

Lesson Study's Impact on Early Grade Teachers' Growth and Pedagogical Knowledge Development

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Abstract

Continuous professional development is vital for enhancing teachers' content knowledge and pedagogical expertise. Research has confirmed that lesson study significantly contributes to improving teachers' professional development in many Asian countries. This study aimed to explore the impact of the Japanese lesson study model on the professional development of early-grade mathematics teachers. Previous research highlighted that many South African teachers lack adequate content knowledge and pedagogical content knowledge in mathematics instruction, leading to poor learner performance in the subject as revealed in national and international assessments. Using a qualitative case study approach, six early-grade teachers from a school in Gauteng Province were purposively selected as participants. Using Creswell's six steps of data analysis, the author analysed the data thematically. The findings revealed that, despite their extensive teaching experience, participants lacked knowledge and understanding of mathematical content and pedagogical content knowledge. However, engagement in collaborative lesson planning, self-reflection, and critical lesson reviews contributed to strengthening their professional development. Additionally, participants reported increased confidence and reduced anxiety when presenting the lessons. They acknowledged that the lesson study approach facilitated their professional growth and enhanced their content and pedagogical knowledge. The study concluded that lesson study is an effective professional development model. Participants emphasised the value of collaborative lesson planning and the formation of communities of practice in fostering learner-centred teaching approaches.

Keywords: collaborative learning, inquiry-based learning, lifelong learning, pedagogical knowledge development, pedagogy innovation, professional teacher development, teaching collaboration, teaching strategies.



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1. Introduction

Professional teacher development and ongoing capacity-building programmes are essential for teachers to keep abreast with new approaches to teaching and learning. The Department of Basic Education (DBE)

(DBE, 2011) believes that professional development programmes should focus on improving teachers' content (CK) and pedagogical content knowledge (PCK) to improve learning outcomes. The researcher believes that despite DBE implementing various

strategies to improve professional development, there is little evidence of learner performance in mathematics. Therefore, the author opines that alternative approaches to professional teacher development are necessary. Ngwenya & Chaba (2024) state that poor learning performance among South African learners was evident in the Trends in International Mathematics and Science Study (TIMSS) international assessment and national systemic evaluations, where learners attained the last position in mathematics (BusinessTech, 2024). Spaul (2013) stated that the low performance of South African learners is evident in previous systemic evaluations due to inadequate teachers CK and PCK, thus resulting in a lack of appropriate lesson planning and teaching. Spaul & Kotze (2015) agree that poor learner performance can be linked to teachers' teaching competencies, content knowledge (CK) and pedagogical content knowledge (PCK). They found that most teachers experienced challenges with CK and PCK in teaching mathematics.

To support teachers, the DBE developed the Integrated Strategic Planning Framework for Teacher Education and Development in South Africa 2011-2025 (DBE, 2011) to ensure continuous professional development for all teachers to deepen their CK and PCK. This framework implemented various professional development strategies such as 'intermittent teacher development workshops', 'support from curriculum specialists' and 'capacity building programmes' organised by the Department of Education. Although these strategies were implemented, there was no improvement in learning outcomes (Spaul & Kotze, 2015). According to Mullis et al. (2020), most Asian countries, such as China, Japan and Singapore, showed tremendous improvement in teaching and learning strategies. This was evident in the

TIMSS international assessment, where Japan scored 555 points, higher than all other countries (BusinessTech, 2024; Mullis et al., 2020). Japan's phenomenal performance is due to the introduction of lesson study, which strengthened teacher professional development and enhanced CK and PCK (Takahashi & McDougal, 2016). For this reason, the author opted for the Japanese lesson study model to strengthen the professional development of teachers and deepen their content and pedagogical content knowledge.

Lesson study, also known as *jugyo kenhyu*, is a specified professional teacher development method that originated in Japan during the late 19th and 20th centuries as part of its national education reform to improve teaching and learning (Makinae, 2019). According to Dudley (2011) and Takahashi & McDougal (2016), lesson study has been used in Japan since the 1870s and has shown significant improvement in teachers' content and pedagogical content knowledge. Holden (2022) and Venketsamy & Hu (2022) state that the principle of lesson study has always been the continuous improvement of teaching practices through the sharing and collaborating of collective ideas. Lesson study involves groups of teachers working together as a team, thus ensuring collaborative planning, teaching, observing and analysing learning and teaching in research lessons. During this process, Warwick et al. (2016) state that teachers record their findings and attempt to improve the lesson through shared discussions. According to Helmbold et al. (2021) and Holden (2022), through various cycles of teaching a lesson, teachers may innovate or refine pedagogical approaches, which can be shared with others through repeated lessons or publication of a paper outlining their work and the improvement of the lesson. During the lesson study cycle,

Shimizu and Kang (2022) state that the focus is on learners' thinking and learning. They (Shimizu and Kang) mention that lesson study emphasises how learners learn and conceptualise mathematics ideas. Therefore, Venketsamy & Hu (2022) opine that during the lesson study cyclic process, teacher adapts their pedagogies to accommodate the different learning styles of learners in their classes. Therefore, Holden (2022) and Helmbold (2020) agree that lesson study significantly contributes to helping experienced and inexperienced teachers learn and improve their CK and PCK. Shimizu (2020) and Helmbold (2020) state that this is due to the processes of joint planning, observation, and analysis, in which teachers begin to understand how learners learn through the eyes of others by comparing what they observed during the research lesson. Dudley (2011) found that those teachers who used lesson study indicated that they became more aware of their learners' learning needs and behaviours in the classroom. The lesson study process helped them think and plan differently to accommodate all classroom learners. Helmbold (2021) believe that lesson study differs from traditional top-down professional development; it positions teachers as researchers and decision-makers to improve their teaching and learning outcomes.

Since its inception into the Japanese education system, lesson study has contributed significantly to the consistently high performance of mathematics and science on international assessments (Rusiana et al., 2024). Almubarak et al. (2025) states that lesson study shifts the focus from rote memorisation to deeper conceptual understanding. Most Asian countries, therefore, implement lesson studies to enhance professional teach-

er development and deepen CK and PCK to address achievement gaps in diverse classroom settings (Shing et al., 2015). Findings in Singapore revealed that lesson study has strengthened reflective practices and continuous professional growth. Cases revealed that lesson studies strengthened teachers' ability to introduce abstract concepts like place value and fractions in developmentally appropriate ways (Cheng & Yee, 2012).

As a result of the high standards of educational attainment by Japanese learners, lesson study became popular in Western countries. Dudley (2011) and Stigler et al. (1999) state that lesson study has been successfully adopted in the United States, Singapore, Hong Kong, China, Sweden, Canada and the Netherlands, emphasising its versatility across different education systems. The versatility of lesson study has been used successfully in these countries to improve teaching techniques and learners' progress in core subjects in primary and secondary schools and develop pedagogic approaches such as assessment for learning. In her study, Helmbold (2021) found that lesson study integrates hands-on activities and manipulatives to foster engagement in the early grades. Some activities included the involvement of parents to align to classroom and home learning. Despite the various advantages of lesson study, Le et al. (2024) found that adapting lesson study to new cultural and institutional contexts can require significant time, training and resources. Helmbold (2021) found that teachers often lacked motivation to be part of the lesson study research group due to time constraints, confidence levels, lack of motivation and complacency.

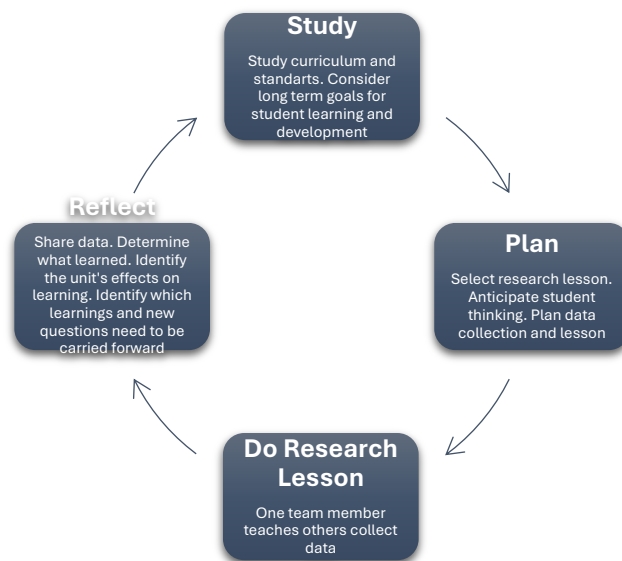


Figure 1. Lesson Study Cycle adapted from Lewis (2009)

According to Shuilleabhain (2015), lesson study is recognised globally as an effective professional development model that places teachers at the centre of the learning process. This process enhances collaboration, reflection and continuous improvement (professional development) of the teacher. Teachers work together during the lesson study to plan, implement, observe and refine lessons, thus creating a supportive professional community (Holden, 2022; Helmbold et al., 2021). The DBE (2011) emphasises the creation of professional communities of learning, network learning communities and in-house collaborative planning, teaching and learning. One of the main reasons for this collaborative community of practice is to encourage sharing ideas and different perspectives on teaching the same lesson, thus enriching the lesson design and teaching strategies. Holden (2022) believes that by working in teams and small groups, teachers break the isolation of individual planning, promoting a culture of mutual support and shared responsibilities. Le et al. (2024) and Shuilleabhain (2015) found that teachers who participated in the lesson study process gained more confidence, became vocal dur-

ing group discussions and presented their lessons without fear of being criticised or frowned upon.

As a teacher professional development model, Lee & Tan (2020) state that lesson study is evidence-based. Teachers meet for a debrief session or colloquium to reflect on lessons in real-time. When classroom lessons are presented, teachers observe teaching approaches and learners' responses and engagement in achieving the learning outcomes (Dudley, 2011; Helmbold, 2021). Furthermore, Shing et al. (2015) agree that teachers become capacitated and empowered with CK and PCK through observations and post-lesson discussions that provide structured opportunities to assess and improve their practices. Through lesson studies, Venkatsamy and Hu (2022) believe that teachers develop an understanding of how learners think, learn and solve mathematics problems through engagement, teamwork and participation. Shing et al. (2015) and Shuilleabhain (2015), therefore, argue that lesson study aligns professional learning with actual classroom challenges, thus enhancing their professional growth. Helmbold et al. (2021) found that teachers strengthened their leader-

ship skills and professional confidence by leading or participating in lesson study teams.

Cheng & Yee (2012) state that teachers who participate in lesson studies view setbacks as part of the improvement process, fostering resilience and adaptability. Since lesson study is cyclical, it encourages life-long learning, therefore promoting the idea of teaching excellence. Through the lesson study collaborative process, Lenski et al. (2009) state that teachers are encouraged and motivated to explore and try out innovative teaching methods, for example, inquiry-based learning in the early grades, using manipulatives in mathematics lessons, encouraging ethnomathematics and play-based teaching and learning. Furthermore, teachers can adapt lessons based on their learner's needs and create a safe space for teachers and learners to experiment without fear of failure. Cevikbas & Kaiser (2020) believe that teachers may adapt their teaching and learning styles in numerous ways. Therefore, innovative teaching methods can change their paradigm and inspire teachers to share and gain new experiences.

Lesson study has demonstrated significant potential to strengthen and enhance teaching strategies, classroom dynamics and learners' learning in mathematics. Holden (2022) found that lesson study improved teaching strategies, whereby teachers anticipated learners' responses and planned their lessons according to a learner-centred approach. According to Widjaja et al. (2017), teachers constantly search for new ways to improve their teaching and learning outcomes. To improve their teaching and learning, Holden (2022) found that teachers integrated manipulations and visual representation to enhance understanding of abstract mathematical concepts. Helmbold (2021) and Cheng & Yee (2012) agree that lesson

study often includes active learning strategies, encouraging a conducive, non-threatening learning environment between teacher-learner and peer interaction. As a result of collaborative planning, Dudley (2011) and Lenski et al. (2009) agree that teachers can plan their lessons by focusing on real-world examples. According to Bayram & Mikmaz (2021), lesson study can increase the workload of already overburdened teachers. Participating in lesson study requires significant time for planning, observation and reflection (Helmbold, 2021). Furthermore, Helmbold (2021) state that the absence of a knowledgeable facilitator or mentor may limit the effectiveness of lesson study in some settings.

This study aimed to explore the impact of lesson study as a model to improve early-grade teachers' CK and PCK and strengthen their professional growth (development). Therefore, the author asked How lesson study impacts teachers' professional development and improves their CK and PCK within a South African context. This is significant for the following reasons: the responses from the participants will determine the effectiveness and impact of the lesson study, which, if positive, can be adopted and implemented across the country to improve teachers' CK and PCK, thus improving learning outcomes and developing teachers' professional growth. The findings will significantly contribute to teachers' professional development in South Africa and improve teaching and learning in early-grade mathematics.

The author used Vygotsky's social interaction and collaboration theory, especially the Zone of Proximal Development (ZDP), for this study. A Russian teacher and psychologist, Vygotsky (1962), first stated that we learn through interactions and communication. Vygotsky (1962) examined how our

social environments influence the learning process. The author believes that this theory is appropriate and closely aligns with the principles of lesson study, namely collaboration, interpersonal relationship, social interaction and learning from a more knowledgeable other (MKO). According to [Vygotsky \(1962\)](#) and [Widiastuti et al. \(2023\)](#), learning occurs when individuals (teachers or learners) engage in tasks or activities beyond their level. The researcher believes that in lesson study, teachers are expected to prioritise collaborative lesson design and analysis, where they must work together to create or identify strategies to suit their learners best. Through community and participatory engagement and learning, lesson studies align with Vygotsky's belief in the social nature of learning through shared enquiry and professional growth.

2. Method

a. Research Model

This study explored the impact of lesson study on the professional development of teachers teaching mathematics in the early grades. Since this study expected the participants to share their experiences, the author opted for a qualitative research approach embedded within an interpretivist paradigm using a descriptive case study.

Qualitative research is multimethod in focus, with the advantage of involving interpretivism and a naturalistic approach to exploring the phenomena (lesson study as a model in strengthening teachers' profession-

al growth). Furthermore, this approach allowed the author to study the participants in their natural environment (classrooms) and make sense of their experiences.

Through the qualitative approach, the author captured and interpreted the participants' experiences to gain a deeper understanding of their views, opinions, and beliefs about the impact of lesson study on their professional development. Additionally, [Ma-ree \(2020\)](#) states that interpretivism allows participants to share their experiences openly and without inhibition. The participant's views and opinions allowed the author to describe and understand how teachers experienced lesson study.

Using a descriptive case study, the author gathered detailed insights into participants' experiences of lesson study. [Venketsamy & Hu \(2022\)](#) state that case studies allow for an in-depth exploration of individuals or groups to understand better specific phenomena, such as the impact of lesson study as a professional development tool.

b. Participants

As illustrated in Table 1 below, the study participants were six early-grade teachers from a Gauteng Province, South Africa school. The table provides details about each participant. Two teachers had extensive years of experience, while one was newly appointed. All participants were qualified to teach in the Foundation Phase, which in South Africa includes Grades R-3.

Table 1. Structure of Participants

Teaching Grade of Participant	Age	Years of Teaching Experience at the Time of Research	Qualification	Code given
Grade R	39	19	BA Ed	T1
Grade R	48	23	HD	T2
Grade 1	24	1	BEd	T3
Grade 1	68	46	THDE & FDE	T4
Grade 2	41	14	BA Hons PGCE	T5

Teaching Grade of Participant	Age	Years of Teaching Experience at the Time of Research	Qualification	Code given
Grade 2	65	17	BA & HED	T6

c. Data Collection Tools

Data were collected using semi-structured interviews and classroom observations. Semi-structured interviews allowed for probing and clarification. The researcher developed a semi-structured interview schedule, which guided the focus group interview. The schedule focused mainly on the effectiveness and impact of lesson study on teacher professional development. Classroom observation allowed for observing the implementation of the lesson study model in mathematics.

d. Workshop on Lesson Study

A two-hour workshop on lesson study was held on April 1, 2019, to introduce the concept and discuss its implementation and collaboration in the classroom. After the session, participants were asked to apply what they had learned in their classrooms. A month later, on May 25, 2019, interviews were conducted to gather their experiences.

e. Data Analysis

To analyse the data and identify appropriate themes, the researcher employed Creswell's steps in data analysis (Creswell, 2018). Firstly, the author read, reread and reviewed all data (Step 1). Once the author understood the data well, he began coding to identify themes and subthemes (Step 2). This approach is defined by identifying themes in data using systematic procedures, and it assists in developing categories of the phenomenon being studied (Maree, 2020). After coding, different themes were recognised and developed according to their similarities and differences (Step 3). Thereafter, different themes were reviewed to ensure coherence

and distinctions from each other (Step 4). In Step 5, the final refinement of themes was conducted to understand what the themes indicated. In the last step, the identified themes were used to answer the research question (Step 6), and conclusions were drawn from the findings of this study.

f. Ethics

The study received ethics approval from the University of Pretoria (Ref EC 19/09/01) and the Gauteng Education Department. Participants were invited via formal letters explaining the study and requesting their consent. They signed consent forms agreeing to voluntary participation and were informed they could withdraw anytime. Anonymity and confidentiality were assured, with pseudonyms used in the reporting phase. All six participants agreed to take part in a group interview.

The table 1 above lists the codes used in the findings section. The author adopted data triangulation as a method to minimise bias in this study. Data from the interviews and classroom observations were compared to ensure consistency. Furthermore, the transcriptions were shared with the participants to ensure that their data were captured correctly. This process ensured the trustworthiness and reliability of the data.

Following the workshop, the researcher conducted a 40-minute group interview with the six teachers, allowing them to share their experiences with lesson study and recognise shared challenges. The interviews, held in May 2019 at the participants' school, took place after school hours to avoid class disruptions. Additionally, the researcher arran-

ged a separate meeting with the subject advisor at the school.

3. Result and Discussion

The findings of this study are divided into four major themes

- a. Teacher's motivation to participate in the study
- b. Teachers experiences of LS planning and teaching
- c. Impact of LS on content knowledge and pedagogical content knowledge
- d. Impact of LS on teachers' professional development

1) Motivation to Participate in the Lesson Study Project

The researcher asked the participants to share their reasons for participating in the lesson study process. All six participants (T1, T2, T3, T4, T5, T6) showed increased motivation to participate in the lesson study program because they all believed they could learn something from each other. T3 and T6 said they felt honored to be part of this new professional development model. They hoped they would learn much from the experience and strengthen their knowledge and insight into the curriculum. For T5, it was more personal because her son would be entering the first grade, and she envisaged that the lesson study would help her support her child at home.

T4 said, "I am looking forward to collaboration and learning from others; I feel I am still a novice teacher and don't know everything. I like the concept of getting together and learning from others."

The participants' responses reveal that they are eager to learn from each other, share their knowledge, enhance their capabilities, and develop in their profession. This view concurs with [Luong \(2022\)](#), who agrees that

Vygotsky's Sociocultural theory acts as a foundation for individuals to develop professionally through social interaction. Lesson study is a professional development model used in several countries to improve mathematics teaching and learning, which is evident in the mathematics performance of Asian learners, especially in Japan, Singapore, and China. According to [Newman & Latifi \(2020\)](#), Vygotsky's name is used to justify approaches to the teaching and learning of mathematics in Singapore. [Dudley \(2011\)](#) states that teachers are highly motivated to improve their CK and PCK through the lesson study process. The findings in this study revealed that all participants were motivated to be a part of the lesson study project since they believed they could learn something new from each other. According to T5, her reasons were personal, concurs with [Widjaja et al. \(2017\)](#), who indicated that teachers are constantly searching for new and novel ways to improve their practices. Since lesson study is recognised and acknowledged in several countries as an effective mode of professional development that emphasises teachers as central to the learning process, this study found that teachers showed positive attitudes towards the lesson study project. Through collaborative planning, discussion and reflections, participants in this study indicated that their CK and PCK improved significantly (T4). This view concurs with [Lenski et al. \(2009\)](#), who state that teachers are encouraged to motivate and explore different approaches to planning and teaching due to its collaborative process.

2) Experience of Lesson Study Planning and Teaching?

To elicit their experiences of lesson study planning and teaching, the researcher asked the participants to share their experiences of collaborative group planning and

teaching. During the planning lesson, participants worked together according to their grades. During the planning session, participants had to work through the National Curriculum Statement: Curriculum and Assessment Policy Statements (NCS: CAPS) for the Foundation Phase, which included the curriculum overview, aims of the current content, annual teaching plan and assessment (DBE, 2011). All participants, except T4, indicated they had numerous years of experience planning and teaching lessons. T3 mentioned. The other participants wanted to know what lesson study planning and teaching is new. However, they are willing to participate in this activity.

T3, who had 46 years of experience, said, "If this lesson study worked in Japan and the Japanese are performing extremely well in the international assessment, there must be something good we can learn."

During the lesson planning, participants engaged actively and collaborated. They shared ideas and approaches to teaching their lessons. Both Grade R teachers (P1 & P2) planned lessons individually to accommodate their learners' needs. Planning together takes lesson planning to a whole different level of learning and engagement. They also stated that they communicated extensively, agreed to and disagreed with certain activities for their respective classes, and had to adapt and accommodate the learners in a single lesson plan (Astutik et al., 2024).

The T3, T4, T5 and T6 shared similar sentiments. According to T4, she mentioned being a newly qualified teacher, I do not have much experience in lesson planning. Working with my colleague, who has 46 years of experience, has taught me so many important matters to consider when planning lessons. I have realised that I must always recap the previous day's lesson before beginning with

the new lesson. Furthermore, I should limit the number of mathematics problem sums to my learners. I learnt that it is important that learners learn the concepts and procedures instead of just writing down answers to a sum.

After planning, each grade presented their lesson to the group of Grades R and 2 participants. The first group to present were the Grade 1s. Participants provided critical and insightful comments on how to introduce the lesson in Grade R through counting songs, rhymes, stories, movement and play pedagogy. Both T1 and T2 highlighted the importance of teaching mathematics through play. T6 said, "When children learn through informal play, there is a higher probability of them remembering the play activity than formal teaching". Since the Grade 1 lesson was based on addition and subtraction, the participants made the following suggestions.

P1, "You can use counting on and counting back strategy for addition of single digit numbers." P5 said, "When teaching tens and units, it would be important for your learners to understand place value, then use breaking down methods, add on or round off numbers, and subtract the added numbers."

These comments were a 'wow' moment for the participants from Grade 1. In their defense, P3 and P4 indicated that they had not thoroughly studied or read through the entire CAPS document. They were relying mainly on the approved textbooks and according to P3, she said she relied on her experience teaching mathematics in the early grades.

From this discussion, it was noticeable that collaborative planning and sharing of ideas improved the lesson planning and introduced novel ways of presenting a lesson. Teachers do not need to continue teaching through the traditional 'talk and chalk' meth-

od; they can also use technology for teaching and learning. This view concurred with P4:

"During our studies at university, technology was emphasised, and we were told about applications and programmes that can be used in classes."

All participant agreed that group planning highlighted their gaps in knowledge and understanding of the curriculum and different pedagogies to enhance teaching and learning. Participants also indicated that planning together has broadened their knowledge and outlook in using different methods of introducing a lesson. The participants agreed it was a humbling experience to present in the presence of their colleagues and that it has also boosted their confidence. Especially T4 said,

"I believe that I could present a lesson to other teachers and showcase what I have learnt. Lesson study to me is about trial and error until we decide to develop a good scripted lesson for a particular topic."

Planning for teaching and learning is a fundamental task of every teacher to ensure that every learner achieves the necessary learning outcomes (Spaull, 2013). Participants in the study agreed that planning is an essential task and must be done according to the country's curriculum policy documents. Although participants had the CAPS documents, they were not fully knowledgeable since they had not fully read or gleaned through the document (T3 and T4). Spaull and Kotze (2015) agree that poor learner performance can be linked to insufficient curriculum knowledge and pedagogies. Newman and Latifi (2020) state that Vygotsky's methodology reveals that he is seeking explanations for what he terms as higher forms of behaviour. Similarly, in this study, participants were eager to improve

their CK and PCK through lesson study. Additionally, all participants agreed that working through the policy document improved their content knowledge, and they better understood the curriculum of 'what to teach' and 'how to teach' Furthermore, the participants agreed that working together and communicating ideas on planning and teaching improved their CK and PCK. Holden (2022) agrees that teachers' knowledge about a subject improves during discussions, collaboration, reflections and sharing views and opinions. This statement concurs with the findings of this study, where all participants agreed that group planning and the presentation of lessons were invaluable learning experiences. Listening to different teachers presenting the same lesson, they noticed that it could be taught differently and adapted to their learner's needs.

3) Impact of Lesson Study on the Improvement of Content Knowledge and Pedagogical Content Knowledge

The researcher asked the participants to share their experiences of the impact of lesson study on the CK and PCK. Both CK and PCK are essential to promote quality teaching and learning of the fundamentals of mathematics. The participants were asked about LS and how it has improved their CK and PCK. All participants agreed that LS has strengthened their CK and PCK through shared collaboration, presentation of lessons and critical discussions (Adhantoro et al., 2025). According to T1, she indicated that she had a very structured view of how to teach mathematics. She described her teaching style as 'dependent on worksheets, meticulous handwriting and developing fine motor control. During the lesson presentation, teachers observed that each group presented the lesson differently; some started with a poem, story, rhyme or song. T1 and

T5 agreed that they could adapt their lessons accordingly.

T3 said, *"Learners have different learning styles, and therefore, teachers must adapt to accommodate all learners."*

Most of the participants, except T3, agreed that their content knowledge was a definite improvement. T3 indicated that some of the examples mentioned during the lesson presentation, she had an experience with it. However, she stated that her content knowledge is 'good' because she understood CAPS well and had attended several curriculum workshops. T2 said,

"This LS approach allowed me to study the CAPS documents, not only for Grade 2 but also to understand Grades R and 1 better. Now that I understand what each grade should focus on, I can plan differently for my learners. She also indicated that she was motivated by the collaboration with her colleagues from different grades."

According to T6, she said,

"LS has motivated me by its potential of generating learner-centred teaching. She said she was very impressed by the novelty of doing something new, especially using Howard Gardner's multiple intelligence theory in planning lessons."

T5 and T6 mentioned that they had taught Grade 2 for many years and thought they "knew everything" until this LS planning, presentation and collaboration session. They both agreed that teachers can benefit much from lesson studies. The lesson on "subitizing" was an eye-opener to the effectiveness of lesson study. Most participants in this study did not understand the concept of 'subitizing' in mathematics. After much discussion, teachers were shown a video and marvelled at the idea of subitizing as a mathematics concept. They all agreed that despite

having numerous years of experience, content knowledge has room for improvement. When a lesson on patterns was discussed, participants thought patterns were just another activity until they were shown the patterns and their relevance to higher grades, where learners are required to calculate the 50th number in a series and sequence pattern.

There were several clear examples of how the LS process improved content knowledge. It was observed that the teachers' vocabulary of mathematics was improved. Teachers combined their experiential knowledge with new concepts, such as using the word 'array, ' terms, and objects. T5 summarised her lesson study experience as,

"my knowledge of patterning, subtraction methods and multiplication methods 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."

All participant indicated that LS positively impacted their pedagogical content knowledge. T1, T3 and T5 said that there were several examples where their participants shared tips and methods to make teaching mathematics enjoyable in their class. T6 mentioned moving away from the basic worksheets and daily written activities. She would employ paired teaching, collaborative teaching and learning, group discussion and exploratory teaching and learning methods. T6 agreed that,

"mathematics should not be confined to the classroom; teachers can take their learners outside the class and teach concepts such as 'estimation, prediction, problem-solving and patterns in nature.' I have a multiple learning style chart in my class, and I used this chart to plan two to three different activities using the

different learning styles to accommodate learners."

All the participants agreed that there is a link between teaching and learning. They concurred that when lessons are planned together, different ideas are shared, and teaching styles are improved, thus allowing them to prepare their lessons differently for the learners. They believed that mathematics lessons must always be practical and meaningful to the learners. To strengthen their content and pedagogical content knowledge, T3 mentioned that teachers should,

"always keep abreast of latest mathematics research, read published articles visit social media and become lifelong learners."

T4 mentioned that she has been following some bloggers on TikTok and YouTube, where she has learnt some new ideas for teaching number concepts and problem-solving mathematics to Grade 1 learners. She also mentioned that many mathematics games and other musical activities could be brought into the classroom for young learners.

Lesson study is a powerful professional development model that can potentially change teachers' mindsets and pedagogies to improve learning outcomes, as evident in most Asian countries (Makinae, 2019). Participants in this study agreed that the lesson study project improved their CK and PCK through engaging with each other, reflecting on their lessons, sharing ideas, collaborating and critiquing each lesson. T1, who relied heavily on worksheets, changed her perception to ensure that her learners had a sound conceptual and procedural understanding of mathematics concepts.

All participants shared similar views that they do not have to adopt the 'chalk and talk' method but instead opt for using songs,

rhymes, poetry and storytelling to teach mathematics concepts (alternate pedagogies). They also agreed that play-based teaching and learning can effectively enhance learning outcomes. Lenski et al. (2009) concur that play-based teaching and learning are effective in the early grades, and teachers often miss this opportunity to introduce play in the classroom. Despite teaching grade 2 for many years, both T5 and T6 believed they knew the art of teaching in the foundation phase until they attended the lesson study project. They both realised how 'little they knew' about teaching and learning. They believe all teachers can improve their CK and PCK through mutual collaboration (Harmadi et al., 2025), open-mindedness and willingness to change. T6 also shared her view by stating that she realised that mathematics teaching and learning do not have to be confined to a classroom environment. Cevikbas & Kaiser (2020) agree that teaching and learning can occur in any environment and that innovative teaching methods can change the teaching paradigm and inspire teachers to gain new experiences.

The impact of lesson study is evident globally in countries where it is being implemented, such as Japan, China, Singapore, and the UK. The TIMSS results for 2024 are evident because these four countries were in the top six positions internationally (BusinessTech, 2024). All these countries have adopted lesson studies to strengthen their teachers' CK and PCK when they identified a deficit in their teaching and learning outcomes (Helmbold, 2021; Cheng & Yee, 2012).

This study revealed that participants benefited positively from the lesson study project. Participants indicated that the lesson study project broadened their thinking, opened their eyes to new and amazing lesson-planning activities, enhanced their creativity,

and made them realise that collaborative planning is much better than planning in isolation.

According to T2, she believed that lesson study has developed her professionally because she could see and reflect on her teaching. She indicated she was caught up in the same teaching mode for 23 years. She indicated that continuous professional development is fundamental for all teachers, and it is not time-bound. Despite being a teacher for 46 years, T3 also mentioned that she enjoyed the lesson study project because she could see and understand that mathematics topics and lessons can be approached from a learner-centred instead of a teacher-centred approach.

4) Lesson Study and Professional Development

The researcher asked the participants to share their lesson study experience and professional development. All participants agreed that the lesson study workshop strengthened their professional growth. T1 commented that LS.

"broadened my thinking', grew me professionally, and opened my eyes to new and fantastic lesson planning and teaching. I am amazed at how little I knew and how much I knew after the LS workshop. The lesson study emphasised creative thinking, and I was amazed at how many ideas came up; we had a hard time selecting what we could do to teach a concept in number operations."

T2 said,

"I enjoyed the LS workshop, and it has broadened my horizons. I realised that the prep and sharing of ideas (new and old) stimulated my creativity, and I am eager to try these new ideas and reinvent the old ones."

According to T3, the professional growth process was not limited to the period of plan-

ning sessions, demonstration lessons, and post-lessons. These lessons became the seedling ground for in-depth thinking about teaching mathematical concepts in the days after the lesson study.

T5 and T6 both indicated that lesson study had positively impacted self-confidence. They concurred that their confidence levels were enhanced through teacher participation in collaborative discussion and participation in or observing and demonstrating lessons. They indicated that the lesson study approach allowed them to contribute their ideas confidently. T4 said she was no longer scared as a novice teacher to be among the more senior teachers. She felt that her ideas were accepted, and this boosted her confidence. She mentioned that just by watching others teach the lessons during the demonstration session; there was so much she could do to teach the same lesson differently.

All participants agreed that LS developed their awareness of learner-centred teaching rather than teacher-centred teaching. During the LS workshops, T3 mentioned that,

"topics were often discussed from the perspective of how learners would enjoy their lesson and which ideas were appropriate for which grade."

All participants agreed that the lesson study encouraged them to collaborate as a team to share their ideas, strategies and experiences. They believed that this process shed light on how they should perceive how their learners learn and how they should adapt their lessons to suit the needs of the learners. Furthermore, lesson study allowed them to reflect on their teaching practice, thus making them critical of their teaching through observation and collaboration. They all agreed that they were continuously striving to improve their lessons. They also concurred that lesson study is an approach that enhances a culture

of mutual support and trust among colleagues, thus strengthening their morale and professional relationships.

As a professional development model, all participants agreed that this model encouraged them to work together as a team and that sharing ideas has given them a new perspective on lesson presentation. This view aligns with [Vygotsky's \(1962\)](#) social learning theory, whereby individuals strengthen their knowledge through interaction with a more knowledgeable other. Furthermore, [Widias-tuti et al. \(2023\)](#) concur that through participation, engagement, communication, and collaboration, a teacher's paradigm about teaching and learning could change significantly due to the sharing of ideas. In this study, all participants agreed that the lesson study project encouraged self-reflection and positive acceptance of critical comments on their lessons ([Andayanie et al., 2025](#)). They came to believe that when critical comments are given to a lesson, it is 'not a personal attack on the individual' but rather to strengthen and improve the lesson for the benefit of the learners.

Additionally, all participants agreed that through lesson study, they have the capacity to reimagine their lessons, plan lessons according to the contextual realities of their learners and ensure that their lessons are learner-centred. Furthermore, participants in this study agreed that, through knowledge of the CAPS document, they can adapt their lessons to accommodate diverse learning styles in their classrooms. Despite the positive responses from the participants, [Helmbold \(2021\)](#) states that there must be a facilitator or mentor who is knowledgeable about the lesson study for every lesson study. The facilitator or mentor has the capacity to make lesson study an exceptional professional development tool or can create negative attitu-

des towards lesson study as an approach to teaching and learning ([Ratih et al., 2019](#)).

The highlights of the findings of this study are as follows:

- a. Lesson study is teacher-driven, ensuring that professional growth is directly aligned with classroom practice.
- b. Teachers actively collaborate, reflect, and refine their teaching practices, fostering a sense of ownership over their development.
- c. Lesson study strengthens professional development and deepens CK and PCK.
- d. A lesson plan is a collaborative process; therefore, collaborative planning, reflective thinking, social interaction, and critical engagement improve the teaching and learning of mathematics.
- e. Lesson Study is cyclical and ongoing, emphasising that teachers engage in continuous improvement rather than one-time training, thus a sustainable model for learning
- f. Teachers gain confidence in their instructional skills by engaging in structured, reflective discussions and lesson observations.
- g. Lesson study is an effective professional development model to strengthen teachers' CK and PCK.

4. Conclusion

The current study's findings revealed that teachers benefitted significantly from the lesson study project, positively impacting their professional growth. They agreed that they could work collaboratively and systematically through lesson study to improve their CK and PCK. Lesson study also gave them the opportunity to reflect on their teaching and learning practices, moving away from teacher-centred learning to learner-centred learning. Many studies have revealed that lesson study yields positive results, im-

proves teachers' creativity and robust thinking, and results in a paradigm shift in lesson planning.

This study was limited to only six participants from the early grades in the Gauteng Province. Since the sample size was small, the findings may not be applicable to a larger population. This study was conducted using only qualitative research methodology, which can involve bias, thus making it difficult to predict more generalisable across the country. The Lesson study has practical implications for South Africa. The Department of Basic Education needs to recognise and acknowledge the positive effects of lesson study and mandate that all teachers collaborate and participate in this professional development model. It is recommended that: (a) Lesson studies should be implemented across all phases of the South African education system to improve learning outcomes; (b) South African schools should establish professional learning communities where teachers collaborate regularly and are supported by school leadership; (c) Universities and teacher training institutions can incorporate lesson study into pre-service and in-service training, ensuring that educators are well-prepared to implement; (d) Use technology for teaching and learning so that teachers can use online platforms, record lesson studies, and use digital collaboration tools that can help and support teachers across the country who participate in lesson studies.

In conclusion, lesson studies are an effective professional development model that can be used across different grades and subjects. Research has shown that lesson studies positively impact teachers' professional development and enhance their CK and PCK through social interaction and collaboration.

5. Conflicts of Interest

No conflict of interest exists.

6. Ethical Approval

The Pretoria University's ethics committee approved ethics, reference number EC19/09/01.

7. Data Availability Statement

The data is available upon request from the author, who was the supervisor of this study.

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9. Authors Contribution

Roy Venketsamy: Conceptualization, Methodology, Formal Analysis, Writing – Original Draft; **Zijiang Hu:** Writing – Review & Editing; **Blanche Ntombizodwa Hadebe-Ndlovu:** Validation, Writing – Review & Editing; **Keshni Bipath:** Validation, Writing – Review & Editing.

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