if there’s no depth. There’s no (pause), you don’t take the child by the hand and lead him. You flutter. And that’s what I feel about the ‘touch here, touch there’. We must go more into understanding...”* (T6 in PM 4/2). However, consensus was reached that while certain topics should be taught over long, unbroken periods, others could be split up into smaller units e.g. *“What about blocking...doing four now and four later on?... Then you divide it into two blocks...”* (T1 in PM 11/2) and *“I’d like to do doubling, and then do something else and then do halving”* (T4 PM 11/2).

## 5.12 CHALLENGES RELATED TO THE FIRST TIME IMPLEMENTATION OF LESSON STUDY

### 5.12.1 Goal setting

In this case study, the challenge of thorough goal setting became apparent in the first LS cycle. Despite of participants having a theoretical understanding of the components of LS, the goal setting process was not executed definitively and clearly at the onset. The discussions around goal setting were not conclusive and the outcome was random experimentation with patterning ideas through the first month of meetings. This problem could be attributed to factors like incompetence on the part of myself as facilitator in knowing how to narrow down a specific goal for the lesson, or to the lack of concept knowledge of the teachers prior to their attempts at goal-setting, which clearly made specific and clear goal setting difficult to accomplish in the first cycle. This flawed process was characterised by shifting goals throughout the first LS cycle. The first goal suggested on the selected topic was *“They must be able to recognise a pattern”* (T2 in PM 11/2). This was quickly followed up with a second goal of *“Explain, how did you get to that? What showed you that this is the pattern?”* (T6 in PM 11/2). These two original goals were shortly followed by a third possible goal of creating free patterns through *“mak[ing] your own pattern...”* (T2 in PM 11/2) and then a fourth option of *“asking them to apply the rules”* (T7 in PM 11/2). The teachers did not stop to closely examine or appropriately phrase any of these four goals for clarity, before continuing with the lesson plan. Their main concern appeared to be focussing on lesson activities rather than a consensus about the lesson outcome.

Once several initial lesson activities were proposed and the teachers enthusiastically agreed on some of them, a fifth goal of *“patterning with numbers”* (T7 in PM 11/2) was introduced. However, throughout the session, it became apparent that the focus of the process was creating a collection of activities around a topic, rather than selecting an activity that would appropriately teach an outcome or goal. The result was a blend of eclectic patterning ideas touching on all of the preceding goals mentioned. *“If we get through those three or four [activities], we’ve achieved our goal”* (T1 in PM 11/2).

Near the conclusion of the second session, a sixth goal was presented by T4, namely to be aware of patterns in nature. This was not agreed on by all the participants as it was felt that this type of patterning was not conducive to increasing mathematical

understanding appropriate for this age group. The final outcome of this session was a collection of patterning activities, but with no clear, single goal to focus the lesson. In the week following this session, “conversations around the staff room coffee pot” indicated that the Grade 1 and 2 teachers were unfamiliar with certain patterning methods e.g., patterning on multiple levels, looped versus non-looped patterning, increasing and decreasing patterning etc. In the light of this, I, as a facilitator, felt it necessary to first conceptually explore these different ideas with the teachers in the succeeding session, before continuing with the lesson plan. However, even before this could be accomplished, at the onset of the succeeding session, a seventh goal was presented by T4, who wanted children to learn the vocabulary of patterning. *“For the lesson, for us now... I came across a very interesting little thing that was there, and for patterning, they’ve actually got vocab... Then I thought for an introduction it would be very nice to teach this vocab to the children, with the definition” (18/2).* After a discussion on patterning vocabulary, much of this session was spent on exploring patterning ideas, using a variety of resources. As this unfolded, patterning on different levels emerged as yet another goal. Through this session, a diversion of two specific LS goals emerged between me as a facilitator and T2. For the sake of developing the conceptual knowledge of the teachers I began focusing on exploring the reasoning behind patterning on different levels and with different variables (disregarding the various elements that could be used) in order to discover a cohesive lesson goal, while T2 was focussed on the previously mentioned lesson goal of increasing the children’s understanding of number patterning (with the specific element of numbers). *“To me then, the ultimate aim is for them to be able to do the patterning with, with the numbers” (T2 in PM 18/2).*

At the conclusion of the session, there was still no consensus on the clear or specific lesson goal. The lesson activities that were collaboratively decided on in the preceding week were then re-visited in detail, before exploring patterning with numbers (T2’s goal). Due to time restraints, T2’s preferred goal of number patterning was ignored for the present, leading to T2 vocalising her feelings of boredom and frustration. The session ended before T2’s goal of number patterning was fully explored. *“Today’s LS felt mostly like a waste of time... After 6 years of being trained in this [methods of patterning of which the other teachers were unfamiliar] and teaching it, I was understandably bored.... Also, more stressed because we are one week closer, with*

*not one extra number patterning idea... This session did not feel like a collaboration, just training" (PJ of T2 18/2).*

In the succeeding session, I presented a hand-out with a summary overview of patterning as was explored in the previous sessions. This hand-out described the common methods, variables and elements of patterning that had already been explored in one form or another in the preceding sessions. The teachers could now place their personal goals within a particular category and focus on which categories were mutually inclusive and important to the collaborative group. I addressed the issue of our conflicting goals with the participants. *"The goals of this lesson, okay we're back to that...we wanted to do number patterning, but number patterning can happen ... everywhere (indicating to different parts of the hand-out). So, we need to be more specific, T2, about what you want to accomplish with number patterning?... What came up in the last LS meeting was everybody's got a different goal, and that can cause quite a lot of stress for some people... for example like T4...for her it was very important to have free activity as a goal...and vocabulary. Those were her important goals. Okay. T2's goal is very important to her, she wants to do numbers. Okay. I realise my goal, whether I like it or not, has been level patterning..." (T7 in PM 24/2).*

The session progressed quite tediously until the core definition of patterning was revisited. This became the consolidating concept that could unite the diverse goals into one emergent goal, namely *"To develop an understanding that a pattern can be found in different forms, but it is a rule that makes something happen over and over again" (Lesson Plan 3/3).* This created a noticeable sense of productive collaboration, relief and purpose in the teachers, as was evident in their journal entries. *"Yay for feeling like we made some sort of break through today! Today felt a lot more like everyone was on the same page and had a good idea of where our lesson was headed... it helped to have a solid idea of where we are headed" (PJ of T1 25/2), "I really enjoyed today's session, because I felt we were moving somewhere. Because I like to be more focused on the outcomes of any lesson, the LS process started making more sense to me" (PJ of T6 25/2) and "The meeting flowed well and I loved the way everyone was kept on track and stopped from digressing and wondering off the topic!" (PJ of T4 25/2).*

In taking what was learnt from the first cycle, I approached the process of goal-setting in a completely different manner for the second cycle. In my capacity as facilitator, I decided to launch the first session of the second cycle by exploring the content knowledge and pedagogical-content knowledge of the teachers prior to selecting possible goals and related activities. I introduced the session by presenting two problems to the teachers to provoke a discussion on the concepts and methods behind subtraction. I also researched the topic extensively myself beforehand and gave an article to the teachers consolidating certain subtraction concepts. With better foundational conceptual understanding, it was a far more relaxed and natural process for the group to select a common goal at the conclusion of the first session. *“Okay, summary... the goal for this LS lesson... if I understand what has happened at this table, is that we would like to do a LS lesson with a part-whole subtraction problem, using three possible methods to get the answer?” (T7 in PM 10/3).*

The outflow of the structure of this planning meeting was a calm consensus about this specific lesson goal. Once we had a goal, teachers could do their own research and present focused activities in the succeeding session. The data suggests that the overall outcome of this approach was a more enjoyable and positive cycle, as evidenced in T2, T3 and T5’s journal entrees, *“I liked our thinking/ discussion being channelled towards our future goal, instead of irrelevant meandering” (PJ of T2 10/3), “I feel like we are more organised this time with already having a rough plan and an idea of the activities we want to do and more or less in what order too. I feel less stressed and more relaxed about it this time” (PJ of T3 17/3) and “Today’s session was enjoyable. It was good to see the different practical examples that the teachers came up with... I am glad we have got a structure to our next lesson” (PJ of T5 17/3).*

T1 was less enthusiastic about the process of first discussing concepts and methods as a foundation to goal-setting prior to activity selection, *“The research into subtraction is fascinating, but considering that we are dealing with Grade Ones, I think we would have been better served brain storming ideas rather than questioning techniques and some methods which I think are way beyond them and actually quite complex....” (PJ of T1 10/3),* but did comment backhandedly about the cohesive advantages thereof a week later *“I am glad the process of getting to a lesson skeleton seemed much quicker this time.... It happened almost unintentionally, but we seem to be gaining a better*

*understanding of how the others work, and how everyone needs to be listened to, it might be my imagination but there seemed to be more control in our discussion” (PJ of T1 17/3).*

The same structure of concept exploration prior to goal-setting was utilised in the third cycle of the research. Again, the participants responded positively to this structure, journaling descriptive phrases like *“happy to have a focused and productive meeting” (PJ of T2 23/6)*, *“I think we made great progress in such a fast amount of time yesterday and that made me very optimistic about what is ahead” (PJ of T3 23/6)*, *“we all seem to be far more on the same page this time” (PJ of T1 23/6)* and *“we are making more progress with less effort” (PJ of T2 7/7).*

In conclusion, the process of goal setting was theoretically clear when first attempting LS, but practically challenging to implement. The process became less problematic when facilitation began with conceptual and methodological exploration, preceding and leading towards goal setting.

### **5.12.2 Mixed starting point**

A challenge that came to the fore in utilising LS in the early grades was the problem of learners having diverse backgrounds in maths and not starting from a uniform understanding regarding the basic mathematics concepts. This provided a challenge for teachers to suggest activities that would suit the needs of the entire class and was a repetitive theme in the early discussions of LS. This problem was most probably exacerbated by the research commencing very early in the school year, as it was less noticeable as a problem by the third cycle in the second term. It has been suggested by the research participants that LS be implemented later on in a school year, once the learners have reached more mutual levels of mathematical understanding.

### **5.12.3 The challenging role of the facilitator**

#### **5.12.3.1 Finding balances**

The role of facilitating the LS process was deeply challenging. One of the first issues was finding a personal definition for facilitation, balancing my tendency to resort to a process of training or teaching against a non-interference approach. It was also difficult to find the balance between talking too much, exerting too much personal control, and talking too little, compromising on giving the group direction. My research journal was

fraught with self-reflection on this topic, as is noticeable in these sampled quotes *“I have to watch that I don’t resort to teaching instead of facilitating. This is a big concern for me” (4/2), “I find the pressure as a facilitator increasing rather than decreasing. I struggle to keep quiet in my role” (11/2) and “I really tried to curb my own input in this session. Not sure if I got it right, but I think I’m getting it better” (10/3).* The teachers themselves provided conflicting feedback in this regard, as can be seen in the following two contradictory quotes from the same participating teacher over a two-week period, *“I would like it if you [as a facilitator] try to not digress from specific talking points too much, as that can take up valuable time. But I also understand that it can be hard and that by digressing sometimes we can unfold other important points that add value to the process” (PJ of T3 4/2) and “I like your willingness to help and the ideas you give as well as the extra you say to make us think more and think more out of the box” (PJ of T3 11/2).*

Again, conflicting advice was given about my balancing the role of providing direction or remaining quiet as a facilitator, in the following two quotes, *“You need to let it roll and try to observe” (PJ of T1 25/2), “I considered [you] a valuable member of the group with a wealth of knowledge and experience to give so I have enjoyed listening to [your] ideas...(T5 in Q 4/4).* T3 accurately summarised this antithesis, *“I think the facilitator has quite a tricky and difficult job, in guiding us, asking questions that really make us think sometimes but also not talking too much and making the whole lesson be what she wants and not something the participant teachers have put together” (Q 4/4).*

### **5.12.3.2 Guiding conversation**

Controlling the amount of general conversation each person was entitled to in a natural and relaxed manner was also challenging. Some of the teachers’ comments implied that this aspect was not executed well. T2 complained that *“maybe some sort of time limit could be put in place to allow more fair communication from more than one never-ending source” (PJ 4/2),* a sentiment shared with T1, *“My word, it feels like we went round and round in circles trying to accommodate one person’s ideas and input yesterday” (PJ 30/6).* However, T3 and T5 disagreed with this assessment. *“[The facilitator] has motivated us throughout the process so far and given each member of the team equal chance to share and participate during meetings and discussions” (T3 in Q 4/4) and “We were all given a chance to contribute and feel included” (PJ of T5*

7/7). Clearly, this aspect was open to each teacher's interpretation, and it was therefore very difficult to gauge the correct amount of guidance and control I should execute in each session. This remained personally challenging and difficult to negotiate throughout the research.

#### **5.12.3.3 Leading without a map**

Facilitation was a difficult process without a clear "road map". Although I was aware of the theoretical stages of LS, approaching the first session without really knowing exactly where to start, what the outcome would be or where the journey would take us was quite stressful. I found myself describing the process in the following way, *"It felt like an exam.... and the problem with LS is that there is no defined route to take. No mapped-out guide plan..."* (RJ 4/2). When talking to others about it, I used descriptive words about "groping in the dark" and "working in a fog".

Clarity evolved somewhat through the study, particularly when a structural map was put in place (see section 7.4.3.). The deliberate focus on laying a groundwork of conceptual understanding (in the second and third cycles) before progressing from the first session to subsequent sessions in each cycle, helped give me direction in the facilitation process. This provided that proverbial map to guide us into setting goals before designing lesson activities to meet these goals.

#### **5.12.3.4 High expectations**

Part of the personal stress associated with facilitation was the high expectations of my ability, expressed by two teachers at the onset. Although comments like *"I have trust in you. I have confidence in your, in your, oomph, and your go-get thing. That will actually do something and make this productive"* (T2 in II 28/1) and *"[I want] to see the, the results of what we are, what you are busy with, and how you are directing us, or facilitating us"* (T6 in II 28/1) should be interpreted as essentially motivating, I found them to create personal stress when concerning myself with potentially disappointing these teachers who had placed their faith in my abilities.

#### **5.12.3.5 Exhaustion**

The role of facilitating was emotionally draining and physically exhausting. The planning meetings were long (averaging 2 hours each) and required intense concentration to facilitate constructively. Again, my private journal often reflected these



feelings of exhaustion. *“It feels like we have been meeting for months already. It’s hard to wrap around my head that it is only 2 official meetings (excluding the interview). The process feels extremely protracted and laborious, but it could be my own thoughts because I am so emotionally invested... I would’ve thought by now that the nerves of preparing for a LS meeting would’ve subsided. Strangely, they are just as present as the first meet”* (RJ 15/2) and *“I found the meeting more draining than last week’s. It is unexpectedly so tiring in every way. I was really unaware of how demanding the process is”* (RJ 8/3). Similar entrees are noted in other weekly comments in my journal.

#### **5.12.3.6 Facilitating with knowledge**

It was apparent to me that as a facilitator, having sufficient content knowledge and pedagogical content knowledge was essential to guide the LS process. Having teaching experience was valued by the participants. *“It helps to know that you, our facilitator, have knowledge and experience and suitable qualifications, not just somebody unsuitable, unqualified, inexperienced, appointed to fill a quota. So communication comes from a place of mutual respect”* (T2 in Q 4/4). In LS cycle 2 and 3, I researched the lesson topic beforehand extensively, and approached the first session of these two cycles by focussing the group discussion on content knowledge, uncovering methods for teaching the topic, and exploring the systematic development of understanding in learners regarding a topic. This assisted me in guiding the participants so that we all could have a good grasp of the content knowledge before engaging in further lesson planning.

### **5.12.4 The challenging role of presenting the demonstration lesson**

#### **5.12.4.1 Pressure to decide autonomously and pressure to perform**

In addition to the fears of presenting, as was expressed by virtually all of the research participants (discussed in section 5.8.1.4.), a problem arose in the first cycle that once the teachers knew who had volunteered to present the demonstration lesson, more opportunity and authority was afforded the teacher to direct the course of the lesson planning. *“The teacher who is taking each actual lesson, needs to have a more active role in directing the lesson...”* (PJ of T1 18/2), and more pressure was felt by that teacher to perform in the preceding sessions before the demonstration lesson. *“During the session, I was repeatedly asked to specify the exact words and phrasing I would*

*use, when presenting the lesson. Although this was meant to be helpful, I found that it left me far more stressed, having every little word controlled” (PJ of T2 18/2).*

The presenter having more authority in selecting activities that she preferred or felt comfortable doing, could be viewed as counterproductive towards the collaborative effort of the group in creating a lesson. A solution presented itself in the second and third cycles, in which the teacher who volunteered to present was kept confidential from the other participants until the day of the presentation lesson. The teachers expressed positivity regarding this change. *“I think this time around where the person presenting is not known yet is a better approach - that way it becomes our lesson and we have more group ownership of the lesson” (PJ of T5 30/6) and “I think that not knowing who the presenting teacher was, took a certain amount of pressure off of that person” (T1 in Q 4/7).*

#### **5.12.4.2 The presenter changes the lesson plan**

In addition to the stress associated with the role of presenting, a further challenge was noted when the presenters made changes to the lesson plan unbeknown to the collaborative group until the time of their presenting. Although the participants were quite gracious in allowing for these changes in the post-lesson feedback, there was journaling evidence that it did cause feelings of frustration in some of the participants. *“Did we discuss giving them different shaped and coloured pieces to use on their charts? I think that made it substantially more difficult...” (PJ of T1 3/3) and “I felt that the presenter gave up and just did what she wanted to do and what was comfortable for her, instead of staying true to the lesson plan” (PJ of T2 11/7).* Part of this challenge can be attributed to the extreme stress the presenters were under, and the human tendency in circumstances such as these to utilise one’s personal interpretation of a lesson plan.

### **5.12.5 Challenges in communication**

#### **5.12.5.1 Positive communication**

During the course of the study, there were comments regarding positive aspects of communication between the teachers. These comments centred on the openness that teachers felt and their ability to share in safe space. T6 remarked about the lessening of reserved feelings between participants, opening communication progressively as

the focus of the research sharpened (Q 4/4). T5 was impressed at the respect that teachers demonstrated towards each other, and she felt *“everyone [was] given a chance to contribute”* without dismissing anyone’s ideas (T5 in Q4/4). In the same questionnaire, she also described how she developed personally *“from listening to the other teachers”*.

#### **5.12.5.2 Poor communication**

However, the challenge of poor general communication between participants was also noted by the participants. Certain teachers felt that one or two participants monopolised the discussions and interrupted too much. *“I felt the discussion was extremely one sided today, with a single teacher taking up nearly all the time and constantly interrupting and talking over others”* (PJ of T2 4/2). Frustration was evident when teachers did not express their point succinctly. *“At times I tend to get frustrated at the ability of some people that have to talk for 3-5 minutes and say absolutely nothing!”* (PJ of T4 25/2). Furthermore, T3 expressed her concern that teachers were over-sensitive, but should also be cognisant of their wording, to avoid offending other participants. *“We can get offended or riled up and then all speak together and sometimes the wording we use can offend other members... In the end we can all still work on communication skills and not getting too offended when things are said that we don’t like”* (T3 in Q4/4).

A particular weakness noted in the communication process was the tendency of the participants to interrupt each other. This vice was noticeable in all participants, particularly when I transcribed these interrupted discourses. T3 and T6 commented about this weakness. *“I think we communicate quite well as a team. I do however think that sometimes we want to all speak at once... I would like to see less talking over each other and more giving each person fair chance to share and speak”* (T3 in Q 4/4) and *“One of the problems I faced was the fact that very often, we cannot listen. We are excellent at talking and not allowing someone to finish sharing their thoughts. That is the moment I freeze up and shut up, because I do not have the loudest voice”* (T6 in Q 4/7).

In spite of evidence suggesting that respectful and clear communication remained a challenge throughout the study, small progress was noted over the course of the three cycles by all participants, bar T3. *“I felt that my opinion was actually listened to, later*

*in the study” (T2 in Q 4/7). “I think [communication] improved” (T6 in Q 4/7). “I think we did get better towards the end” (T1 in Q 4/7) and “I think we also bonded as a group and thus the communication improved and was more free” (T5 in Q 4/7).*

In sum, LS presented an opportunity for teachers to practice their communication skills. Sometimes this was effectively accomplished but was more often recorded as challenging. A small improvement was noted at the conclusion of the study, albeit *“slightly; very slightly” (T4 IN Q 4/7).*

#### **5.12.6 Too many activities**

One of the last challenges that was noted in this study was the tendency of the participants to put too many activities into the demonstration lessons. This was noted both in the post lesson discussions and private journaling of the participants. T4 described how this problem stemmed from *“get[ting] very excited in the LS. Everybody comes with ideas and that sort of thing, and you really want them to use your ideas and because it makes you feel great!” (T4 in PLD 10/7).* The compressing of multiple activities into the demonstration lessons compromised the participants’ ability to fully explore the power of a problem-solving teaching approach. *“As most mentioned, I feel there were too many activities and not enough time to focus on each one as much as needed or enough time to explore more problem-solving with each activity as I think was planned” (PJ of T3 10/7) and “I think if we limited the lesson to the one activity, it would’ve been enough! With too many activities we didn’t get the idea of problem-solving and building on the feedback of the children quite right” (RJ 10/7).*

#### **5.12.7 Working within the given school time-table**

In this case study, working within the school’s given time-table was surprisingly not as difficult to navigate as was expected, when considering findings from internationally comparative LS research undertakings.

The school management were supportive of the process, which removed many potential obstacles regarding scheduling. Once the non-participating school staff were appraised of the LS process, they repeatedly expressed their willingness to assist their fellow participating staff members.

The LS planning sessions were held after school on a day that best suited the participants. The school management were willing to appoint substitutes once a week for After Care positions (this is a paid, voluntary afternoon job at the school) so that research participants could attend. The actual LS presentation lessons were held near the end of the school day. The school management was willing to move the morning assembly time-slot to the afternoon. All foundation phase learners who were not attending the LS lesson were present at this assembly, which coincided in length with the presentation lesson. Learners could go directly home after the lesson or assembly. In the last cycle, due to COVID-19 social distancing restrictions learners who did not attend the lesson could not remain in the hall for an assembly and were simply asked to leave school earlier that day. Parents were supportive of this, and those who could not collect their children earlier gave their consent for their children to play on the playgrounds while being supervised.

The demonstration lessons were viewed by research participants, a mathematics and LS expert from the University of Pretoria, non-participating staff members and visiting teachers from surrounding schools. What was difficult to plan, however, was the attendance of other non-early-grade staff of the school at the presentation lesson. As they had classes of their own at this time, there were not enough substitute teachers to allow for them to leave their classes to view the demonstration lesson. This was disappointing for some. It was suggested that the lesson be recorded and viewed privately by interested staff members, but this was considered too stressful for the presenters. In the last cycle, when non-participating learners were dismissed earlier, more teachers were able to watch the demonstration lesson.

### **5.13 CONCLUSION**

This chapter presented the research findings according to the themes that emerged from the inductive and deductive analysis of the data. The motivation for participation in the research was expounded, followed by a discourse on the impact that this case study had on the participants in areas of content knowledge, pedagogical content knowledge, emotional and physical well-being, inter-grade cooperation and general collaboration. The impact that the study had on curriculum planning and development was also explored. The challenges that were faced through the research were visited, including difficulties in integrating the process into the school time-table. The

succeeding chapter will explore the findings' alignment to the conceptual framework guiding the research and discuss the new insights that were attained in this study in the light of the literature review.

## **6. CHAPTER 6: ALIGNMENT OF FINDINGS**

### **6.1 INTRODUCTION**

After a thorough inductive and deductive analysis of the data, the previous chapter incorporated a discussion on the findings that emerged. The impact of LS on the professional development of the research participants was discussed, as well as challenges that emerged in implementing LS for the first time in this particular context. This chapter outlines the alignment of the research findings with the literature review of chapter 2 and the conceptual framework of chapter 3. Aspects of the literature are confirmed or contradicted. The absences and silences inherent in former findings related to the topic are also addressed.

### **6.2 ALIGNMENT OF RESEARCH FINDINGS TO LITERATURE REVIEW**

In considering the literature findings of chapter 2, this study both confirmed and less often, contradicted the studies and statements of prior PD researchers.

In terms of the confirmation of findings, the literature in this study considered the key elements of successful professional development. Of those elements, the most frequently described was PD that was learner-focused, of a prolonged duration and contextually relevant. In this study, LS confirmed all of these factors in its effectiveness for impacting the professional development of its participants. Furthermore, the literature describes effective PD as focused on improving the pedagogical knowledge, pedagogical content knowledge and subject content knowledge of teachers, and on being collaborative, hands-on and resulting in deep seated teacher change. All of these factors were explored and confirmed in the findings of the study.

With regards to findings contradicting the literature, this study did not find classroom assessment as a satisfactory platform for launching into learner-centred learning. It also found significant PD gains within a shorter period than anticipated. The process of learning for the teachers was based on content and problem-solving, but improved content knowledge preceded the development of pedagogical-content knowledge. LS as a PLC was enriching and beneficial in spite of the mixed motives that teachers had for joining, and underlying feelings of disrespect that were perceived between participants. The social stages that the PLC progressed through were more tumultuous and undefined than the literature suggests. The PLC was also regarded

as successful in spite of the fact that it was not teacher-driven. A significant finding that was particularly contradictory to the literature was that this study was entirely possible to implement in the school time-table, and that teachers were willing to dedicate the time necessary for participation.

The following table illustrates on the above-mentioned links between the literature and findings.

**Table 6.1: Alignment of the findings to aspects of the literature framework of the study**

|                                          | Topic of discussion from literature review | Authors and years                                                                | Knowledge introduced in literary findings                                                | Confirmation ✓ or contradiction ✗ based on this research                                                                                                                                                                                                                                     | Interpretive discussion |
|------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| The Professional Development of Teachers | PD should be learner-focused               | Dufour (2004)                                                                    | Use classroom assessments to establish learner-centred learning.                         | ✗ At a Grade 1 level, learner assessments were not utilised as a guide for designing learner-centred learning. Teacher observations and perceived learner affective enjoyment of the process were more often referred to as the indicators of teaching for learner-centeredness (see 5.7.6.) |                         |
|                                          |                                            | Msonde & Msonde (2017)                                                           | Learners should be part of their own learning process.                                   | ✓ Increased consensus amongst research participants that learner engagement through problem-solving was a beneficial didactic approach (see 5.6.4.3.)                                                                                                                                        |                         |
|                                          |                                            | Lalor & Abawi (2014)                                                             | Learner-oriented teaching is a natural outflow of a PLC                                  | ✓ Learner-oriented teaching was an outcome of participation in the PLC (see 5.7.6.)                                                                                                                                                                                                          |                         |
|                                          | Prolonged duration                         | Cordingley, Higgins, Greany, Buckler, Coles-Jordan, Crisp, Saunders & Coe (2015) | Significant gains are only probable after two terms of PD intervention                   | ✗✓ Significant gains were already noted within one month of LS participation. Evidence of these gains were sustained over the duration of the study (almost 3 months in total) (see 5.7.)                                                                                                    |                         |
|                                          |                                            | Patton, Parker & Tannehill (2015)                                                | Long duration PD leads to teachers implementing skills and knowledge learnt.             | ✓ Evidence of implementation of skills and knowledge gained, particularly by the second cycle (see 5.7.4.)                                                                                                                                                                                   |                         |
|                                          |                                            | Saunders (2014)                                                                  | Longer duration PD results in changes in teacher's beliefs and values regarding teaching | ✓ Evidence of changes in pedagogical content knowledge and didactic beliefs over the research period (see 5.6.)                                                                                                                                                                              |                         |



|  | Topic of discussion from literature review                                                        | Authors and years                                            | Knowledge introduced in literary findings                                                                                                                                                                                                                                                 | Confirmation ✓ or contradiction ✗ based on this research                                                                                                                                                                                                                                     | Interpretive discussion |
|--|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|  | Contextual relevance                                                                              | Schleicher (2016)                                            | PD is most effective when aligned with school priorities and perceived areas of weakness in context.                                                                                                                                                                                      | ✓ LS was an effective contextually relevant and personalised PD tool (see 5.7.11.)                                                                                                                                                                                                           |                         |
|  |                                                                                                   | Knowles, Holton III & Swanson (2015)                         | In order for adult learning to occur effectively:<br>Know why you are learning something.<br>Be personally invested.<br>Learning should be experiential.<br>Learning must be relevant.<br>Learning must be problem-centred rather than content-centred.<br>Motivation should be internal. | ✓ ✗ This case study confirmed the effectiveness of adult learning in all areas mentioned by Knowles <i>et al.</i> However, content-learning (see 5.5. and 5.12.1) together with problem-centred learning emerged as key for participating teachers' effective progression in the LS process. |                         |
|  |                                                                                                   | De Clercq & Shalem (2014)                                    | PD is effective when building on from existing knowledge and competence.                                                                                                                                                                                                                  | ✓ Teachers could direct their own learning from a place of existing knowledge and competence (see 5.7.11)                                                                                                                                                                                    |                         |
|  |                                                                                                   | Singh (2011)                                                 | PD should be designed around the needs of the school and teachers.                                                                                                                                                                                                                        | ✓ The LS process was exceptionally personalised and packaged to suit the school (see 5.7.11)                                                                                                                                                                                                 |                         |
|  | Improvement of pedagogical knowledge, pedagogical content knowledge and subject content knowledge | Darling-Hammond, Hyler & Gardner (2017)<br>Schleicher (2016) | Effective PD must focus on content.                                                                                                                                                                                                                                                       | ✓ The LS process was dependent on content-rich discussion (see 5.5.4.)                                                                                                                                                                                                                       |                         |
|  |                                                                                                   | Brodie (2013)                                                | Effective PD is dependent on the introduction of external knowledge.                                                                                                                                                                                                                      | ✓ It was apparent that this was a critical dimension of the LS process and without it, problems arose in the goal-setting stage of LS and beyond (see 5.5.2.; 5.12.1. and 5.12.3.6.)                                                                                                         |                         |
|  |                                                                                                   | Stewart (2014)                                               | PD is enhanced when teachers go through cycles of grappling with content.                                                                                                                                                                                                                 | ✓ PD was enriched through each LS cycle. Repetitive cycles provided evidence of deep contemplation and internalisation of content (see 5.7.2. and 5.7.3.)                                                                                                                                    |                         |

|  | Topic of discussion from literature review              | Authors and years                                                                                           | Knowledge introduced in literary findings                                                                                                                                               | Confirmation ✓ or contradiction ✗ based on this research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Interpretive discussion |
|--|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|  |                                                         | Van Driel & Berry (2012)                                                                                    | PD should incorporate pedagogical content knowledge through teacher input and practical examples, culminating on opportunities for teachers to reflect on attempted strategies.         | ✓ Evidence suggests that teachers were developed through shared pedagogical content input and reflective discussion (see 5.6.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                         |
|  |                                                         | Guerriero (2014)<br>Ward, Kim, Ko & Li (2015)<br>Brodie and Sanni (2014)<br>Cordingley <i>et al.</i> (2015) | Inconclusive debate as to whether pedagogical content knowledge or content knowledge was the precursor of the other (or if they emerged simultaneously). Theorists remain unreconciled. | ✓ ✗ In this study, content knowledge was an important precursor for pedagogical content knowledge. The latter naturally flowed out of the former (see 5.12.1.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                         |
|  |                                                         | Spaull (2015)                                                                                               | South African teachers are lacking in content knowledge.                                                                                                                                | ✓ Evidence of poor teacher content knowledge present in study (see 5.5.2.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                         |
|  | Collaboration through professional learning communities | Darling-Hammond & McLaughlin (2011)                                                                         | Collegial communities of practice enhance the sharing of knowledge.                                                                                                                     | ✓ All participants provided evidence of enhancing their knowledge through collaboration (see 5.10.3.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                         |
|  |                                                         | Akiba & Liang (2016)                                                                                        | PLCs are more effective than other PD avenues e.g., workshops, university courses or private learning endeavours                                                                        | ✓ All participants expressed that the PLC (LS) was the most effective form of PD for them to date (see 5.7.11.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                         |
|  |                                                         | Hord (1997)                                                                                                 | Successful PLCs have:<br>School leadership involved.<br>Creativity.<br>Shared vision and values.<br>Non-evaluative sharing.<br>Mutual respect and trust.                                | ✓ ✗ In spite of its success, the PLC in this case did not meet all of Hord's criteria. Cooperation and support from school leadership was an essential aspect in the success of this study (see 5.3. and 5.12.7.). Participants demonstrated creative thought (5.7.1.). However, participants had diverse motives for involvement (see 5.3.) and also diverse initial pedagogical-content values (see 5.6.1. and 5.6.4.). There was an atmosphere of non-evaluative sharing (see 5.10.2. and 5.12.5.1.), but mutual respect was not pre-established (see 5.9.3.). However, this did show slight improvement through the LS process (see 5.9.3.). |                         |

|  | Topic of discussion from literature review | Authors and years                          | Knowledge introduced in literary findings                                                                                                                                                                                                                                                                       | Confirmation ✓ or contradiction ✗ based on this research                                                                                                                                                                                                                                                                                                                                                                                                                                          | Interpretive discussion |
|--|--------------------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|  |                                            | Tuckman (1965)                             | PLCs have a protracted list of advantages.<br><br>PLCs will progress through social stages:<br>Testing-dependence<br>Conflict<br>Cohesion<br>Functional roles<br>PLCs will also progress through task stages:<br>Orientation to the task<br>Emotionality<br>Relevant opinion exchange<br>Emergence of solutions | ✓ The study confirmed a protracted list of advantages (see 5.5., 5.6., 5.7., 5.8.2., 5.9., 5.10. and 5.11.)<br><br>✓ ✗ All the stages were identifiable through the study, although not so clearly distinguishable and clearly categorised as Tuckman proposes. The stages were often overlapping and blended. Participants regressed to certain stages and some stages preceded others in their order of presentation. The process was more tumultuous and undefined than what Tuckman suggests. |                         |
|  |                                            | DuFour (2004)                              | PLCs are hard work and require commitment and dodged persistence.                                                                                                                                                                                                                                               | ✓ The personal effort and tenacity required was clearly evidenced in the data (see 5.8.1.1. and 5.8.1.2.)                                                                                                                                                                                                                                                                                                                                                                                         |                         |
|  |                                            | Schleicher (2016)                          | PLCs improve teacher self-efficacy and job satisfaction.                                                                                                                                                                                                                                                        | ✓ ✗ Improvements in teacher confidence was clearly established (see 5.7.5.), but job satisfaction was not a defined outcome of the study.                                                                                                                                                                                                                                                                                                                                                         |                         |
|  |                                            | Ronfeldt, Farmer, McQueen & Grissom (2015) | PLCs should either be aimed at analysing learner data and responding to it, or PLCs should be aimed at the curriculum and teaching strategies.                                                                                                                                                                  | ✓ The young age of the participants limited the focus of analysing learner data and responding to it. The goals of this study were therefore more confined to the broad realm of curriculum and teaching strategies (see 5.11 and 5.6.4.).                                                                                                                                                                                                                                                        |                         |
|  |                                            | Ndlalane & Jita (2009)                     | Even with a PLC leader possessing insufficient content knowledge and pedagogical content knowledge, PLCs still break down feelings of isolation and spontaneously improve content knowledge and pedagogical content knowledge.                                                                                  | ✓ ✗ This fell beyond the scope of this research. However, participants were generally more content when the facilitator/ leader introduced content knowledge, which, from the second cycle onwards, increased the mutual and collaborative sharing of pedagogical content knowledge (see 5.12.1. and 5.12.3.6). This PLC study proved effectiveness in breaking down isolation (see 5.10.2).                                                                                                      |                         |

|  | Topic of discussion from literature review | Authors and years                           | Knowledge introduced in literary findings                                                                                                                                                                                                                                                   | Confirmation ✓ or contradiction ✗ based on this research                                                                                                                                                                                                                                                                                                                                                                                                                           | Interpretive discussion |
|--|--------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|  |                                            | Steyn (2013)                                | Successful PLCs should have clarity of focus and commitment to professional learning.<br>PLCs should have supportive interpersonal relationships and a safe space for interaction, competent facilitators, support and involvement of school leadership a network with surrounding schools. | ✓ ✗The goal setting process established clarity of focus (see 5.12.1.). Once successfully implemented (cycle 2 onwards) the PLC functioned with more ease. Generally, there was an atmosphere of support in the sessions (see 5.8.2.3., 5.10.2. and 5.12.5.1.). The school leadership was sincerely supportive (see 5.3. and 5.12.7.). Inter-school networking was difficult to establish, due to lack of enthusiasm for such collaboration from surrounding schools (see 5.4.2.). |                         |
|  | Role of facilitator                        | Cordingley <i>et al.</i> (2015)             | External facilitator input is important for successful PD providing new perspectives and challenging existing belief systems.                                                                                                                                                               | ✓The facilitator's role in the study incorporated introducing new information (5.12.3.6.) as well as challenging existing beliefs (see 5.7.3.)                                                                                                                                                                                                                                                                                                                                     |                         |
|  |                                            | Vangrieken, Meredith, Packer & Kyndt (2017) | The interaction between the facilitator and PLC is the greatest determiner of a successful PLC outcome.                                                                                                                                                                                     | ✓ ✗Was not a clear outcome of the study                                                                                                                                                                                                                                                                                                                                                                                                                                            |                         |
|  |                                            | Brodie (2013)<br>Chauraya & Brodie (2018)   | Facilitators are key to the successful PLC process and they initiate teacher reflections.                                                                                                                                                                                                   | ✓Evidence in participants' journaling confirms the important role of the facilitator (see 5.12.3.)                                                                                                                                                                                                                                                                                                                                                                                 |                         |
|  |                                            | Patton, Parker & Neutzling (2012)           | Good facilitation is definable as teacher-centred.                                                                                                                                                                                                                                          | ✓Although theoretically, facilitation is described as a clear and definable process, this research suggests that it was a process fraught with difficulties, inconsistencies and personal complexities, combining a focus on teacher-centeredness, content centeredness and process centeredness (see 5.12.3.).                                                                                                                                                                    |                         |
|  | Hands on learning and modelling            | Patton, Parker & Tannehill (2015)           | Successful PD involves active participation and not passive reception.                                                                                                                                                                                                                      | ✓All participants were actively involved in the study. All participants without exception contributed to the collaborative process (see 5.10.2. and 5.10.3.).                                                                                                                                                                                                                                                                                                                      |                         |

|  | Topic of discussion from literature review | Authors and years                | Knowledge introduced in literary findings                                                                                                                                                                                               | Confirmation ✓ or contradiction ✗ based on this research                                                                                                                                                                                                                                                                                                    | Interpretive discussion |
|--|--------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|  |                                            | Ingvarson, Meiers, Beavis (2005) | Successful PD involves active learning followed by reflection.                                                                                                                                                                          | ✓ This was evident both in the LS cycles in themselves and in the reflective journaling though participation in the research (see 5.7.2. and 5.7.3.)                                                                                                                                                                                                        |                         |
|  |                                            | Doyle & Ponder (1977)            | Practicality ethic describes how teachers will only be receptive to learning things of practical value. They will also only be receptive to change if their input is considered. Teachers are adapters and not adopters of innovations. | ✓ There was evidence of practical learning (see 5.6.8.) and learning through mutual input (5.10.3.)                                                                                                                                                                                                                                                         |                         |
|  |                                            | Bryan (2014)                     | Modelling is a powerful tool for teacher learning.                                                                                                                                                                                      | ✓ Teachers made pertinent observations and reflective comments indicative of learning after observing live classes (see 5.7.9.).                                                                                                                                                                                                                            |                         |
|  |                                            | Weade & Evertson (1991)          | Benefits of modelling are enhanced through observing the teaching process and the learner's responses, more so than by observing the teacher alone.                                                                                     | ✓ This was specifically implemented and was commented on as enhancing the probability of a successful and safe outcome of the observation process (see 5.8.1.4.).                                                                                                                                                                                           |                         |
|  | School leadership                          | Takahashi & McDougal (2016)      | Enthusiastic, supportive and communicative principals are catalysts for school-wide PD.                                                                                                                                                 | ✓ This study had the full support of the school management team. They were instrumental in motivating staff to participate, rearranging the school time-table and appointing substitute teachers to allow participants to participate in the study (see 5.3. and 5.12.7.). A member of the school management team was also a participant in the LS process. |                         |
|  |                                            | Geldenhuys & Oosthuizen (2015)   | Principals should be directly involved in the implementation of PD in their schools.                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                             |                         |
|  |                                            | Hord (1997)                      | Principals should be at the centre of the PD of their staff                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                             |                         |
|  | Teacher change                             | Mezirow (1978)                   | Sustained change requires a shift in one's frame of reference                                                                                                                                                                           | ✓ There was evidence of changes in the habitual thinking of participants and manifestations of these changes in class activities outside of LS (see 5.7.2., 5.7.3. and 5.7.4.)                                                                                                                                                                              |                         |

|                          | Topic of discussion from literature review          | Authors and years                                        | Knowledge introduced in literary findings                                                                                                                                                                                                                                                   | Confirmation ✓ or contradiction ✗ based on this research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Interpretive discussion |
|--------------------------|-----------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|                          | Professional development in a South African context | NPFTED of the DBE (2006)<br><br>ISPFTED (2011)           | PD should be teacher-driven, school-based and well-co-ordinated.<br><br>Advocates PD through teacher-initiated, community-based PLCs                                                                                                                                                        | ✓ ✗ This case study was an entirely school-based PLC. It did not meet the criteria of teacher-directed as it was researcher-directed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                         |
| The Lesson Study Process | Goal setting                                        | Fujii (2014)<br><br>Seleznyov (2018)<br><br>Sekao (2019) | Goals should be established to find solutions to teaching-learning problems.<br><br>The first critical component of authentic Japanese LS is the integration of a school-wide research theme into the lesson goal.<br><br>Lesson goals should be linked to assessment data of the learners. | ✓ ✗ The first cycle began with an assortment of unclear goals due to poor facilitation and poor teacher content knowledge. Goals were easier to establish in the second and third cycle once content was more thoroughly explored prior to goal setting. Goals developed more out of curriculum planning and content knowledge, than identifiable teaching-learning problems (see 5.12.1.).<br><br>✗ The school did have a school-wide goal for 2020, but this was difficult to apply as a reference point for goal-setting in the study. It was more often used after the fact than directing the planning of the lesson. It was difficult to marry the intricacies of the new process of LS with a rather vague school-wide goal.<br><br>✗ This was difficult to attain in a Grade 1 setting where formal assessments did not commence until later on in the school year. Assessment results could not be utilised as a departure point for goal setting. In cycle 2 and 3, goal setting was focused more on the planned year schedule, and a collaborative consensus regarding the content deemed important or a method that pupils needed to develop (see 5.12.1.). |                         |

|  | Topic of discussion from literature review | Authors and years               | Knowledge introduced in literary findings                                                                                                                                                                                               | Confirmation ✓ or contradiction ✗ based on this research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Interpretive discussion |
|--|--------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|  |                                            | Bjuland & Mosvold (2015)        | Goal setting should incorporate what the learner should learn and what the teacher hopes to learn                                                                                                                                       | ✗The complexity and challenge of simplistic goal setting in this virgin study did not begin to address these two proposed aspects of a more mature goal-setting process.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                         |
|  | Lesson Planning                            | Takahashi, Lewis & Perry (2013) | Lesson planning should incorporate an understanding of the context of the lesson within a greater curriculum, a problem-solving aspect that develops mathematical thinking and a consideration of the challenges that pupils will face. | ✓ ✗The context of each lesson within the greater curriculum framework was thoroughly considered before the planning of each lesson commenced (see 5.11.1.). The idea of teaching through problem-solving was foreign and difficult for participating teachers to incorporate in their lesson plan (see 5.6.4.3.). Problem-solving was compromised by the lessons being designed around too many activities (see 5.12.6.). It was also difficult to pose a problem to pupils when the pupils had almost no foundational understanding of basic methods. A blend between method teaching and problem-solving was mostly settled on (see 5.6.4.). |                         |

|  | Topic of discussion from literature review | Authors and years                      | Knowledge introduced in literary findings                                                                                                                                                                                                                                                | Confirmation ✓ or contradiction ✗ based on this research                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Interpretive discussion |
|--|--------------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|  |                                            | Fujii (2014)                           | In authentic Japanese LS approximately 31% of the time is spent on discussing the type of problem or task that would be presented, 29% on the anticipated learner responses, 31% on what learners would present and how learner thinking could be utilised and 10% on the lesson summary | ✓ ✗ The LS time did cover some of the criteria described by Fujii, but owing to the young age and short attention span of the learners, as well as enthusiasm of the teacher participants, multiple activities were suggested for one lesson instead of only one. Time was dedicated more towards planning these activities. Activities were planned to bridge what was known to what was unknown (see 5.6.6.), introducing an element of fun to maths (see 5.7.6.) and engaging learners in some aspects of problem solving (see 5.6.4.). Much time was dedicated on discussing the flow of these activities and the resources needed for the activities (see 5.7.8.), rather than on the types of expected responses and how these could be utilised by the teacher. The planning of multiple activities may have compromised the authenticity of the problem-solving process (see 5.12.6.) |                         |
|  | Teaching and observing the research lesson | Cajkler, Wood, Norton & Pedder, (2014) | Observers focus on gathering information about the lesson's impact on learners and their learning                                                                                                                                                                                        | ✓ Post lesson discussion centred on observations around learners and their learning (5.7.9.1.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                         |
|  |                                            | Takahashi & McDougal (2016)            | Observation should be undertaken through the lens of a predetermined research theme and the pre-established lesson goals                                                                                                                                                                 | ✓ ✗ This became clearer through the study, as goal setting became more specific (see 5.12.1.) Observing teachers were given a short speech and hand-out prior to observing, helping them to direct their observations to the research theme and lesson goals.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                         |
|  |                                            | Lewis (2000)                           | By providing an extensive predetermined rubric for observation, teachers can be channelled to become better observers of children                                                                                                                                                        | ✓ The given rubric helped teachers to direct their observation and feedback was indicative of this                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                         |



|  | Topic of discussion from literature review | Authors and years                     | Knowledge introduced in literary findings                                                                                                                                                      | Confirmation ✓ or contradiction ✕ based on this research                                                                                                                                                        | Interpretive discussion |
|--|--------------------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|  |                                            | Bjuland & Mosvold (2015)              | LS is set apart from other PD methods because it centres on learners learning                                                                                                                  | ✓ ✕ This was not a clear singular outcome of the research process but could be regarded as one of many outcomes elevating LS above other PD methods (see 5.7.11)                                                |                         |
|  |                                            | Thomson, Bell & Hendry (2015)         | Teachers will apply what they learn through observing other teachers in their own classes                                                                                                      | ✓ There were examples of teachers implementing what they observed in the demonstration lessons in their own classrooms (see 5.7.9.2.).                                                                          |                         |
|  | Post-lesson discussion                     | Takahashi & McDougal (2016)           | The post lesson discussion is less about refining a lesson and more about PD of the teacher                                                                                                    | ✓ Reflections in journals revealed growth and PD and not merely lesson refinement (see 5.7.2. and 5.7.3.).                                                                                                      |                         |
|  |                                            | Fujii (2018)                          | Post lesson discussion should incorporate an analysis of the appropriateness of the selected problem-solving task                                                                              | ✓ There was much discussion surrounding the appropriateness of the selected problem-solving tasks, including the problem of trying to incorporate too many activities in the presentation lesson (see 5.12.6.). |                         |
|  |                                            | Dudley (2013)                         | Post lesson discussion should compare learner performance with what was predicted, and should discuss what was learned, the effect of teaching and how teaching might be conducted differently | ✓ All post lesson discussions evidenced broad discussions comparing expected learner performance with the actual outcome, the effect that teaching had, and necessary future changes.                           |                         |
|  |                                            | Fujii (2014)                          | Post-lesson discussions must be teaching directed and not teacher directed                                                                                                                     | ✓ This was accomplished through safe-guards like pre-meeting discussions and pre-observation handouts focussing observation criteria away from the teacher (see 5.8.1.4.)                                       |                         |
|  |                                            | Cajkler, Wood, Norton & Pedder (2014) | Post-lesson discussions must steer away from being a solely praise-based celebration                                                                                                           | ✓ Evidence of a balance between praise and criticism was evident                                                                                                                                                |                         |

|  | Topic of discussion from literature review | Authors and years                          | Knowledge introduced in literary findings                                                                                                                                                                                                                                                                                                                                              | Confirmation ✓ or contradiction ✗ based on this research                                                                                                                                                                                                                                                                                                                                        | Interpretive discussion |
|--|--------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|  | Using feedback to guide planning           | Seleznyov (2018)                           | Knowledge from previous cycle is used to guide new lesson planning                                                                                                                                                                                                                                                                                                                     | ✓✗There was evidence of knowledge transfer from one cycle to the next, particularly in areas like goal setting (see 5.12.1.) and resource selection (see 5.7.8.). However, knowledge regarding the problem of an excess of activities was not successfully transferred from one cycle to the next in this study (see 5.12.6.).                                                                  |                         |
|  | The role of the expert                     | Takahashi (2014)                           | The expert brings knowledge about recent research and the government curriculum to the table. The expert links theory and practice and guides teachers in reflective teaching and learning. The expert develops the theoretical understanding of participating teachers and gives critique. He has an understanding of the interconnectedness of learning between sections and grades. | ✓✗Although constructive in his feedback, this study did not provide evidence of the expert particularly introducing new knowledge about recent research or the government curriculum. The expert did guide the teachers in reflective thought processes and provided constructive criticism, but did not engage in discussion on the interconnectedness of learning between sections or grades. |                         |
|  | Spreading the word                         | Seleznyov (2018)                           | LS knowledge should be spread amongst teachers and across schools                                                                                                                                                                                                                                                                                                                      | ✗This was not effectively accomplished in this study. Across school co-operation was limited (see 5.4.2.), and communication within the school between teachers regarding the LS knowledge was not prioritised in this study.                                                                                                                                                                   |                         |
|  |                                            | Fujii (2018)                               | Teachers should write extensive reports on what they have learnt                                                                                                                                                                                                                                                                                                                       | ✗This step was avoided in this study to prevent overloading teacher participants with more administrative work. General staff meetings where feedback could have been provided were also cancelled due to COVID-19 social distancing restrictions.                                                                                                                                              |                         |
|  | Facilitation                               | Schipper, Goei, de Vries & van Veen (2017) | LS Facilitators:<br>Manage the process<br>Guide exploratory thought<br>Assist in planning, communicating, gathering and arranging resources<br>Provide theory                                                                                                                                                                                                                          | ✓The active role of facilitation became more apparent as the study progressed (see 5.12.3.). The “how” of facilitation also became more focussed as the design of the LS cycle improved through each cycle (see 5.12.1.).                                                                                                                                                                       |                         |

|  | Topic of discussion from literature review | Authors and years                        | Knowledge introduced in literary findings                                                                                 | Confirmation ✓ or contradiction ✗ based on this research                                                                                                                            | Interpretive discussion                                                                                                                                                                                                                                  |
|--|--------------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |                                            | Khokhotva (2018)                         | Facilitators are important in their role as motivators                                                                    | ✗ Little evidence of this was recorded as participating teachers appeared dedicated and committed to see the process through without additional facilitator motivation (see 5.8.3.) |                                                                                                                                                                                                                                                          |
|  | Advantages of LS                           | Takahashi, Lewis & Perry (2013)          | Teacher saturation in new materials                                                                                       | ✓                                                                                                                                                                                   | The majority of findings from research on the positive impact of LS were corroborated by this study. There was a less noticeable linking of goals (micro- and macro) and this study had no impact on national policy or the overt honouring of teachers. |
|  |                                            | Lewis (2000)                             | Individual PD                                                                                                             | ✓                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
|  |                                            |                                          | Improved ability to observe children                                                                                      | ✓                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
|  |                                            |                                          | Improved content knowledge                                                                                                | ✓                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
|  |                                            |                                          | New approaches developed                                                                                                  | ✓                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
|  |                                            |                                          | Micro-goal connectivity with school macro-goals                                                                           | ✗                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
|  |                                            |                                          | Working out conflicting views                                                                                             | ✓                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
|  |                                            |                                          | Thirst for improvement                                                                                                    | ✓                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
|  |                                            |                                          | Impacting national policy                                                                                                 | ✗                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
|  |                                            |                                          | Honouring teachers                                                                                                        | ✗                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
|  |                                            | Lewis, Perry & Hurd (2009)               | Positive impact on:<br>Teaching instruction<br>Teacher knowledge<br>Professional community<br>Teaching-learning resources | ✓<br>✓<br>✓<br>✓                                                                                                                                                                    |                                                                                                                                                                                                                                                          |
|  |                                            | Ní Shúilleabháin (2016)                  | Improved content and pedagogical content knowledge                                                                        | ✓                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
|  |                                            | Ogegbo, Gaigher & Salagaram (2019)       | Teachers can think more from the learner’s perspective                                                                    | ✓                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
|  |                                            | Cheung & Wong (2014)                     | Powerful tool for self-reflection                                                                                         | ✓                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |
|  | Possible problems associated with LS       | Groves & Doig (2010)                     | Cultural constraints:<br>Unwillingness to be scrutinised and criticised by colleagues                                     | ✓ Teachers exhibited extreme fear and unwillingness to present demonstration lessons (see 5.8.1.4.).                                                                                |                                                                                                                                                                                                                                                          |
|  |                                            | Akiba, Murata, Howard & Wilkinson (2019) | Time constraints                                                                                                          | ✗ This was not an insurmountable challenge. Once teachers were motivated to participate, the time was available for implementation (see 5.12.7.).                                   |                                                                                                                                                                                                                                                          |

|  | Topic of discussion from literature review | Authors and years               | Knowledge introduced in literary findings                                                                        | Confirmation ✓ or contradiction ✕ based on this research                                                                                                                                                                                                      | Interpretive discussion |
|--|--------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|  |                                            | Ono & Ferreira (2010)           | Teachers' focus on teaching breadth and not depth                                                                | ✕✓ Although teachers discussed teaching for meaning, depth may have been compromised because of too many activities planned (see 5.7.7. and 5.12.6.)                                                                                                          |                         |
|  |                                            | Janis (1982)<br>Stanley (2011)  | Problem of group think<br>Reinforcement of poor thinking                                                         | ✕ This was not an overt problem, however, facilitation focused on introducing new material to the group (see 5.12.1. and 5.12.3.6)                                                                                                                            |                         |
|  |                                            | Takahashi & McDougal (2016)     | Limited resources (textbooks)                                                                                    | ✕✓ A deficit of local resources (textbooks) that could be sourced was noted (see 5.6.2.), but most ideas and content were forthcoming from internet research (see 5.7.10.)                                                                                    |                         |
|  |                                            | Takahashi, Lewis & Perry (2013) | Teacher inability to glean from resources the necessary content information or understanding of learner thinking | ✕ This was not an overt problem in this study                                                                                                                                                                                                                 |                         |
|  |                                            | Takahashi (2014)                | Lack of experts for role of knowledgeable other                                                                  | ✕✓ A single LS expert was found to assist in the study, but it is apparent that experts are not easy to come by. This expert was also unavailable for the last demonstration lesson.                                                                          |                         |
|  |                                            | Yoshida (2012)                  | Overemphasis on product                                                                                          | ✕✓ There were occasional examples of participants valuing product over process (see 5.12.6.). There were more instances of participants describing growth through the collaborative process than their growth through creating a product (see 5.10.3).        |                         |
|  |                                            |                                 | Rushed implementation                                                                                            | ✕ This was not an overt problem in this study                                                                                                                                                                                                                 |                         |
|  |                                            |                                 |                                                                                                                  | Unlike the examples mentioned in the literature, this study highlighted other specific problems associated with the implementation of LS in this case (see 5.12.), namely:<br>Issues related to goal setting<br>A mixed starting point of learners in Grade 1 |                         |

|  | Topic of discussion from literature review | Authors and years | Knowledge introduced in literary findings | Confirmation ✓ or contradiction ✕ based on this research                                                                                                                                 | Interpretive discussion |
|--|--------------------------------------------|-------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|  |                                            |                   |                                           | The challenging role of the facilitator<br>Fear and problems associated with presenting<br>Poor communication skills<br>Incorporating too many activities into the demonstration lessons |                         |

### 6.3 FINDINGS ADDRESSING THE ABSENCES AND SILENCES IN THE LITERATURE

The literature guiding the study focused primarily on LS in foreign contexts and for intermediate and senior grades. The literature is comparatively silent surrounding the potential impact of LS on the professional development of teachers in a South African context. It is particularly mute regarding LS's potential to develop local teachers in an early grade context. The largest recorded attempt at a LS initiative in South Africa, the Mpumalanga Secondary Science Initiative (MSSI) project aimed institutionalising LS as a school-based PD initiative in Mpumalanga from 1999 to 2003 (Ono & Ferreira, 2010) was targeted at teachers from the Senior Phase (Grade 7-9) and Further Education and Training Phase (FET) (Grade 10 to 12) bands. Other research projects undertaken by Coe, Frick and Carl in the Western Cape (2010), and Ogegbo, Gaigher and Salagaram's (2019) focused on the Intermediate Phases (Grade 4-6) and FET phases respectively. The literature is therefore conspicuously silent on studies in LS in the early grade level (Grade R-3).

One of the important implications of this absence lies in the fact that LS is designed around a cycle that has been implemented in higher grades. This cycle begins with goal-setting (Fujii, 2019:412). The literature recommends that goal setting, both for general PD and LS, be rooted in the diagnostic assessment of the learner's performance to determine shortcomings (DuFour, 2004:6; Guskey, 2014:14; Sekao, 2020). However, in this study, at the onset of mathematics education in the early grades, such clear diagnostic evidence and problems surrounding the conceptual understanding of early grade learners is not readily available, and mostly subjective. Therefore, the recommended structure of the LS cycle as presented in the literature

loses some of its applicability. Based on the absence of clear diagnostic evidence for these early grades, in this study, the goal-setting stage of LS was anchored in an alternative starting point. Literature is silent on these potential alternatives. The findings of this study suggest that it was the teachers' conceptual understanding, rather than learners' diagnostic assessment, which facilitated the required goal setting stage of the LS cycle. This, in turn, promoted activity planning and had the potential to reciprocally impact conceptual understanding (see 5.12.1. and 7.4.3.). This finding lead to the re-structuring of the LS cycle in this study to begin with sessions exploring conceptual knowledge. The topics selected for the cycle were determined by the dates coinciding in the curriculum year-plan and not on diagnostic assessment. Once the topics were selected, findings in this study suggest that a helpful starting point for facilitating the cycle is the exploration of conceptual definitions, known methods or strategies for teaching and learning about the concept, the language of teaching the topic, potential pitfalls, articles and national curriculum content. These discussions facilitated goal-setting and a relaxed flow to the succeeding sessions in the cycle. A fuller exposition of this alternative process is discussed in section 7.4.3.

The literature is also silent regarding studies involving the dynamics of a collaborative professional development attempt between Grade R-2 teachers. The position of Grade R in South Africa remains unofficial, as formal education is only a legal requirement between the ages of 7 and 15 (SASA, 1996:6). However, the Department of Basic Education recognises Grade R in the national prescribed curriculum (DBE, 2011c). In this study, the collaborative relationship between teachers from these two bands was explored. Findings suggest that this combination of professional collaboration produced positive outcomes for inter-grade cooperation, the flow of knowledge between the grades, the improvement in flow of curriculum between these grades and the improvement of respect between teachers (see 5.9.).

#### **6.4 ALIGNMENT OF THE FINDINGS TO THE CONCEPTUAL FRAMEWORK OF THE STUDY**

This study relied on the work of four theorists in guiding the research process. The following table elucidates how this theoretical understanding underpinned the implementation of the study or the interpretation of the findings.

**Table 6.2: Alignment of research findings to conceptual framework of the study**

| Theoretical framework                         | Concepts isolated for their relevance and contribution to the study of the impact of LS as a PD tool                                                                                                                                                                                                                                                                                                                                                                                                    | Implementation in facilitating study or interpretation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Input-process-output theory by McGrath</b> | <ul style="list-style-type: none"> <li>• The essence of the group is defined by the interaction of its members</li> <li>• Group interaction and output is influenced by the input variables, namely: the nature of the participants, the group structure, the environment and the group's purpose</li> <li>• Group output impacts the input variables reciprocally</li> <li>• Group interaction forms interdependent patterns around communication, the task and interpersonal relationships</li> </ul> | <p>The cyclical theory of the group input variables reciprocating into group output variables was used in the facilitation and analysis of the study.</p> <p>In the careful monitoring and recording of group interactions it was noted that the participants collaborated freely (see 5.10.2.) and developed new understanding and respect for each other (see 5.9.3.). Although there were incidents of interpersonal strife (see 5.6.1., 5.8.1.1. and 5.9.3.), on the whole, group interaction was positive (see 5.10.2.) and professionally enhancing (see 5.7.11.) and personally rewarding (see 5.8.2.).</p> <p>In the challenge of establishing goal directives in the first LS cycle, the LS process was re-evaluated through McGrath's theoretical perspective and the conclusions reached were that the mixed input content knowledge (see 5.5.2.) and contradictory didactic approaches (see 5.6.1.) of the group had an effect on the group's communication patterns (see 5.12.5.2.), task development and interpersonal relationships of the group (see 5.9.3. and 5.8.1.1.), which resulted in the output variable of conflicting goals (see 5.12.1.). These conflicting goals in themselves became input variables that did not allow for optimal interpersonal collaboration or optimal task output variables (see 5.12.1.).</p> <p>In the second and third LS cycles, the input of specific and researched content knowledge (see 5.12.1 and 5.12.3.6.) had the required result of improved group interaction and goal setting which became the lubricating input variable facilitating further positive group interaction.</p> <p>Although the initial motivation for participation was not unified (see 5.3.), the group remained united in their desire to see the process through. The most apparent output variable (the lesson) and other output variables (e.g. professional development and positive collaboration experiences) became motivating input variables for teachers to continue</p> |

| Theoretical framework                        | Concepts isolated for their relevance and contribution to the study of the impact of LS as a PD tool                                                                                                                                                                                                                                                                                                                                                                                                           | Implementation in facilitating study or interpretation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | the process (see 5.8.3.), encouraging a cyclic continuation of the process.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Social development theory by Vygotsky</b> | <ul style="list-style-type: none"> <li>• Learning occurs collaboratively within a social context</li> <li>• Tools and signs indicate and mediate learning</li> <li>• Dialogue and discourse are vehicles of learning</li> <li>• Studying human behaviour involves more than studying responses to input stimuli</li> <li>• Learning involves a more capable individual/s socially mentoring a less capable individual/s through a scaffolding process within the zone of proximal development (ZPD)</li> </ul> | <p>This LS project was a clear example of collaborative learning within a social context (see 5.10.2.). The very nature of LS is highly collaborative and participants were very aware of learning from each other in this social context (see 5.10.3.).</p> <p>The use of hand-outs, sketches and manipulatives was apparent as vehicles of learning. Ideas were seldom explored without the use of tools to enhance the collaborative learning experience (see 5.7.8.). Participant signs were extensively analysed in their journaling, and interpretation was guided by peer reviewing.</p> <p>An important aspect of Social Development theory that came to the fore in the results, was the impact of communication on the functioning of the group. The practicing of clear communication and turn-taking improved slightly through the cycles, but poor communication was noted as a stress factor for group participants, and a contributor to poor shared learning (see 5.12.5.2.).</p> <p>The need for more capable individuals mentoring less capable ones became apparent, but the diversity of strengths of the group did not limit this relationship to a perpetually linear one. The mentorship process was often a cross- relational one, where the dominant strengths of the one teacher would present as mentorship to the other teachers, but as a new area of expertise was explored, the roles were reversed (see 5.10.3.). However, the role of content mentorship, i.e. of bringing new content knowledge to the learning environment, was a primary responsibility of the facilitator (see 5.12.3.6.).</p> <p>In exploring content, the reciprocal pedagogical-content knowledge of the participants was shared, often through demonstrations, and always through language.</p> |



| Theoretical framework              | Concepts isolated for their relevance and contribution to the study of the impact of LS as a PD tool                                                                                                                                                                                                                                                                                                                                                                                                             | Implementation in facilitating study or interpretation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>This research confirmed that the LS environment provided an ideal platform for teacher scaffolding. There were incidences of frustration when the ZPD of group participants were not corresponding. Some participants explained how certain concepts were well within their understanding, while for others it was a new field of understanding. The diverse ZPD that participants presented did require all participants to extend patience at various times of the study, allowing time and space for their peers to develop a particular concept. On the whole, participants were gracious with each other in this regard. There was only occasional evidence of boredom and frustration (see 5.8.1.1.)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Educational theory by Dewey</b> | <ul style="list-style-type: none"> <li>• Learning involves construction based on prior experiential knowledge</li> <li>• Learning should be contextually relevant</li> <li>• Learning requires active participation</li> <li>• Learning is a social process</li> <li>• Learning is guided by a facilitator who arranges experiences matching the learners' needs</li> <li>• Learning must be purpose-driven</li> <li>• Reflective thinking leads to examining and constructing core beliefs and ideas</li> </ul> | <p>Based on their cumulative years of teaching experience, the participants in this research possessed a wealth of experiential knowledge. It was a natural process to link new knowledge with pre-existing knowledge and the conversations and self-reflections of the teachers was rife with examples of how the study aided this linking process (see 5.7.2. and 5.7.3.).</p> <p>The learning process was exceptionally contextually relevant, as the process was steeped in references to classroom experiences, personal perspectives and the general school context (see 5.7.11.).</p> <p>All participants were actively involved in the process. Some were more vocal than others, as is to be expected with diverse personalities, but all teachers felt as though they contributed to the LS process (see 5.12.5.1.).</p> <p>The role of the facilitator was challenging and dynamic (see 5.12.3.). The deliberate arranging of learning experiences by the facilitator became more apparent in each cycle (see 5.12.1.). The research process of participant journaling did, however, provide the facilitator with an added advantage of having a better understanding of the participants' needs and allowed for adaptations to the facilitation style accordingly. Although not an official component of Japanese LS, journaling was</p> |

| Theoretical framework                    | Concepts isolated for their relevance and contribution to the study of the impact of LS as a PD tool                                                                                                                                                                                                                                                                                       | Implementation in facilitating study or interpretation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                          |                                                                                                                                                                                                                                                                                                                                                                                            | <p>an invaluable aid in this regard and would be recommended for similar studies involving the facilitation process and adapting the LS sessions to better suit the needs of the participants.</p> <p>Learning was motivated by both a process purpose (professional development) and a product purpose (presentation lesson) (see 5.8.3.). The process purpose was sometimes slow and required endurance, while the product purpose was more rewarding in the short term. In this study, learning was therefore fuelled by both short term and long term purpose.</p>                                                                                                                                                                                          |
| <b>Social learning theory by Bandura</b> | <ul style="list-style-type: none"> <li>• Learning can occur vicariously (through observation)</li> <li>• Successful action, modelling, social persuasion and positive emotional experiences influence the development of self-efficacy</li> <li>• Self-efficacy impacts behaviour, thought, emotion and motivation</li> <li>• Self-regulation is learning through introspection</li> </ul> | <p>In the research findings, the majority of learning was attributed to the collaboration process of pre-lesson and post-lesson discussion (see 5.10.3.). There were instances of vicarious learning, although this had less supporting evidence (see 5.7.9.).</p> <p>The self-confidence of participants improved throughout the study (see 5.7.5.), which in accordance with Bandura's theory can account for the changes in teaching behaviour and motivation that were noted (see 5.7.4. and 5.8.2.4.).</p> <p>There were several instances where the study provoked deep introspection (see 5.7.2. and 5.7.3.) and, in accordance with Bandura's theory, this impacted the subsequent self-regulation of teaching practices in the class (see 5.7.4.).</p> |

The conceptual framework underpinning the study provided a solid framework for guiding the facilitation of the LS research, interpreting the findings and reflecting on their significance in the light of the theoretical groundwork established by prior experts in the field.

## **6.5 CONCLUSION**

This chapter consolidated the research findings of the previous chapter with the literature review and conceptual framework of the study. Areas in which the findings confirmed or contradicted the expectations established by the literature review and conceptual framework were discussed. The succeeding and final chapter will present a conclusion to the study, particularly with reference to the research findings and how they relate to the research questions. These findings, together with the presentation of an adapted LS model are presented to answer the absences and silences noted in the literature.

## **7. CHAPTER 7: CONCLUSION AND RECOMMENDATIONS**

### **7.1 INTRODUCTION**

The preceding chapter considered the research findings in the light of the literature study and conceptual framework underpinning the study. In the light of the research findings this chapter presents the conclusion to the study, particularly with reference to the research questions. An altered model of LS implementation for the early grades is proposed. The chapter concludes with a discussion on the limitations of the study and recommendations for future research.

### **7.2 CHAPTER OVERVIEW**

The following discussion is a breakdown of the preceding chapters and their content.

#### **Chapter 1**

My introductory chapter commenced with an explanation of the importance of attending to the professional development (PD) of teachers in a South African context. I briefly visited the vision of the ISPFTED and discussed the platforms for PD offered through SACE and the CPTD system. The challenges of top-down PD approaches through workshops were weighted against the relatively untapped potential of bottom up PD approaches through the establishment of professional learning communities in South African schools. LS was posed as a possible solution to overcoming certain challenges described in the literature associated with teacher PD.

My personal rationale behind the study was explained, and the primary and secondary research questions were proposed. I incorporated a clarification of various concepts encountered in the study. A brief literature review visited literature describing effective PD, the proposed conceptual framework guiding the research and the theme of early grade mathematics intervention. I introduced LS in its basic form. My selected research design of social constructionism situated in the theoretical perspective of interpretivism was briefly explained. The methodology of case study as my proposed method of investigation, together with the eclectic methods of data collection, was explained. I briefly described my thematic analysis of the data, together with the ethical considerations that would guide the research. A brief time-line of my study was presented.

## **Chapter 2**

In Chapter 2 I reviewed literature in the field pertaining to the PD of teachers in general and within a South African context. Factors contributing to effective PD were explored as well as the shortages in meeting the local PD need. I visited existing literature on LS, exploring the components of authentic Japanese LS and possible problems to be expected in implementing the LS process. I concluded the chapter by reviewing the literature explaining the importance of professionally developing mathematics teachers for the early grades of South Africa.

## **Chapter 3**

In this chapter I rationalised the conceptual framework underpinning the study, utilising the work of four theorists in particular. Joseph McGrath's Input-Process-Output theory was explained in how, within a group context, the input variables have a reciprocal relationship with the output variables. The group's interaction, in turn, effects these input and output variables in a cyclical pattern. The work of Vygotsky was considered in the context of adult learning through social-cultural experiences, utilising language and tools within a zone of proximal development. Dewey's theory contributed to understanding the importance of learning through personal experience, and by making learning active and contextually relevant. Dewey's theory also contributed to the understanding that learning should be purposeful, socially situated and involve reflective thought. Bandura contributed the fourth theory to the study. He advocated vicarious learning, learning promoting self-efficacy and learning that impacts the self-regulation of behaviour.

## **Chapter 4**

This chapter situated the study within the epistemological framework of social constructivism, in which knowledge is constructed through social and cultural processes. I described my interpretivist theoretical perspective, as a subjective participant in a non-experimental research. My methodology of the research was presented as a case study, focusing on the phenomenon of early grade LS in an isolated and specific context. I described how the data were collected through a semi-structured focus group interview, questionnaires, field notes and reflective journaling. I defined the parameters of the research context as well as the criteria for sampling. Data decryption was explained using a thematic analysis. I concluded the chapter with

a description of the various steps undertaken in the study to ensure that the trustworthiness of the research was maintained. My ethical considerations were also expounded.

## **Chapter 5**

In Chapter 5 I presented an overview of the research findings. The coding and thematic analysis of the data revealed themes relating to the motivation of teachers to participate in the study, the impact of LS on the content knowledge and pedagogical content knowledge of the participants, as well as the impact of LS on other areas of their professional development. I explored the theme of the affective and physical impact of LS, as well as LS's impact on intergrade cooperation and general teacher collaboration. I presented findings on the impact of LS on curriculum development. My chapter concludes with a description of the challenges experienced in the study, in implementing LS in the early grades for the first time.

## **Chapter 6**

This chapter aligned the research findings discussed in Chapter 5 with the literature review of chapter 2 and the conceptual framework guiding the research in chapter 3. I explored confirmations and contradictions between the findings and the literature, as well addressed certain silences in the literature.

### **7.3 ALIGNMENT OF THE FINDINGS TO THE RESEARCH QUESTIONS**

The ISPFTED (DBE, 2011a) envisions the establishment of PLCs in schools to keep teachers abreast of emerging “knowledge about content and practice” (DBE, 2011a:14). It is also expected that PLCs will allow teachers to orientate themselves within the current curriculum and devise “activities and materials” to assist with their work. This study aimed to address research questions pertinent to the DBE's projected vision for professional learning through communities developing within schools. It was a study aimed particularly at investigating the gap in the literature regarding the impact of LS, as a PLC, on the professional development of teachers in the early grades of schooling.

### **7.3.1 Secondary research questions**

The study posed four secondary research questions. The evidence suggests that all questions were addressed in the study and the findings, on the whole, corresponded to expectations created in the literature.

#### **7.3.1.1 Secondary research question one**

The first secondary research question was: *What are teachers' perceptions of the impacts of using the LS method on curriculum development in mathematics in the early grades?*

The study created an awareness of curriculum flow within a grade and across the early grades (see 5.11.). There was a general awareness of current curriculum shortfalls. The study created opportunities for teachers to thoroughly plan for topics as units of progressive understanding within a grade. The participants also divided curriculum content logically and in accordance with their school calendar across given dates. Dates were allocated to topics based on a preference for using a spiral approach (revisiting the topic over time) or a block approach (teaching the topic for an extensive length of time).

The participants also developed a better understanding of curriculum connectivity between the early grades. There was a new awareness of repeating topics across the grades within the curriculum. Consensus was established regarding the need for a measure of repetition of curriculum content between grades, but the study created a better understanding of the need for depth of teaching and learning curriculum content in each grade.

#### **7.3.1.2 Secondary research question two**

The second of the secondary research questions asked: *What are teachers' perceptions of the impacts of using the LS method on their pedagogical content knowledge and content knowledge in teaching mathematics to the early grades?*

In the area of content knowledge, this LS unearthed that in spite of personal confidence there was a deficit in the content knowledge of the participants. This study proved to be a noteworthy tool in improving content knowledge, particularly when new content knowledge was deliberately introduced at the onset of a cycle (see 7.4.3.).

In the scope of pedagogical content knowledge, teachers definitely came to the table with pre-existing didactic opinions (see 5.6.). Some teachers were particularly focused on factors like meticulous handwriting, developing fine motor control (e.g., through colouring in), emergent literacy skills and the careful laying out of work. Other teachers seemed to be less focused on these aspects and more concerned about teaching more exclusively for mathematical concept development. There were provoking conversations regarding this dichotomy, but no clear resolution was reached between the two views.

With regards to pedagogical content knowledge, the study did lead teachers to acknowledge the link between better teaching and learner performance. The study positively impacted the tendency of most participants to look for lesson designs not based on worksheets, both in the LS presentation lessons and in teachers' private classroom practices.

Teachers approached the study with pre-existing ideas regarding the best approach to teaching and learning of mathematics. Through the analysis of the transcribed data, these approaches were categorised into three schools of thought, namely that teaching mathematics was an incidental outflow of learners' inherent genetic potential, or that teaching mathematics involved extrapolating methods for mathematical topics, or that teaching and learning mathematics involved solving problems for a learner journey of self-discovery of the best methods. At the conclusion of the study, participants were more inclined to believe that the problem-solving approach was superior to other approaches, albeit with a blend of method-based teaching.

The study provoked teachers to examine aspects of their teaching related to the grouping of learners, the incorporation of movement into lessons and the need for providing clear instructions for learners to follow. The teachers shared various tips and experiences that mutually developed their pedagogical content knowledge. A noticeable outcome of the study was that teachers set a high standard for their lessons in the LS process, which impacted the level that teaching was pitched at in Grade 1 and 2 outside of the LS sessions.



### 7.3.1.3 Secondary research question three

The third secondary research question asked: *How can LS be adapted in a South African context to fit into a full school timetable?*

In the context of expectations created through the literature, this was surprisingly less challenging than expected (see 5.12.7.). However, this study employed the full cooperation of the school management who were particularly supportive in rearranging the time-table for the demonstration lessons. The sessions for lesson discussion and design were held outside of school hours. Although participants complained about their tiredness on several occasions, they all voluntarily remained committed to attending planning meetings for the full three cycles, after school hours. Their motivation to do so may however be attributed to their knowledge that the study was both a professional development exercise as well as a research project.

The demonstration lessons were scheduled for the end of the school day. The normal school assembly time was shifted to the last period of the school day, which allowed for multiple teachers to view the demonstration lesson, while non-participating learners were supervised by fewer staff in the hall. As the school hall in this case study was relatively small, only eight classes could be accommodated simultaneously for the assembly, freeing seven teachers to view the demonstration lesson. In the last cycle of this study, social distancing imposed through COVID-19 restrictions did not allow for non-participating pupils to assemble in the hall. The parents were invited to fetch non-participating learners earlier from school. Those who could not be collected earlier were supervised on the playgrounds by two non-participating teachers. In all instances, this case study suggests that time-tabling factors are less of a barrier if school management is supportive and is willing to work in favour of the professional development process.

A bigger challenge to the LS process and school timetabling was the time-table clashes between the host school and those of surrounding schools. Teachers from surrounding schools were invited to attend demonstration lessons. As different schools have different time-tables most schools declined the invitation to attend. It was only in schools where management was motivated to send their staff (they made their own alternative time-tabling arrangements) or had reserve staff in the form of assistant teachers, that teachers could attend.

#### **7.3.1.4 Secondary research question four**

The fourth secondary research question was: *What are the challenges a school may encounter when implementing LS for the first time?*

This matter was extensively explored in this case study (see 5.12.). Factors that proved to be most challenging included the art of goal setting in the initial meetings of the LS cycles. Without a solid conceptual base in the first LS cycle, the participants approached the cycle with conflicting personal goals. This issue was only fully resolved in the second and third LS cycles when mutual conceptual understanding was established prior to the goal setting stage. This allowed for less frustration and more fluid facilitation of the LS process (see 5.12.1 and 7.4.3.).

The problems of mixed starting points (learner level of competence at the onset) were often mentioned as a challenge through the study. It would appear as though different Grade R standards, from different schools, produced an imbalance of learner scholastic levels, making the transition into the Grade 1 curriculum quite difficult for Grade 1 teachers to navigate. Admittedly, if the study commenced later on in the school year, this challenge may have been mitigated.

The role of facilitator was fraught with challenges. Finding the balance between training and facilitating was quite difficult. It was also difficult to determine if I was monopolising the conversation too much or allowing others to do the same. It was a constant negotiation to ensure that the conversation was relaxed and equally shared between participants. One of the most stressful aspects of the facilitation process was not having a clear “road map” to guide the sessions. The participants expressed faith and curiosity in my facilitation abilities, which added a dimension of pressure. The process of facilitation involved a constant consideration of many factors both personally and professionally, making the role quite emotionally and physically draining.

An unresolved challenge in the study, was the fear that participants faced in presenting demonstration lessons in front of their peers and visiting teachers. Although every effort was taken to emphasise that observation be directed at the learners’ learning, and that the teacher presenting was not the focal point of the observation process, participants remained fearful of this aspect regardless. A secondary challenge

associated with being a presenting teacher was that these teachers felt additional pressure to perform during the sessions building up to the demonstration lesson. This was mitigated in the last cycle by keeping the identity of the presenting teacher unknown until the day of the lesson.

Challenges in clear communication between participants were noted. Teachers were largely aware of their communication shortcomings, including a propensity for speaking over each other or expressing themselves unclearly. This LS process highlighted these deficiencies but also provoked a desire in some participants to change their poor communication habits. Evidence was presented of a small measure of improvement in interpersonal communication through the study.

A final challenge that was noted was the repetitive problem of including too many activities in the demonstration lessons. This propensity made the research lessons quite full and compromised on the demonstrating teacher's ability to follow through with the children presenting their ideas for problem-solving.

### **7.3.2 Primary research question**

The primary research question guiding the study was: *What is the impact of LS on the professional development of early grade teachers?*

Evidence discussed in the preceding chapters suggests that LS had a significant impact on several areas of the professional development of participating teachers (see 5.5. -5.11.) This was particularly noticeable in an improvement of the content knowledge (see 5.5.) as well as the pedagogical content knowledge (see 5.6.) of participants. Professional development was also noteworthy in the manifestation of a deeper awareness of teaching approaches (incidental teaching, method-teaching and problem-solving teaching), ways of grouping pupils, the need to provide clear instructions, the use mathematical language correctly and the use of movement in teaching. Teachers were impacted in their use and demonstration of creativity, an awareness of learner-centred teaching and the potential of using diverse teaching resources. There was a general provocation towards self-study through researching on the internet to be prepared for the LS sessions. The study improved the self-confidence of the participants, as well as their curiosity and motivation towards teaching mathematics. The LS process impacted the Grade 1 and 2 teachers' striving

towards higher attainment levels, both in the demonstration lessons and in teaching outside of the LS context.

The following table summarises the impact this LS research had on particular areas of professional development for the early grade teacher participants.

**Table 7.1: Summary of the impact of the study on the professional development of the participants in the study**

| Areas pertaining to professional development | Specific impact of lesson study, based on findings in this study                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Content knowledge (see 5.5.)                 | <p>Teachers expressed high levels of confidence in their own conceptual understanding prior to the study. However, the study elucidated several deficits in their content knowledge, ranging from an insufficient grasp of the CAPS syllabus, to a lack of knowledge about mathematical definitions and methods. Participating in this study had the dual benefit of creating a personal awareness of content knowledge shortcomings in some participants, and a means of improving these shortcomings in all participants.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Pedagogical content knowledge (see 5.6.)     | <p>The participants approached the study with pre-existing didactic beliefs. The study noticeably altered most of the participants' beliefs regarding their dependence on worksheets, decreasing their dependence.</p> <p>There was no evidence to suggest that pre-existing opinions regarding the importance of developing meticulous handwriting, developing fine motor control skills (e.g., through colouring in), emergent literacy skills and the careful laying out of work, in comparison to the importance of mathematical conceptual knowledge development, were specifically altered.</p> <p>However, this study did provoke participants to re-examine their beliefs in three particular schools of thought, namely the genetic predisposition of mathematical ability in learners developed through incidental teaching, the need for method-based teaching and the effects of teaching with a problem-solving approach. Participants acknowledged that through their involvement in this LS, problem-solving became a more attractive and preferential didactic approach.</p> <p>Participants often discussed the link between good mathematics teaching and potential learning.</p> <p>This study inspired some of the teachers to experiment with new grouping of pupils for teaching in their classes, as well as linking movement activities to mathematics lessons. An awareness of the important relationship between mathematics instruction and language was emphasized.</p> <p>The LS meetings provided ample space for the sharing of teaching tips. The meetings also provoked the teachers to design lessons of a noticeably high</p> |

| Areas pertaining to professional development                | Specific impact of lesson study, based on findings in this study                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                             | <p>standard, and specifically in the case of the Grade 1 and 2 teachers, to increase their expectation of their learners outside of the LS context.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p>Other impacts on professional development (see 5.7.)</p> | <p>This LS research provoked participants to use their creativity and to appreciate creative thinking in their colleagues. The study provoked rich and rewarding thinking about mathematical concepts both during the sessions and through reflective thought thereafter. This deep thinking was not limited exclusively to the topics discussed in the meetings but spilled over into reflections about teaching in general. The outcome of this thinking was noticeable implementation of new ideas in the classroom practices of the teachers.</p> <p>This study improved the self-confidence of the participants, particularly that of the youngest participant.</p> <p>Teachers were provoked to discussions and lesson designs based on learner-centeredness. These discussions further highlighted the necessity for teaching for deeper understanding in learners.</p> <p>New teaching resources were debated, designed, created and evaluated throughout the study. This also provoked participants to think creatively about using new resources outside of the LS sessions in their classes.</p> <p>Through the study, the participants had opportunities to observe learners and the learner thinking processes. These observations were rewarding and sometimes surprising or disappointing. Observing other teachers presenting lessons also provoked participants to implement some of their observations and evaluate the appropriateness for their own classroom settings.</p> <p>Indirectly, the professional development of the participants was also enhanced by their self-study. Particularly from the second cycle onwards when the structure of the cycles was more established (see 7.4.3.). As facilitator, I encouraged teachers to bring focused content and activities to the collaborative sessions. This provoked them to self-study and subsequently had a further impact on their professional development.</p> |
| <p>Affective and physical impact (see 5.8.)</p>             | <p>This study often left participants physically drained. Teachers were not always positive through the study, and occasionally expressed emotions like boredom, disillusionment, fear and frustration. Particular stressors identified in the study were the differences in didactic beliefs of different grade participants, physical exhaustion, fear of participation (feelings of inadequacy), fear of presentation and the clash of lesson goals between participants in the initial cycle of the study (see 5.12.1.).</p> <p>In spite of these negative aspects, there were many recorded cases of the study invoking positive emotions like enthusiasm, curiosity and enjoyment.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Areas pertaining to professional development        | Specific impact of lesson study, based on findings in this study                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                     | Participants found that overall, the study was extremely motivating for their mathematics teaching.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Intergrade cooperation and relationships (see 5.9.) | <p>From the onset of the study, it was apparent that teachers lacked sufficient knowledge about the content being covered in mathematics in the grades preceding or succeeding their own. In this study, teachers were made more aware of the repetition of content between grades and the poor knowledge retention of learners from one grade to the next.</p> <p>This LS provided the platform for teachers to consider their feelings of being disrespected by other grades. This was a particular concern of the Grade R teachers, who felt disrespected by the higher-grade teachers. However, an improvement in mutual respect was noted by most participants in the study. Participation in the research therefore built personal (respect) and professional (curriculum and content flow) bridges between the grades which were necessary, noted and valued by participants.</p> |
| Collaboration (see 5.10.)                           | This study harnessed the power of collaborative thinking between professionals. Participants acknowledged a pre-existing unfulfilled need for collaboration. The collaborative process created in this study was repetitively described as enjoyable and fruitful by all participants. Teachers developed each other richly throughout.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Curriculum development (see 5.11.)                  | The participant teachers examined the Grade 1 curriculum as a whole, as well as certain constituent parts of that whole. The flow of the curriculum within the grade was improved as well as the curriculum flow across the early grades (Grade R, 1 and 2). Through the study, certain topics were delegated to block curriculum teaching and others to spiral curriculum teaching in the Grade 1 curriculum. There was also discussion about the breadth and depth that certain topics should be covered in the grade as well as in preceding and succeeding grades.                                                                                                                                                                                                                                                                                                                   |
| Communication (see 5.12.5.)                         | This study revealed communication flaws between participants. This revelation assisted some participants in improving their skills through the process.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

The following table represents a simplistic overview of the impact of Lesson Study on various areas of professional development of the participants.

**Table 7.2: Simplistic overview of the impact of lesson study on the PD of early grade teachers**

| Broad PD area impacted        | Specific PD area impacted                                                                                                      | Decreased/<br>Weakened                                                               | Increased/<br>Improved |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------|
| General content knowledge     | Mathematical content knowledge (see 5.5.4.)                                                                                    |    |                        |
| Pedagogical content knowledge | Teacher pedagogical content knowledge (see 5.6.)                                                                               |    |                        |
|                               | Dependence on worksheets (see 5.6.2.)                                                                                          |    |                        |
|                               | Variety of methods in method-based teaching approach (see 5.6.4.2.)                                                            |    |                        |
|                               | Desire to use a problem-solving teaching approach (see 5.6.4.3.)                                                               |    |                        |
|                               | Belief in the genetic disposition of learners towards mathematics, resulting in an incidental teaching approach (see 5.6.4.1.) |  |                        |
|                               | Link between teaching and learning (see 5.6.3.)                                                                                |  |                        |
|                               | Change in grouping of learners (see 5.6.5.)                                                                                    |  |                        |
|                               | Awareness of giving clear instructions and the importance of using clear language in teaching mathematics (see 5.6.7.)         |  |                        |
|                               | Level of attainment expected from learners in Grade 1 and 2 (see 5.6.9.)                                                       |  |                        |
|                               | Level of attainment expected from learners in Grade R (see 5.6.9.)                                                             |  |                        |
|                               | Combining movement into mathematics lessons (see 5.6.10.)                                                                      |  |                        |
|                               | Creative thinking (see 5.7.1.)                                                                                                 |  |                        |

| Broad PD area impacted                   | Specific PD area impacted                              | Decreased/<br>Weakened | Increased/<br>Improved                                                               |
|------------------------------------------|--------------------------------------------------------|------------------------|--------------------------------------------------------------------------------------|
| General learning and PD                  | Self-reflection on teaching mathematics (see 5.7.2.)   |                        |    |
| General PD and learning                  | Self-reflection on teaching in general (see 5.7.3.)    |                        |    |
|                                          | Self-confidence (see 5.7.5.)                           |                        |    |
|                                          | Awareness of learner-centred teaching (see 5.7.6.)     |                        |    |
|                                          | Use of novel resources in teaching (see 5.7.8.)        |                        |    |
|                                          | Self-study (see 5.7.10.)                               |                        |    |
| Affective and physical                   | Motivation towards teaching mathematics (see 5.8.2.4.) |                        |   |
|                                          | Professional curiosity (see 5.8.2.2.)                  |                        |  |
| Intergrade cooperation and relationships | Flow of knowledge between grades (see 5.9.4.)          |                        |  |
|                                          | Curriculum development across grades (see 5.11.2.)     |                        |  |
|                                          | Feelings of respect for colleagues (see 5.9.4.)        |                        |  |
| Curriculum development                   | Curriculum development within the grade (see 5.11.1.)  |                        |  |
| Interaction with peers                   | Learning through collaboration (see 5.10.3.)           |                        |  |
|                                          | Communication (see 5.12.5.1.)                          |                        |  |

## 7.4 DISCUSSION OF OTHER KEY FINDINGS

The study into the impact of LS on the professional development of early grade teachers produced several findings that directly addressed the research questions.



There were, however, other findings outside of the scope of the research questions, having a secondary impact on the research questions, which emerged in the data analysis.

#### 7.4.1 Motivation required to begin lesson study

At the onset of the study, teachers shared diverse motives for participating in the research (see 5.3. and 5.4.). There was no dominating motivating factor amongst participants, which makes it difficult to recommend any particular way of presenting the process to teachers or schools in a similar context. With regards to time restrictions, much can be done with the support of the school management in alleviating perceived time challenges to participation. The following table summarises the factors motivating and demotivating teachers to participate in the research.

**Table 7.3: Factors influencing teachers' motivation to participate**

| Motivation factors                                                                                                                                                                                                                                                                                                                     | Demotivation factors                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Improving others (not self)<br>Collaboration with other grades<br>Participation in research<br>Personal reasons<br>Perceived benefit to classroom teaching<br>Collaboration in general<br>Developing learner-centred teaching<br>Curiosity regarding the facilitation of LS<br>The appeal of doing "something new"<br>Self-improvement | Time restraints<br>Afternoon job<br>Administrative overload<br>Fear of exacerbating poor pre-existing interpersonal relationships<br>Fear of being selected to present a lesson for peer review<br>Self-doubt<br>The grade for which the LS programme was pitched |
| Demotivation factors for other schools                                                                                                                                                                                                                                                                                                 | Recommendations by participants for improved motivation                                                                                                                                                                                                           |
| School programme too full<br>The disruption of teaching time                                                                                                                                                                                                                                                                           | Emphasis on expected positive outcomes<br>Emphasis on voluntary participation                                                                                                                                                                                     |

#### **7.4.2 Motivators to continue with the process**

There was also no singular driving factor motivating participants to continue with the process (see 5.8.3.). Some of the participants acknowledged the awareness of their professional development as motivating for them to continue. Most of the participants simply enjoyed the collaboration process with their colleagues. Curiosity was a motivator, with a desire to see the outcome of the process, including the actual presentation lesson itself. Participation in the research remained a motivator for one participant who believed in the power of the process to impact education beyond the school context. The same teacher mentioned her work ethic as the final motivator for her to continue, particularly through her phases of disillusionment.

#### **7.4.3 Preferred implementation of lesson study**

It is noteworthy that after experiencing three cycles of LS, the participants could not reach a consensus regarding the optimal design of the study for continuation in the school. Some participants opted for voluntary participation, while others maintained that compulsory participation would be more fruitful. All participants felt that all teachers in every grade should participate and were positive about mixing teachers from different phases. It was suggested by more than one participant that inviting teachers to attend one session of a LS project would be very inspirational and would encourage voluntary participation. Consensus was not reached regarding the number of cycles that should be implemented (although it was mentioned that the longer one participated, the richer the experience) or which term the process should commence in. I therefore conclude that LS is quite flexible and can be adapted in a variety of ways to suit the school context in which it occurs.

#### **7.4.4 New insights – a proposed adaptation to the lesson study model eliminating some challenges of the lesson study process as experienced in this study**

Through the process of implementing LS for the first time in the early grades of a school, various challenges came to the fore that had an impact on the facilitator's ability to implement the traditional cycle of goal setting, planning, teaching and reflecting. Specific goal setting for the research lesson was more difficult than initially anticipated (see 5.12.1.). Furthermore, it became apparent that exploring new content knowledge needed to precede goal-setting in the cycle. In this study, once this factor

was worked into the order and agenda of the meetings, the cycle was better mapped out and facilitation was easier accomplished.

In the traditional Japanese LS cycle, the collaborative teacher group establishes a research theme as the first step of the LS process (Fujii, 2019:412; Seleznyov, 2018:220). Included in this stage, the teachers engage in studying the curriculum and determining what topic is particularly difficult for learners to understand, followed by establishing a learner-oriented goal for the lesson (Akiba *et al.*, 2019:3).

A similar adaptation of this recommended start of the LS cycle emerged in the model proposed by the University of Pretoria and is intimated as the LS model adopted by South Africa (Sekao, 2020). In this model, LS begins with diagnostic assessment through an analysis of learner results to determine shortcomings and areas requiring intervention. “This is where the LS has to start, where we identify a problematic concept in mathematics” (Sekao, 2020). Dr Sekao explains further how this can be accomplished through analysing learner responses to common tests or examinations.

However, in early grades, like those of this case study, formal testing and examinations are not readily available as diagnostic tools for young learners. As mathematical concept formation is embryonic in Grade R and Grade 1, it is not beneficial to identify the learners’ incorrect or misguided concepts, as these concepts are in the very process of being formed. It is therefore proposed that after identifying the broad teaching topic based on the time of year and the curriculum, the starting point of the LS cycle in very early grades should rather be “What and how should concepts be taught?” instead of “What concepts have not been grasped, are difficult for learners to grasp or need re-teaching?”. The subtle difference between these two questions has far-reaching implications for the preparedness of the facilitator and teacher participants in the LS cycle for early grades. In the South African model (Sekao, 2020), the goal for a presentation lesson is rooted in the qualitative analysis of learners’ weaknesses. In this adapted model, the goal for a presentation lesson is rooted in participating teachers’ broad conceptual understanding of a topic, to better equip them, in laying a solid foundation for good conceptual understanding in learners.

The following image summarises the various steps taken in the proposed adaptation of the LS cycle model, to better suit the needs of early grade teachers.

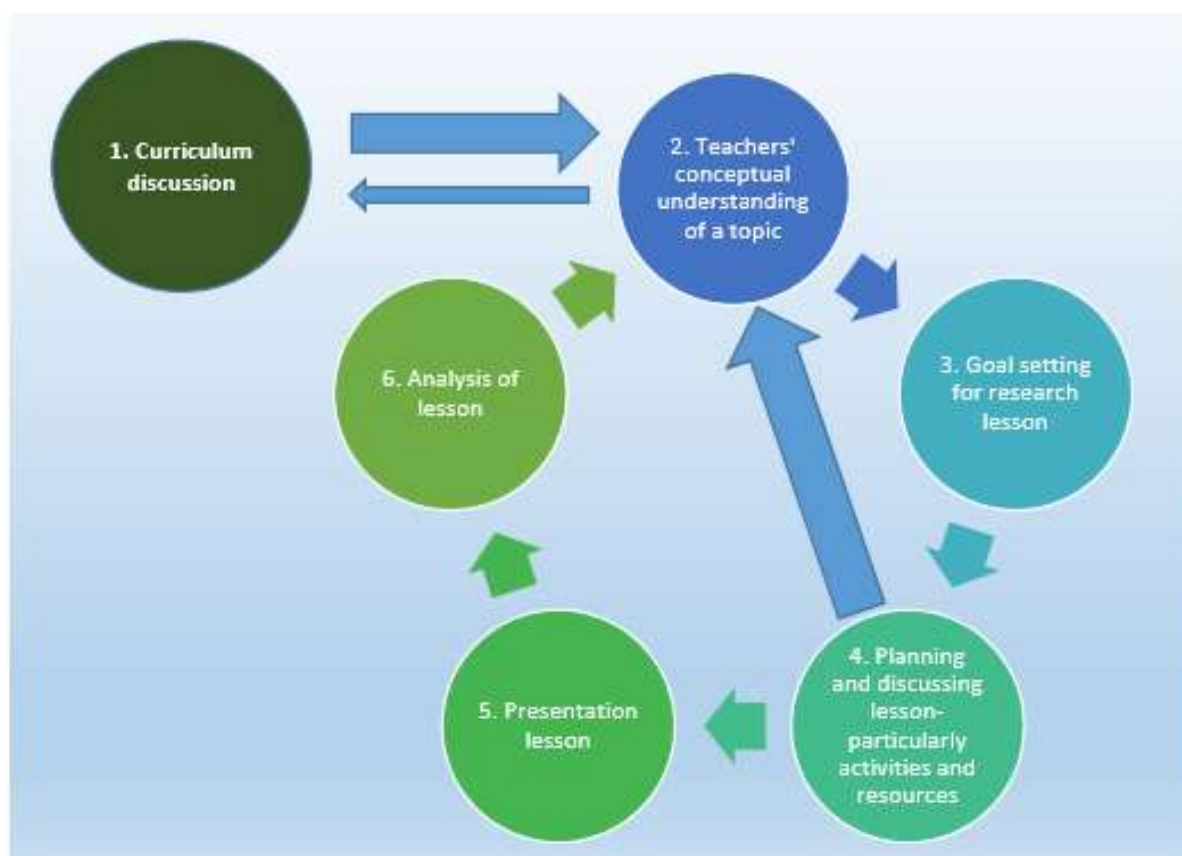


**Figure 7.2: Proposed adaptation of lesson study model for early grade application (compiled by author)**

The departure point for this adapted LS model is a collaborative discussion on the curriculum layout across the school calendar (see circle 1 in figure 6.1.). In this study, the LS participants spent a substantial portion of time (approximately 4 hours) in broadly discussing the curriculum and its division across the teaching weeks before embarking on planning the first research lesson. Once the curriculum division and flow were established, including a discussion on factors like revisiting short sections of topics throughout the year versus covering topics in undivided blocks (spiral versus block curriculum), the broad topics for the research lessons became apparent. Planning presentation lesson dates coincided with the curriculum calendar e.g., we planned our first research lesson for the first week of March and the school curriculum plan provided us with our broad topic of “patterning”.

It was apparent in our second and third LS cycles that a practical and fruitful start of the LS cycle began with increasing the conceptual understanding of the participants (see circle 2 in figure 6.2.). A foundation of content knowledge assisted the participants in the goal setting stage (see circle 3 in figure 6.2.). Once goals were established, it

became easier to discuss possible lesson activities to meet these goals (see circle 4 in figure 6.3.). However, in working through various activities, the content knowledge and pedagogical content knowledge of the teachers was expanded even further. This had the potential to shift or alter the original goals of the lesson, (see back arrow in figure 6.2. from circle 4 to circle 2). It is therefore not an entirely linear model, as shifting from one stage to the next was occasionally necessary. This shifting back and forth between the stages of LS cycle is also a common occurrence in the traditional South African LS model as explained by Dr Sekao (Sekao, 2020). Once the final activities were selected and the lesson flow was refined, the remaining stages of the LS cycle proceeded according to the expected LS model (see circle 5 and circle 6 in figure 6.2.) (Groves, Doig, Widjaja, Garner & Palmer, 2013:10).

Based on this study, the facilitation of this adapted LS cycle is explained in terms of recommended inputs and outputs, in the following table:

**Table 7.4: Recommended inputs and outputs of specific meetings in lesson study cycles for early grade teachers**

| First cycle (succeeding cycles begin at meeting 2) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                               |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                    | Brought to the table by participants (input directed by facilitator)                                                                                                                                                                                                                                                                                                                                                                                                                                          | Outcome of collaborative discussion (output)                                                                                                                                                                                                                                                                                   | Resulting evidence (output)                                                                                                                                   |
| Meeting 1                                          | <ol style="list-style-type: none"> <li>1. Current national curriculum</li> <li>2. Year-plan (dated)</li> <li>3. Teacher experience</li> <li>4. Textbooks or other teaching resources</li> </ol>                                                                                                                                                                                                                                                                                                               | Distribution of topics (units) prescribed by current national curriculum into school's year-plan (including block or spiral distribution)                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• Year-plan with specified topics</li> </ul>                                                                           |
| Meeting 2                                          | <ol style="list-style-type: none"> <li>1. Important definitions</li> <li>2. Known methods or strategies for teaching and learning about the concept</li> <li>3. Way in which teachers use language related to the topic (including the phrasing of questions or problems around topic)</li> <li>4. Pitfalls learners face in this topic (based on teacher experience)</li> <li>5. Relevant articles or research on the topic</li> <li>6. National curriculum statement information regarding topic</li> </ol> | <ol style="list-style-type: none"> <li>1. Lists of potential goals for teaching the topic</li> <li>2. Allocation of goals to individual lessons within the topic unit (goals allocated to individual lessons)</li> <li>3. One lesson within the unit selected as a demonstration lesson with a clear, specific goal</li> </ol> | <ul style="list-style-type: none"> <li>• Construction of a broad "topic map"</li> <li>• Topic selected for demonstration lesson with specific goal</li> </ul> |

| First cycle (succeeding cycles begin at meeting 2) |                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                          |                                                                                                      |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
|                                                    | Brought to the table by participants (input directed by facilitator)                                                                                                                                                                                                                                               | Outcome of collaborative discussion (output)                                                                                                                                                                                                                             | Resulting evidence (output)                                                                          |
| Meeting 3                                          | <ol style="list-style-type: none"> <li>1. Possible problem-solving activities for demonstration lesson</li> <li>2. Possible method-teaching activities for demonstration lesson</li> <li>3. Resources for collaborative demonstration and participation, often in their rudimentary and unfinished form</li> </ol> | <ol style="list-style-type: none"> <li>1. Discussion on merits of activities in the light of meeting the lesson goal</li> <li>2. Selection of best activities</li> <li>3. Preferable grouping of learners for activities</li> </ol>                                      | <ul style="list-style-type: none"> <li>• A skeletal lesson plan</li> </ul>                           |
| Meeting 4                                          | <ol style="list-style-type: none"> <li>1. Raw materials for making lesson resources</li> <li>2. Expected learner questions</li> <li>3. Expected learner responses</li> </ol>                                                                                                                                       | <ol style="list-style-type: none"> <li>1. Flow of activities</li> <li>2. Wording/ phrasing of parts of the lesson</li> <li>3. Constructing of lesson resources</li> <li>4. Selection of lesson presenter</li> </ol>                                                      | <ul style="list-style-type: none"> <li>• In depth lesson plan</li> <li>• Lesson resources</li> </ul> |
| Meeting 5                                          | <ol style="list-style-type: none"> <li>1. Demonstration lesson</li> </ol>                                                                                                                                                                                                                                          | <ol style="list-style-type: none"> <li>1. Post lesson discussion with focus on               <ol style="list-style-type: none"> <li>1.1. Learner-learning</li> <li>1.2. The extent to which demonstration lesson met goal objectives of meeting 2</li> </ol> </li> </ol> | <ul style="list-style-type: none"> <li>• Feedback report on cycle</li> </ul>                         |

In this study, by following this tabulated “road map” that evolved, the sessions became progressively easier to facilitate, and challenges were mitigated. The problems associated with goal setting (see 5.12.1.) and facilitating (see 5.12.3.) were subsequently alleviated from cycle 2 onwards. A secondary outcome was also better communication between research participants (see 5.12.5), although this cannot be conclusively attributed to the implementing of this altered model and may be a natural outcome of general group interaction over a period of time (Tuckman, 1965:386).

## 7.5 LIMITATIONS OF THE STUDY

### 7.5.1 Inherent limitations of this study as a case study

In the paper of Hodkinson and Hodkinson (2001), the strengths and limitations of case study research are expounded. Although ideal for rich conceptual and theoretical development, case studies are limited by their cumbersome nature. They produce vast amounts of data which could compromise the uncovering of smaller and less

noticeable important issues. The uncovered complexities are difficult to represent clearly and case studies do not lend themselves to easy graphic representations, as would be the case with numerical data. Furthermore, case studies findings are difficult to generalize. Although the strength of the case study is improved when the researcher engages in analysis using her expertise and intuition, objectivity becomes more difficult to establish.

All of these inherent weaknesses are applicable in this study. Vast amounts of data were generated, and although the data was repeatedly coded and re-coded, creating a research trail that was audited by an independent colleague, important themes and topics could have been overlooked in the data analysis and representation process. The representation of the findings was also difficult to present concisely without compromising on the richness of the evidence. As this case study was very contextualised and consisted of a small sample, the broad scale generalisability of the findings is not recommended. Nevertheless, the theoretical findings can be transposed to similar situations, and where the reader can identify with the context of the study, parallels will be pertinent.

### **7.5.2 Limitations caused by the researcher as a participant observer**

One of the primary limitations of this research is the inherent subjectivity of the researcher as a participant and a researcher. My beliefs and experiences as a researcher, as well as the influence I may have wielded over the participants may have created a bias in the process of data collection and analysis (Iacono, Brown & Holtham, 2009:41). Although steps were taken to eliminate as much bias as possible through the establishing of an audit trail and engaging in regular meetings with a peer auditor, as well as inviting research participants to assist with member checking, researcher bias was an inevitable limitation of this chosen method of study. To mitigate this bias, effort was also expended in using multiple sources of information in the triangulation and crystallisation processes (see 4.7). However, as this study was exploratory, interpretation of the data involved a personal and interpretive process only possible through my direct insider perspective. Naturally, the perspective of a different participant observer would influence the interpretation of the findings, possibly highlighting alternative research themes, even when faced with the same data set as what I worked with (Guest, Namey & Mitchell, 2013:79).

### **7.5.3 Limitations created through demand characteristic bias**

In a social study, it is a challenge to mitigate the awareness that the participants have of the study's intended purpose (demand characteristic bias). The researcher may unconsciously cue the participants regarding the research expectations (Nichols & Maner, 2008:151). However, I do believe the participants in the research were more conscious of their own professional development process than the actual research purpose, as seen by this statement:

*I have enjoyed listening to her [the facilitator's] ideas, and so have often forgotten that this is a research project...(T5 in Q4/4)*

Nevertheless, the possibility exists that the responses of the teachers in their interviews, questionnaires and personal journals could have been influenced by their awareness of the expected findings of the research, whether deliberate or unconscious.

## **7.6 RECOMMENDATIONS FOR FUTURE RESEARCH**

### **7.6.1 Longevity of impact**

Although evidence suggests that impressive professional gains were made through the three LS cycles in this research, it would be a noteworthy to determine the longevity of these gains. This would elucidate if changes were sustained, particularly in areas like participant teachers' curriculum planning, curiosity, didactic approaches and motivation to teaching mathematics as a result of participating in the study. The sustained causal relationship between participation in a LS project and these variables would be difficult to establish, however. Nevertheless, this would be a beneficial endeavour to determine the long-term value of LS as a potential professional development tool for early grade educators in South Africa.

### **7.6.2 Facilitation styles**

One of the many struggles I faced as a participant researcher in this study, was the best approach to facilitation in the LS group. Although each LS group will develop its own basic characteristics due to inevitable human factors, and no two LS groups can be alike, I would recommend more detailed research into issues around what types of questions facilitators should ask, how much facilitators should speak in relation to



participants and how much content facilitators should bring to the table at the onset of a LS cycle. I trust that the adapted LS cycle model proposed in this research will assist future facilitators in similar contexts by providing a basic “road map” for beginning LS for early grade teachers, however, further research is required to provide guidance into attaining a recommended balance between training and facilitating, particularly in the area of developing the conceptual knowledge of the group in a LS context.

### **7.6.3 Several case studies and multiple researchers for greater triangulation of research results**

This study was limited to a single case study in one school conducted by a single researcher. It is recommended that multiple case studies across different schools be conducted to triangulate and strengthen the findings of the research. Multiple concurring case studies would also generate findings into the impact of LS on inter-school relationships at a district level, as cross-school participation will be facilitated through teachers’ required visitations to demonstration lessons. Furthermore, several researchers engaged in interpreting the data would mitigate many of the bias factors incurred in this case study.

### **7.6.4 Intergrade cooperation with intermediate phases**

One of the secondary research questions of this study was directed at the impact of LS between teachers of different early grades. Impact was noted in their improved understanding of curriculum flow, as well inter-grade collaboration and a measure of improved respect between grades. The grades participating in this study were from different grades within one phase however, namely the foundation phase of schooling in South Africa, Grade R to Grade 3 (DBEWC online). Research should be undertaken into the benefits of LS across two phases. It is suggested that teachers from the foundation phase and intermediate phase participate in cross-phase LS to determine the impact on curriculum development and flow between two different school phases.

### **7.6.5 Lesson Study for younger grades**

This research incorporated teachers from Grade R to Grade 3. Further research should be undertaken to explore the impact of Lesson Study on the PD of pre-Grade R teachers. There is vacancy in the research for Lesson Study and its impact in the very young grades, both locally and internationally. However, challenges will include

that the teaching content and concepts become less elucidated or documented as the grades get progressively younger. Curriculum expectations become less defined and creative ideas for problem-solving in this context become quite challenging. Research should be undertaken to determine if Lesson Study is as a robust PD platform for PD in these younger grades as what it has proven to be in the foundation phase of schooling.

## **7.7 CONCLUDING REMARKS**

In the research findings, LS has proven to be a remarkably flexible and fruitful approach to the bottom-up PD of early grade teachers. Through the collaborative input, reflective ruminations and brave demonstrations of the ladies who participated in the research, our teaching lives were changed. Although the impact of this change is highly contextualised, the evidence suggests that this case study kindled something powerful in the hearts of the teachers, influencing their professionalism and, most importantly, the lives and learning of the young in their care.

*“Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it is the only thing that ever has.” (Margaret Mead in Keys, 1982:79)*

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## 9. APPENDICES

### 9.1 SAMPLE OF PRIMARY TEACHER CONSENT LETTER



Faculty of Education

#### Appendix A:

#### Primary teacher letter of consent

23 March 2020

#### The impact of Lesson Study on the professional development of early grade teachers

Dear Teacher

I am Erika Helmbold, a Doctorate student at the University of Pretoria. The title of my study towards my doctorate degree is: The impact of Lesson Study on the professional development of early grade teachers. The aim of the study is to investigate the professional development outcomes in the lives of early grade teachers through the implementation of Lesson Study at a school.

The research will be conducted under the supervision of Dr Roy Venketsamy and Dr Judy van Heerden, Department of Early Childhood Education, University of Pretoria.

I kindly invite you to participate in this study. There are various parts to this research, including one or two group interviews (using a semi-structured interview format), one or two questionnaires, weekly reflective journaling and participation in three Lesson Study cycles. The anticipated duration of the research is 16-weeks. Your involvement would require your remaining at school after hours for at least two hours once a week to collaboratively plan or discuss lessons with the other research participants. Three participating teachers may volunteer to present a collaboratively planned lesson to Grade 1 or 2 learners during the research period.

Your participation in the study is voluntary and confidential. You have the right to withdraw at any point during the research study without any consequences or explanations. You can be assured that your decision will be respected. Confidentiality will be guaranteed as I will use aliases in the transcription phase. No participant names or personal information will be reported in my findings. If you chose to withdraw from the research, the confidential data collected to that point may still be used in the research.

In participating in this research study, you will be asked for permission by the researcher to make audio recordings of the collaborative meetings and semi-structured interviews. The purpose thereof is to make transcription of the data valid and authentic. The transcriptions will be safely kept in the cloud and password protected. All data collected will only be used for academic purposes.

You may ask questions before or during the time of participation. If you have any concerns regarding the data collection procedures, please notify me or my supervisor. As a participant, you will have the opportunity to access and verify the recorded views and the transcriptions made.

Faculty of Education  
Fakulteit Opvoedkunde  
Lefapha la Thuto

I would like to take photographs during the study, which may be used in the presentation of the research findings. Your anonymity will be protected through facial editing (blocking) in these photographs.

We also would like to request your permission to use your data, confidentially and anonymously, for further research purposes, as the data sets are the intellectual property of the University of Pretoria. Further research may include secondary data analysis and using the data for teaching purposes. The confidentiality and privacy applicable to this study will be binding on future research studies.

Please indicate by signing, your understanding of the information shared above, the purpose being to give your consent to participate.

Kind regards

\_\_\_\_\_  
Erika Helmbold  
[admin@solidfoundationprimary.com](mailto:admin@solidfoundationprimary.com)  
011-978-5300  
083-988-9702

Supervisors  
Dr Venketsamy ([roy.venketsamy@up.ac.za](mailto:roy.venketsamy@up.ac.za))  
Dr van Heerden ([judy.vanheerden@up.ac.za](mailto:judy.vanheerden@up.ac.za))

**Permission for research**

I, \_\_\_\_\_, hereby give permission to Erika Helmbold, to include me as a participant in her research entitled: The impact of Lesson Study on the professional development of early grade teachers.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## 9.2 SAMPLE OF EXPERT CONSENT LETTER



Faculty of Education

### Appendix B:

#### Expert letter of consent

28 August 2019

#### The impact of Lesson Study on the professional development of early grade teachers

Dear Dr DS (alias)

I am Erika Helmbold, a Doctorate student at the University of Pretoria. The title of my study towards my doctorate degree is: The impact of Lesson Study on the professional development of early grade teachers. The aim of the study is to investigate the professional development outcomes in the lives of early grade teachers through the implementation of Lesson Study at a school.

The research will be conducted under the supervision of Dr Roy Venketsamy and Dr Judy van Heerden, Department of Early Childhood Education, University of Pretoria.

I kindly invite you to participate in this study. Your role would be that of giving expert advice in collaborative meetings as a specialist in Lesson Study and early childhood mathematics. Your involvement in the research would require your attending up to three early grade mathematics research lessons in a school in the Ekurhuleni North region at the end of a school day and then giving your advice and reflective thoughts at a collaborative post-lesson discussion meeting thereafter.

Your participation in the study is completely voluntary and you may withdraw your participation at any time, without any consequences or explanations. If you chose to withdraw from the research, the data collected to that point may still be used in the research. All discussions and data collected will remain completely confidential. This will be ensured through the use of a pseudonym, and no personal information will be reported in the findings. The recordings and transcriptions of the data will be stored under password protection in the cloud. Only the adult research participants, the research supervisors and myself will have access to the data for analysis, verification and comment. The data will only be used for academic purposes.

I would like to take photographs during the study, which may be used in the presentation of the research findings. Your anonymity will be protected through photograph editing (facial blocking).

We also would like to request your permission to use your data, confidentially and anonymously, for further research purposes, as the data sets are the intellectual property of the University of Pretoria. Further research may include secondary data analysis and using the data for teaching purposes. The confidentiality and privacy applicable to this study will be binding on future research studies.

Faculty of Education  
Fakulteit Opvoedkunde  
Lefapha la Thuto



You are welcome to ask me any questions at any time during the research process. Please bring any concerns that you may have to my attention, or to the attention of my supervisors. You are invited to verify the transcription and analysis of the data at any time prior the writing of the formal thesis.

If you are willing to participate in the study, please kindly complete the attached consent form.

Kind regards

\_\_\_\_\_  
Erika Helmbold  
[admin@solidfoundationprimary.com](mailto:admin@solidfoundationprimary.com)  
011-976-5300  
083-988-9702

Supervisors  
Dr Venketsamy ([roy.venketsamy@up.ac.za](mailto:roy.venketsamy@up.ac.za))  
Dr van Heerden ([judy.vanheerden@up.ac.za](mailto:judy.vanheerden@up.ac.za))

**Permission for research**

I, \_\_\_\_\_, hereby give my permission to Erika Helmbold, to include me as a participant in her research entitled: The impact of Lesson Study on the professional development of early grade teachers.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

### 9.3 SAMPLE OF FAMILY CONSENT LETTER



Faculty of Education

**Appendix C:**

**Family letter of consent**

**25 /01/ 2019**

#### **The impact of Lesson Study on the professional development of early grade teachers**

Dear Parents

I am Erika Helmbold, a Doctorate student at the University of Pretoria. The title of my study towards my doctorate degree is: The impact of Lesson Study on the professional development of early grade teachers. The aim of the study is to investigate the professional development outcomes in the lives of early grade teachers through the implementation of Japanese Lesson Study at your school.

My intended research project will be conducted under the supervision of Dr Roy Venketsamy and Dr van Heerden, Department of Early Childhood Education, University of Pretoria.

Your child is kindly invited to participate in the research as a participant in up to three mathematics lessons during school hours. Learner participation is completely voluntary and data collected through his/her involvement will be both anonymous and confidential, through the use of aliases and photograph editing. All learners' faces will be blocked out when presented in the study.

Following due ethical research protocol, I will take extreme care to respect the rights and dignity of our young research participants. Learners will be asked if they would like to participate before any research lesson begins. Any learners not wishing to participate may leave the class and will be supervised for the duration of the lesson by a staff member. Any child experiencing distress or discomfort, however mild, at any stage of the lesson, will be invited to leave without penalty. I do, however, foresee that it will be a fun experience for our learners.

We also would like to request your permission to use the data we may collect for further research purposes. The data sets are the intellectual property of the University of Pretoria. Further research may include secondary data analysis and using the data for teaching purposes. The confidentiality and privacy applicable to this study will be binding on future research studies.

If you are willing for your child to participate in the research study, please complete the attached consent form. All data gathered will only be used for academic purposes.

If you have any questions or need more clarity about any part of the research, please do not hesitate to contact me.

Faculty of Education  
Fakulteit Opvoedkunde  
Lefapha la Thuto

Yours in education

\_\_\_\_\_  
Erika Helmbold

011-978-5300

[admin@solidfoundationsprimary.com](mailto:admin@solidfoundationsprimary.com)

Supervisors

Dr Venketsamy (roy.venketsamy@up.ac.za)

Dr van Heerden (judy.vanheerden@up.ac.za)

**Permission for research**

I, \_\_\_\_\_ (name of parent) hereby give my permission to Erika Helmbold to include my child \_\_\_\_\_ (name of child) as a participant in mathematics classes as a part of a research entitled: The impact of Lesson Study on the professional development of early grade teachers.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

---

Faculty of Education  
Fakulteit Opvoedkunde  
Lefapha la Thuto

## 9.4 SAMPLE OF ORAL LEARNER ASSENT SCRIPT

### Appendix D: Learner assent script

#### Oral learner assent script

Morning children.

There are a lot of teachers here today!

We would like to all watch a special maths lesson in your class.

We are not here to give you marks or test you, or do anything difficult or scary! We just want to watch Mrs \_\_\_\_\_ teach the lesson and watch how you learn while she teaches you!

Nobody has to be here today, and if you would rather like to leave, you can join Mrs \_\_\_\_\_ class in the hall. If you feel sad or scared at any time, you can put up your hand and a teacher will take you to the hall. You won't get into trouble.

During the lesson the teachers and other grownups are going to walk around and look at your work. I would like you to try and ignore them. This might be a bit difficult. They are not here to talk to you, so try to pretend that they really aren't there.

If you are happy to be here for this lesson, please draw a circle around the picture of the smiley face. If you don't want to do this, just draw a circle around the frowny face.

(Sample of faces...)



Is everybody comfortable and ready to start? Would anyone like to leave before I start? Let's go...

## 9.5 SAMPLE OF SECONDARY TEACHER CONSENT LETTER



Faculty of Education

### Appendix E:

#### Secondary teacher letter of consent

24 January 2020

#### The impact of Lesson Study on the professional development of early grade teachers

Dear Teacher

I am Erika Helmbold, a Doctorate student at the University of Pretoria. The title of my study towards my doctorate degree is: The impact of Lesson Study on the professional development of early grade teachers. The aim of the study is to investigate the professional development outcomes in the lives of early grade teachers through the implementation of Lesson Study at a school.

The research will be conducted under the supervision of Dr Roy Venketsamy and Dr Judy van Heerden, Department of Early Childhood Education, University of Pretoria.

I kindly invite you to participate in this study. Your involvement will require attending up to three Grade 1 or 2 maths lessons, presented during school hours in the last period of a school day on a Tuesday afternoon, followed immediately by a collaborative feedback meeting after school hours about the lesson. This will occur sporadically over a 16-week period.

Your participation in the study is completely voluntary and you may attend all or any of the research lessons and meetings. You may also withdraw your participation at any time, without any consequences or explanations. Participation by yourself and your school will remain completely confidential. This will be ensured through the use of aliases, and no personal or school information will be reported in the findings. Photographs will be taken during these lessons but your anonymity will be protected through editing (facial blocking). The recordings and transcriptions of the data will be stored under password protection in the cloud. The data will only be used for academic purposes, and the University of Pretoria will retain custodianship of the research findings.

We also would like to request your permission to use your data, confidentially and anonymously, for further research purposes, as the data sets are the intellectual property of the University of Pretoria. Further research may include secondary data analysis and using the data for teaching purposes. The confidentiality and privacy applicable to this study will be binding on future research studies.

You are welcome to ask me any questions at any time during the research process. Please bring any concerns that you may have to my attention, or to the attention of my supervisors.

If you are willing to participate in the study, please complete the attached consent form.

Faculty of Education  
Fakulteit Opvoedkunde  
Lefapha la Thuto

Kind regards

\_\_\_\_\_  
Erika Helmbold  
[admin@solidfoundationsprimary.com](mailto:admin@solidfoundationsprimary.com)  
011-976-5300  
083-988-9702

Supervisors  
Dr Venketsamy ([roy.venketsamy@up.ac.za](mailto:roy.venketsamy@up.ac.za))  
Dr van Heerden ([judy.vanheerden@up.ac.za](mailto:judy.vanheerden@up.ac.za))

**Permission for research**

I, \_\_\_\_\_, hereby give my permission to Erika Helmbold, to include me as a participant in the research study entitled: The impact of Lesson Study on the professional development of early grade teachers.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

---

Faculty of Education  
Fakulteit Opvoedkunde  
Lefapha la Thuto



## 9.6 SAMPLE OF PRINCIPAL'S CONSENT LETTER



Faculty of Education

### Appendix F:

#### Principal's letter of consent

24 January 2020

#### The impact of Lesson Study on the professional development of early grade teachers

Dear Principal

I am Erika Helmbold, a Doctorate student at the University of Pretoria. The title of my study towards my doctorate degree is: The impact of Lesson Study on the professional development of early grade teachers. The aim of the study is to investigate the professional development outcomes in the lives of early grade teachers through the implementation of Lesson Study at a school.

The research will be conducted under the supervision of Dr Roy Venketsarry and Dr Judy van Heerden, Department of Early Childhood Education, University of Pretoria.

I kindly invite your teachers to participate in this study. Your teachers' involvement would require their attending up to three Grade 1 or 2 maths lessons, presented during school hours in the last period of a school day on a Tuesday afternoon, followed immediately by a collaborative feedback meeting about the lesson after school hours. This will occur sporadically over a 16-week period in term 1 and 2 of 2020.

Your teachers' participation in the study is completely voluntary and they may attend all or any of the research lessons and meetings. They may also withdraw their participation at any time, without any consequences or explanation. Participation by your teachers and your school will remain completely confidential and anonymous. This will be ensured through the use of aliases, and no personal or school information will be reported in the findings. The recordings and transcriptions of the data will be stored under password protection in the cloud.

We also would like to request your permission to use any data collected, confidentially and anonymously, for further research purposes, as the data sets are the intellectual property of the University of Pretoria. Further research may include secondary data analysis and using the data for teaching purposes. The confidentiality and privacy applicable to this study will be binding on future research studies.

You are welcome to ask me any questions at any time during the research process. Please bring any concerns that you may have to my attention, or to the attention of my supervisors.

Faculty of Education  
Fakulteit Opvoedkunde  
Lefapha la Thuto

The research requires the Department of Education to grant permission for the study to be conducted. All protocols were followed in attaining ethical permission to do the research, including permission granted by the Ethics Board of the University of Pretoria.  
Please sign the attached consent form, indicating that you are aware of and support the teachers at your school participating in the research.

Kind regards

\_\_\_\_\_  
Erika Helmbold  
[admin@solidfoundationprimary.com](mailto:admin@solidfoundationprimary.com)  
011-976-5300  
083-988-9702

Supervisors  
Dr Venketsamy ([roy.venketsamy@up.ac.za](mailto:roy.venketsamy@up.ac.za))  
Dr van Heerden ([judy.vanheerden@up.ac.za](mailto:judy.vanheerden@up.ac.za))

**Permission for research**

I, \_\_\_\_\_, hereby give my permission to Erika Helmbold, to include selected early grade educators from my school to participate in the research entitled: The impact of Lesson Study on the professional development of early grade teachers.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_



## 9.7 SAMPLE OF AUDITOR CONSENT LETTER



Faculty of Education

### Appendix G:

#### Auditor letter of consent

11 November 2019

#### The impact of Lesson Study on the professional development of early grade teachers

Dear Mr JS (alias)

I am Erika Helmbold, a Doctorate student at the University of Pretoria. The title of my study towards my doctorate degree is: The impact of Lesson Study on the professional development of early grade teachers. The aim of the study is to investigate the professional development outcomes in the lives of early grade teachers through the implementation of Lesson Study at a school.

The research will be conducted under the supervision of Dr Roy Venketsamy and Dr Judy van Heerden, Department of Early Childhood Education, University of Pretoria.

I kindly invite you to participate in this study. Your role would be that of auditing the data transcription and analysis process. Your involvement in the research would require weekly auditing of research field-notes, transcriptions and reflective journaling. You would also need to audit the overall research findings. Your voluntary concurrence would need to be declared in a signed letter from you at the conclusion of the research.

Your participation in the study is completely voluntary and you may withdraw your participation at any time, without any consequences or explanations. If you chose to withdraw from the research, the auditing done by yourself up to that point may still be declared in the final research findings. All discussions and data collected will remain completely confidential. This will be ensured through the use of pseudonyms, and no personal information will be reported in the findings. The recordings and transcriptions of the data will be stored under password protection in the cloud. Only yourself, the adult research participants, the research supervisors and myself will have access to the data for analysis, verification and comment. The data will only be used for academic purposes.

I would like to take photographs during the study, which may be used in the presentation of the research findings. Anonymity will be protected through photograph editing (facial blocking).

We also would like to request your permission to use the audited data, confidentially and anonymously, for further research purposes, as the data sets are the intellectual property of the University of Pretoria. Further research may include secondary data analysis and using the data for teaching purposes. The confidentiality and privacy applicable to this study will be binding on future research studies.

Faculty of Education  
Fakulteit Opvoedkunde  
Lefapha la Thuto

You are welcome to ask me any questions at any time during the research process. Please bring any concerns that you may have to my attention, or to the attention of my supervisors.

If you are willing to participate in the study, please kindly complete the attached consent form. By signing the attached consent form you are also agreeing to protect both the anonymity and confidentiality of all research participants and institutions.

Kind regards

\_\_\_\_\_  
Erika Helmbold  
[admin@solidfoundationprimary.com](mailto:admin@solidfoundationprimary.com)  
011-976-5300  
083-988-9702

Supervisors  
Dr Venketsamy ([rov.venketsamy@up.ac.za](mailto:rov.venketsamy@up.ac.za))  
Dr van Heerden ([judy.vanheerden@up.ac.za](mailto:judy.vanheerden@up.ac.za))

**Permission for research**

I, \_\_\_\_\_, hereby give my permission to Erika Helmbold, to include me as a participant in her research entitled: The impact of Lesson Study on the professional development of early grade teachers. I agree to protect the anonymity and confidentiality of all research participants and their institutions.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## 9.8 ETHICS APPROVAL LETTER



Faculty of Education

Ethics Committee

18 November 2019

Ms Erika Helmbold

Dear Ms Helmbold

**REFERENCE: EC 19/09/01**

We received proof that you have met the conditions outlined. Your application is thus **approved**, and you may start with your fieldwork. The decision covers the entire research process, until completion of the study report, and not only the days that data will be collected. The approval is valid for two years for a Masters and three for Doctorate.

The approval by the Ethics Committee is subject to the following conditions being met:

1. The research will be conducted as stipulated on the application form submitted to the Ethics Committee with the supporting documents.
2. Proof of how you adhered to the Department of Basic Education (DBE) policy for research must be submitted where relevant.
3. In the event that the research protocol changed for whatever reason the Ethics Committee must be notified thereof by submitting an amendment to the application (Section E), together with all the supporting documentation that will be used for data collection namely; questionnaires, interview schedules and observation schedules, for further approval before data can be collected. **Non-compliance implies that the Committee's approval is null and void.** The changes may include the following but are not limited to:
  - Change of investigator,
  - Research methods any other aspect therefore and,
  - Participants.

The Ethics Committee of the Faculty of Education does not accept any liability for research misconduct, of whatsoever nature, committed by the researcher(s) in the implementation of the approved protocol.

Upon completion of your research you will need to submit the following documentations to the Ethics Committee for your

Clearance Certificate:

- Integrated Declaration Form (Form D08),
- Initial Ethics Approval letter and,
- Approval of Title.

Please quote the reference number **EC 19/09/01** in any communication with the Ethics Committee.

Best wishes

**Prof Liesel Ebersöhn**  
Chair: Ethics Committee  
Faculty of Education

Room 3-3, Level 3, Building 10  
University of Pretoria, Private Bag X20  
Hatfield 0028, South Africa  
Tel +27 (0)12 420 1234  
Fax +27 (0)12 420 5656  
Email [marisa.leask@up.ac.za](mailto:marisa.leask@up.ac.za)  
[www.up.ac.za](http://www.up.ac.za)

Faculty of Education  
Fakulteit Opvoedkunde  
Lefapha la Thuto

## 9.9 GDE ETHICS APPROVAL LETTER



### GAUTENG PROVINCE

Department: Education  
REPUBLIC OF SOUTH AFRICA

8/4/4/1/2

#### GDE RESEARCH APPROVAL LETTER

|                                |                                                                                     |
|--------------------------------|-------------------------------------------------------------------------------------|
| Date:                          | 04 December 2019                                                                    |
| Validity of Research Approval: | 10 February 2020 – 30 September 2020<br>2019/341                                    |
| Name of Researcher:            | Helmbold E.G                                                                        |
| Address of Researcher:         | 75A Skool Road<br>Marister<br>Benoni                                                |
| Telephone Number:              | 083 988 9702                                                                        |
| Email address:                 | admin@solidfoundationsprimary.com                                                   |
| Research Topic:                | The impact of Lesson Study on the professional development of early grade teachers. |
| Type of qualification          | PhD                                                                                 |
| Number and type of schools:    | One Primary School and One ECD Site                                                 |
| District/s/HO                  | Ekurhuleni North                                                                    |

#### **Re: Approval in Respect of Request to Conduct Research**

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

 04/12/2019

1

Making education a societal priority

#### Office of the Director: Education Research and Knowledge Management

7<sup>th</sup> Floor, 17 Simmonds Street, Johannesburg, 2001

Tel: (011) 355 0488

Email: Faith.Tshabalala@gauteng.gov.za

Website: www.education.gpg.gov.za

1. Letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.
2. The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.
3. A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.
4. A letter / document that outline the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.
5. The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.
6. Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.
7. Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.
8. Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.
9. It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.
10. The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.
11. The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.
12. On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.
13. The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.
14. Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards



Mr Gumani Mukatuni  
Acting CES: Education Research and Knowledge Management

DATE: 04/12/2019

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## 9.9 QUESTIONNAIRE 1

### Questionnaire 1

1. Remind me again, how did you feel about teaching mathematics before we started this research project at our school?
2. What are your thoughts now?
3. Explain if your ideas about constructing your maths syllabus or lessons changed at all?
4. Explain if your ideas on how you approach mathematics teaching in the classroom changed at all?
5. Is your knowledge about the early grade maths and maths content changing?
6. What do you think about Lesson Study?
7. Discuss the process of collaborating with other teachers through Lesson Study.
8. Has Lesson Study impacted your motivation levels for teaching maths?
9. Have you noticed any changes, since participating in this project, in the way you plan for your other subjects (non-maths)?
10. What surprises you in the research?
11. Explain if we should carry on with Lesson Study after this research project is finished.
12. Explain if you would recommend Lesson Study to other schools.
13. Explain if you would recommend Lesson Study to other grades.
14. Explain if you would recommend Lesson Study for other subjects.
15. What do you enjoy or not enjoy about the planning phase?
16. What do you enjoy or not enjoy about the lesson presentation?
17. What do you enjoy or not enjoy about the post-lesson discussion?
18. How does it feel working with other preschool teachers/ Foundation phase teachers?
19. What do you think is important to explain to schools wanting to start Lesson Study?
20. What has been personally challenging for you in this process?
21. What is personally rewarding for you in this process?
22. What do you think about each member contributing to the team?
23. What do you think about the role of the facilitator?
24. Talk about the communication between us?
25. What would you like to see done differently the last cycle?



## 9.10 QUESTIONNAIRE 2

### Questionnaire 2

1. When you think of our three cycles of LS, remind me what problems (if any) did YOU face along the way?
2. What problems (if any) do you think OUR SCHOOL faced along the way?
3. Explain the areas you believe you were most professionally developed through LS
4. What are your thoughts about using worksheets/ workbooks after participating in LS?
5. Identify which statement/s most describe your current outlook towards teaching maths:
  - a) Children are either born mathematically inclined or they aren't. We can give them guidance but ultimately they'll find their own way.
  - b) As much as possible, children should be creatively and inspirationally taught different methods for doing maths.
  - c) A child should be taught to solve problems in maths and develop their own methods that can guide them.
6. If your outlook in 5 changed through the Lesson Study process, can you give me more detail or more insight as to why you think it changed?
7. If we were to carry on with Lesson Study at our school, describe specifically how you would prefer it to be implemented. Please include information on the following:
  - a) The exact number of cycles per year (a cycle refers to everything building up to and including one lesson – for us, one cycle was about one month).
  - b) If it must be voluntary or compulsory for staff members to participate
  - c) What term LS should occur (if that matters to you)?
8. What did you learn about YOUR OWN communication skills during the whole study?
9. Did it change in the study?
10. What did you notice about general communication between all the participants through the whole study?
11. Did it change?
12. Describe if LS impacted "how high" you aim in your teaching at i.e. are you expecting more of yourself and the kids after LS or less?
13. Describe if LS impacted your use of movement in your day-to-day maths lessons (give an example if possible).
14. Describe how LS impacted your understanding of the CONTENT that other grades teach
15. Describe how LS impacted your understanding of the CONTENT taught in YOUR grade.
16. Describe if LS created NEW feelings of respect/ disrespect towards your colleagues from the other grades.
17. Other than the things we've already implemented; can you think of how we could practically eliminate some of the fear associated with presenting the LS lessons?
18. What motivated you to complete the research?

19. Thinking of the demonstration lessons...can you think of any example of you taking something you saw the presenting teacher do as a "demonstration teacher" that you decided to try out in your classroom?
20. How did LS compare to your past professional development experiences (e.g. to workshops, university courses or private learning)?
21. When considering the way in which the three cycles were structured/ facilitated, which was most enjoyable for you?
22. Would you like to share any other thoughts on the research project?