

**THE ROLE OF SCHOOL LEADERSHIP
IN SCHOOLS THAT WORK SUSTAINABLY
ON SCHOOL IMPROVEMENT WITH
PROFESSIONAL LEARNING COMMUNITIES**

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THE ROLE OF SCHOOL LEADERSHIP IN SCHOOLS THAT WORK SUSTAINABLY ON SCHOOL IMPROVEMENT WITH PROFESSIONAL LEARNING COMMUNITIES

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CONTENTS

| | | |
|------------------|--|-----|
| Chapter 1 | Introduction | 7 |
| Chapter 2 | Leadership practices and sustained data use with data teams | 21 |
| Chapter 3 | Leadership practices and sustained lesson study | 49 |
| Chapter 4 | Leading PLC-related knowledge brokerage | 73 |
| Chapter 5 | Leaders' interpretation of the PLC and their educational beliefs | 111 |
| Chapter 6 | Conclusion and discussion | 141 |
| | References | 157 |
| | Samenvatting (Dutch summary) | 173 |
| | Appendix: interview questions | 181 |
| | Publications and presentations | 183 |
| | ICO PhD dissertation series | 187 |
| | Dankwoord (Acknowledgements) | 191 |



1

Introduction



1.1 PROBLEM STATEMENT

Schools aim to support student learning in the best way possible. At the same time, they need to keep up with a rapidly changing society: changing policies and increasing diversity in their (student) population. Therefore, continual professional development is crucial. Professional development is defined as learning that results in changes to teacher knowledge and practices (Bakkenes et al., 2010; Darling-Hammond et al., 2017). Professional development can help to enhance teaching quality, which in turn can improve classroom practices and student learning. Professional development is more effective when staff members take part collectively, when it is of sufficient duration and when it involves active learning or opportunities to use or apply what has been learned (Cordingley, 2015; Desimone, 2009; Dunst et al., 2015; Van Driel et al., 2012). These conditions are often integrated in how professional learning communities work. In professional learning communities (PLCs), teachers and school leaders collaborate with the goal of professional development and school improvement (Do an & Adams, 2018; Little, 2012; Lomos et al., 2011; Stoll et al., 2006; Vescio et al., 2008). PLCs have been found to be promising tools for both teacher and student learning (Do an & Adams, 2018).

By sustaining professional development approaches such as PLCs (hereafter referred to as sustainability), teachers and school leaders can work continually and effectively on educational challenges (Cordingley, 2015; Desimone, 2009; Dunst et al., 2015), so that all students can benefit from their work. Implementation with a limited duration leads to impacts with limited durations (Bellei et al., 2020) and to staff members' aversion towards the future implementation of professional development approaches (Chung et al., 2017). Additionally, as professional development approaches are often disconnected (e.g., Bellei et al., 2016; Borko, 2004; Fullan, 2004), the personal and economic resources invested by staff members in a particular approach that could have been invested elsewhere are wasted (Askill-Williams & Koh, 2020).

Sustainability is a challenge for a lot of schools, however (e.g., Askill-Williams & Koh, 2020; Cohen & Mehta, 2017; DuFour, 2004; Hubers et al., 2017). This might have to do with using up the start-up enthusiasm and resources or loss of the key person driving the approach (Askill-Williams & Koh, 2020). Leadership seems to be crucial for sustainability (e.g., Fullan, 2004; Harris & Jones, 2010; Hollingworth et al., 2018; King, 2016; Prenger et al., 2020; Santangelo, 2009; Spillane, 2006), but the research into sustainability and leadership in the context of teacher professional development is scarce (e.g., Hubers, 2020; Maitlis & Christianson, 2014; Prenger et al., 2020). In sum, it is vital to increase knowledge on how leadership can improve sustainability. This dissertation therefore focuses on leadership for sustainability and aims to answer the main question: *What is the role of school leadership in schools that work sustainably on school improvement with professional learning communities?*

1.2 CONCEPTUAL FRAMEWORK

The following sections provide an overview of the two key concepts that will be addressed throughout this dissertation: sustaining professional development approaches, such as PLCs, and leadership.

1.2.1 Sustaining professional development approaches

A lack of clarity on what sustainability means is apparent in the literature. Askill-Williams and Koh (2020) found that “process terms such as maintenance, institutionalization, integration, and routinization” (p. 661) are often used to describe sustainability. With these process terms, a distinction is made between a fidelity perspective and a local adaptation perspective. In the fidelity perspective, sustainability could mean that the professional development approach is understood and performed exactly as intended (Anderson, 2007). In the local adaptation perspective, adjustments to practice are allowed, as long as teachers adhere to the core components of the professional development approach (Quinn & Kim, 2017).

A review into empirical studies on sustainability (Prenger et al., 2020) found that although sustainability was rarely defined, the studies in their review focused on four specific elements of sustainability. First, the core components of the approach should be continually carried out. Second, the approach should become an integral part of the daily school routines, meaning that the approach is not perceived as something added or new, but as part of the “fabric” of the school. Third, the results achieved by the approach should be maintained or further improved. Fourth, the approach can be adapted over time while adhering to the core components, so it can be fitted to the work in the school. Based on this review, in this dissertation sustainability is achieved when the core components of the professional development approach become a self-evident and functional part of the school (or: organizational routine, Feldman & Pentland, 2003), which is flexible and adaptive to ongoing work, and aimed at regular improvement. The local adaptation perspective is thus taken.

1.2.1.1 Professional learning communities

Sustainability of effective professional development approaches is something that should be strived for, so that an impact on both teacher and student learning can be continually reached. Professional learning communities (PLCs) are promising for that. PLCs are groups of staff members at a school who meet regularly and discuss and explore theory, practices, and experiences in connection with a specific theme related to their own school (Little, 2012; Stoll et al., 2006). The general assumption behind PLCs is that school staff members develop professionally because they discuss and explore teaching and learning, thereby challenging their thoughts and actions, which leads to changes in their skills and knowledge and how these are applied, through which school improvement can take place (Lomos et al., 2011; Vescio et al., 2008). In PLCs, the “professional interactions [can be viewed] as an organizational mechanism

that provides new ideas, critical feedback, and multiple perspectives for teachers through specific practices such as reflective dialogue” (Lee & Louis, 2019, p. 85). Doan and Adams’s (2018) literature review on empirical studies that focused on PLCs found positive effects on both professional development and student achievement, and they described PLCs as “a powerful format for learning to thrive” (p. 655).

In this dissertation, the focus is on two forms of PLCs: data teams and lesson study teams. In these PLCs, schools’ staff members discuss and explore teaching and learning by researching their own practice. Both focus on local problems or needs, follow a cyclical process and assign an active role to practitioners in research and improvement (Yurkosofy et al., 2020). The multi-functional role, as teacher and as researcher, helps teachers to “enhance the scope of their actions as well as the quality and appropriateness of the changes and solutions they propose” (Vasquez, 2017, p. 5). This makes these PLCs extremely relevant for the challenges schools face today.

1.2.1.2.1 Data teams

A data team consists of four to six teachers and one or two school leaders, who use data to solve a specific educational problem at their school. A data team can, for example, focus on disappointing exam grades for mathematics or a high percentage of grade repeaters at a specific school or grade level. Data teams use a structured cyclical procedure of eight steps, based on a theory of action (Poortman & Schildkamp, 2015; Schildkamp et al., 2016). The eight steps are:

1. *Define problem.* The team decides on which educational problem they will focus.
2. *Formulate hypotheses.* The team develops hypotheses with regard to what may cause their problem.
3. *Collect data.* The team collects data to either confirm or reject the hypotheses. Several types of data can be collected, such as assessment data or student voice data.
4. *Check quality of data.* The team assesses the quality of the collected data. If the data are valid and reliable, the team proceeds to Step 5. Otherwise, the team needs to collect additional data.
5. *Analyze data.* The team analyzes the data. This can involve qualitative and quantitative data analysis, and simple (descriptive) as well as more sophisticated analyses (e.g., *t*-tests, correlations).
6. *Formulate interpretations and conclusions.* The team draws a conclusion as to whether their hypothesis about the cause of the problem was correct, and either proceeds to Step 7 (correct hypothesis) or returns to Step 2 (incorrect hypothesis) and investigates new hypotheses.
7. *Implement improvement measures.* The team takes action based on the data to solve their educational problem, to improve educational quality.

8. *Evaluate*. The team evaluates if their measures were implemented as intended and if these measures were effective.

The steps are described in a data team manual, which also includes guidelines and activities, such as creating a data table to support the data collection process. The data team meets at least once a month. The first year a data team starts working at a school, external guidance from a trained data team coach is provided for just-in-time support for data use (Poortman & Schildkamp, 2016).

The goal of data teams is to improve the quality of education at the school and to provide professional development in data use in order to solve future educational problems as well (Schildkamp & Poortman, 2015). Data teams have been found to improve teachers' data literacy (Ebbeler et al., 2017; Kippers et al., 2018) and student achievement (Lai & McNaughton, 2016; Poortman & Schildkamp, 2016).

1.2.1.2.2 Lesson study

In lesson study, small groups of teachers investigate the learning of their students and their teaching practice (Lewis et al., 2006; De Vries et al., 2017). To do that, a research cycle consisting of five phases is used (Stepanek et al., 2007). The phases are:

1. *Start with a question or issue from teaching practice*. The teachers decide the problem they are going to focus on. This has to be related to their students' learning and/or their teaching practice. Together they formulate a lesson goal, accompanied by a research question. For example, this can be how does the [chosen didactics] contribute to letting students find the area of a triangle independently?
2. *Design research lesson (including observation forms) and write out research lesson plan*. The lesson is called a research lesson, because it is observed (live) and researched in the following phases. In addition to designing the lesson, teachers have to think about student responses they expect. These can be included in the observation form. The form is focused on the research question and is used during the live lesson observation.
3. *Teach research lesson, with live observation, and collection of data*. The research lesson is taught by one of the teachers. The other teachers observe the lesson and especially the learning of the students, and make notes related to the categories or questions on the observation form. After the research lesson is taught, students are interviewed for further understanding of the observations.
4. *Engage in post-lesson discussion*. The research lesson is discussed. The goals and question that were formulated in phase 1 are the focus of the discussion.
5. *Adjust and re-teach the research lesson, engage in post-lesson discussion, followed by a final reflection*. Based on the post-lesson discussion, the teachers adjust the research

lesson. Phases 4 and 5 are then repeated. Afterwards, the group reflects on the entire lesson study process and formulates their gains.

The goal of lesson study is to systematically improve teaching and student learning in classrooms (Lewis et al., 2006). Lesson study teams have been found to improve teachers' knowledge and skills in general (e.g., Lee & Tan, 2020; Vermunt et al., 2019; Willems & Van den Bossche, 2019), which in turn can affect student learning (Dudley et al., 2019).

1.2.2 Leadership

Leadership is assumed to be a key factor influencing sustainability (e.g., Bellei et al., 2020; Harris & Jones, 2010). Not only have formal leaders such as principals been found to be change agents important for sustainability (Andreou et al., 2015; Bambara et al., 2009; Drits-Esser et al., 2017; Hollingworth et al., 2018; Santangelo, 2009), but also others such as teachers can fulfill that role (Fullan, 2004; King, 2016; März et al., 2018; Ng & Nicholas, 2013; Prenger et al., 2020; Spillane, 2006). In this dissertation, leadership is therefore looked at through a distributed leadership lens. From a distributed leadership perspective, leadership is about all activities tied to the core work of the school that are designed by the school's staff members to influence the motivation, knowledge, or practices of other members of the school organization (Harris & DeFlaminis, 2016; Spillane, 2006; Woods & Roberts, 2016). These activities can be performed by formal and informal leaders. Formal leaders (e.g., a principal) are those with a leadership position that is formally assigned and informal leaders (e.g., a teacher) are those who influence other staff members without having a formally assigned leadership position (Pescosolido, 2001; Pitts & Spillane, 2009).

Numerous authors have written about successful school leadership, and several systematic literature reviews and meta-analyses have been conducted. For example, Leithwood et al. (2008) state in their review that "building vision and setting directions", "Understanding and developing people", "Redesigning the organization", and "Managing the teaching and learning program" are "core sets of successful leadership practices" (p. 31-32). Hendriks and Scheerens (2013) show in their meta-analysis that "Academic climate", "Professional capacity of the staff, cooperation and commitment of staff", "Organizational capacity" and "Instructional conditions" (p. 389) are important aspects that leadership should focus on. Robinson et al. (2008) found in their review that successful leadership has five dimensions: 1) "Establishing goals and expectations" (p. 659), 2) "Resourcing strategically" (p. 661), 3) "Planning, coordinating, and evaluating teaching and the curriculum" (p. 661), 4) "Promoting and participating in teacher learning and development" (p. 663), and 5) "Ensuring an orderly and supportive environment" (p. 664). These findings and the specific practices they mentioned can be summarized into three core functions of leadership: organizing and (re-)designing the organization, managing the teaching and learning program, and understanding people and supporting their development.

In the literature reviews and meta-analyses, leadership is related to student outcomes in an indirect manner through the way school leaders lead, organize and support teachers. As working sustainably on school improvement should lead to continually improving or maintaining improved student results (e.g., Alanis & Rodriguez, 2008; Bambara et al., 2012; Prenger et al., 2020), it seems plausible that these core functions of leadership are important for leading sustainability too. Those three core functions were therefore used as the conceptual framework for the studies in this dissertation.

1.2.2.1 Leadership practices

The three core functions of leadership are enacted through different leadership practices. Previous research (e.g., Andreou et al., 2015; Bambara et al., 2012; Bean et al., 2015; Zehetmeijer, 2012) identified that specific practices can help with continually carrying out the core components of the PLC and can help them become an integral part of the daily school routines. For the core function organizing and (re-)designing the organization, an example leadership practice related to the core function organizing and (re-)designing the organization is having and communicating a vision related to the PLC (e.g., Perry & Lewis, 2009; Prenger et al., 2020; Sun et al., 2016). Leadership practices related to the core function managing the teaching and learning program are planning, monitoring, and evaluating. To our knowledge, leadership practices related to this core function have not been studied in conjunction with sustainability. However, we expect that these are connected to working sustainably on school improvement with PLCs, as PLCs focus on improving teaching and learning in schools. An example leadership practice related to understanding people and supporting their development is providing support (Andreou et al., 2015; Lim et al., 2011).

Although previous research has identified different leadership practices that seemed to contribute to the sustainability of professional development, leadership was seldom the main topic of the research (cf. Andreou et al., 2015; Bellei et al., 2020; Gaikhorst et al., 2017), which often emphasized interviews and self-reports to come up with largely normative descriptions in relation to leadership (Azorín et al., 2019). Scholars have called for research into the enactment of leadership in general (Harris & DeFlaminis, 2016; Hubers, 2020; Leithwood et al., 2020), as well as in relation to sustainability (Prenger et al., 2020). Observing the enactment of leadership for the sustainability of professional development approaches will therefore be a subject of research in this dissertation. Furthermore, because leadership in relation to sustainability of professional development is largely understudied, the nature of this dissertation research will be strongly explorative.

1.2.2.2 Leadership and knowledge brokerage

Knowledge brokerage is important for sustainability because it helps to make the professional development approach an integral part of the daily school routines (e.g., Coburn et al., 2009;

Gaikhorst et al., 2017; Stoll et al., 2006). In brief, knowledge brokerage is the communication and discussion between staff members who participate in the professional development approach and staff members who do not of knowledge that is acquired and further developed during the professional development approach (Farley-Ripple et al., 2017; Malin et al., 2018). Leaders can contribute to knowledge brokerage related to the professional development approach, which is important for understanding people and supporting their development. They can contribute directly to knowledge brokerage by engaging in brokering knowledge themselves (King, 2016). They can contribute indirectly to knowledge brokerage by stimulating and motivating staff members to engage in knowledge brokerage, for example by organizing meetings to share and discuss results obtained through the professional development approach (e.g., Hubers et al., 2019) and encouraging meaningful interaction between staff members (e.g., Brown et al., 2020). Leadership and knowledge brokerage will be a subject of research in this dissertation, because scholars have stressed the need for more research on the combination of these topics (Farley-Ripple & Grajeda, 2020; Ward, 2017) and its importance for sustainability.

1.2.2.3 Leaders' beliefs

Leaders' practices are based on their beliefs (e.g., Burch & Spillane, 2003; Fishbein & Ajzen, 2010). More specifically, how those with school leadership roles implement and act upon professional development approaches such as PLCs is greatly affected by their understanding of the PLC and by their beliefs (Burch & Spillane, 2003; Coburn, 2005; Gawlik, 2015; Spillane & Callahan, 2000). As PLCs are a tool for improving *teaching and student learning through professional development and educational research by teachers* (Little, 2012; Stoll et al., 2006), we assume that beliefs about these (italicized) concepts are crucial for school leaders' practices related to the core components of the PLC. As research on beliefs and sustainability is scarce (Maitlis & Christianson, 2014), leaders' beliefs will also be a subject of research in this dissertation.

1.3 RESEARCH DESIGN

Because of the lack of studies into leadership in relation to sustainability and to gain in-depth insights into the role of leadership in schools that work sustainably on school improvement with professional learning communities, *in situ* knowledge about the way leadership is enacted is crucial. Therefore, a case study design was used (Yin, 2014) and different types of data, including observational data, were collected. The schools were intensively observed by having the researcher be present at each of the schools for an extended period of approximately 170 hours, divided over six to eight successive weeks per school. Staff room discussions and behaviors, lessons, and meetings were observed. As a part of the field work, shadowing was performed. Shadowing is defined as "a semi-structured, undisguised, participant observation occurring in the field" (Tulowitzki, 2019, p. 103). The formal school leaders (i.e., principals and assistant principals) from the schools were shadowed for a day. Policy-related documents,

such as vision statement documents, were also collected. A questionnaire was used to map the schools' social networks, which consist of social relations. Social relations are necessary for knowledge brokerage and important for professional development approaches such as PLCs, as "these webs of relationships are often the chief determinants of how well and quickly change efforts take hold, diffuse and sustain" (Daly, 2010, p. 2). Finally, leaders of all schools were interviewed one year after the observations to gather additional information on sustainability as well as information on leaders' beliefs.

Five secondary schools in the Netherlands that worked sustainably on school improvement with PLCs (data teams or lesson study teams) participated in the studies in this dissertation. Working sustainably on school improvement with PLCs was defined as that the school still worked explicitly with the PLC after the implementation phase, the school still considered the PLC to be relevant for school improvement and the school explicitly intended to keep working with the PLC. The data team schools were selected out of 29 schools that participated in different large projects on improving data use skills. From the 13 schools that had finished the implementation phase, still considered data teams to be relevant for school improvement and explicitly intended to keep working with data teams, three were asked whether they wanted to participate (based on spread over geographical regions) by email. After a face-to-face conversation, all three schools - Schools A, C and D - accepted. The lesson study schools were selected out 19 schools that participated in two different projects on working with lesson study in their own school. From the 12 schools that after the implementation phase still worked with lesson study, considered lesson study to be relevant for school improvement and explicitly intended to keep working with lesson study, four with whom the university had good contacts were asked to participate. After face-to-face conversations, two schools – Schools B and E – agreed to participate in this study.

School A was a secondary senior general and pre-university level school in the eastern Netherlands. It had approximately 1,000 students, 70 teachers and five school leaders. School A worked with data teams. In 2013, School A started working with data teams when they participated in a program that was funded by the Ministry of Education. School A voluntarily signed up. **School B** was a secondary pre-vocational level school in the northern Netherlands. It had approximately 200 students, 20 teachers and two school leaders. School B worked with lesson study. In 2016, the Inspectorate of Education assessed the education of the school board to which School B belongs as insufficient. There was an urgency to improve. The school board decided that all of their schools should start working with lesson study. **School C** was a secondary senior general and pre-university level school in the southern Netherlands. It had approximately 1,100 students, 80 teachers and four school leaders. School C worked with data teams. In 2014, School C started working with data teams when they participated in a program that was funded by the Ministry of Education. School C voluntarily signed up. **School D** was a secondary pre-vocational, senior general and pre-university level school in the southern

Netherlands. It had approximately 1,400 students, 100 teachers and nine school leaders. School D worked with data teams. In 2015, School D started working with data teams when they wanted to improve the English language arts results in the third grade. **School E** was a secondary senior general and pre-university level school in the northern Netherlands. It had approximately 800 students, 50 teachers and two school leaders. School E worked with lesson study. In 2013, a cross-school lesson study trajectory (for more information, see De Vries & Prenger, 2018) started. The goal of the trajectory was after six lesson study cycles in four years, teachers would become lesson study facilitators for their own school. Three teachers at School E participated in the trajectory, which was the start of lesson study at School E.

1.7 STRUCTURE OF THE DISSERTATION

To address the main question, four studies were conducted and are presented in Chapters 2 to 5. These are visualized in Figure 1.1.

In **Chapter 2**, leadership practices for sustainable data use with data teams were studied. Three secondary schools that worked with data teams (Schools A, C, and D) were studied by means of a mixed-methods (i.e., intensive observation period and social network questionnaire) case study. This chapter aims to provide in-depth insight into what sustainable data use looked like, what leadership looked like at those schools, and the relation between sustainable data use and leadership. In **Chapter 3**, leadership practices for sustained lesson study were investigated. For the purpose of this study, two secondary schools that worked with lesson study (Schools B and E) were studied by means of a mixed-methods (i.e., intensive observation period, interviews and social network questionnaire) case study. This study aimed to gain in-depth insight into what sustained lesson study looked like, what leadership looked like at those schools, and the relation between sustained lesson study and leadership. Both chapters 2 and 3 thus took a more holistic leadership approach. In **Chapter 4**, the role of leaders in knowledge brokerage was examined, as knowledge brokerage was found to be an important leadership practice for sustainability. Leaders of knowledge brokerage at five secondary schools that worked sustainably on school improvement with PLCs (Schools A, B, C, D and E) were studied by means of a mixed method (i.e., social network questionnaire, interviews, and intensive observation period) case study. This study aimed to gain in-depth insight into the characteristics of those leaders, the knowledge they brokered, the quality of their relationships, and the activities they used to broker knowledge. In **Chapter 5**, leaders' understanding of the PLC and their underlying educational beliefs are focused on, as these influence school leaders' actions. For the purpose of this study, leaders of two secondary schools that worked sustainably on school improvement with PLCs (Schools A and E) participated and were studied by means of a semi-structured interview approach. This study aimed to explain the sustainability of a PLC by leaders' understanding of the PLC and their underlying educational beliefs. Finally, **Chapter 6** presents a summary of the findings, a

general conclusion and discussion of the main findings. Moreover, the practical implications of the research presented in this dissertation will be discussed

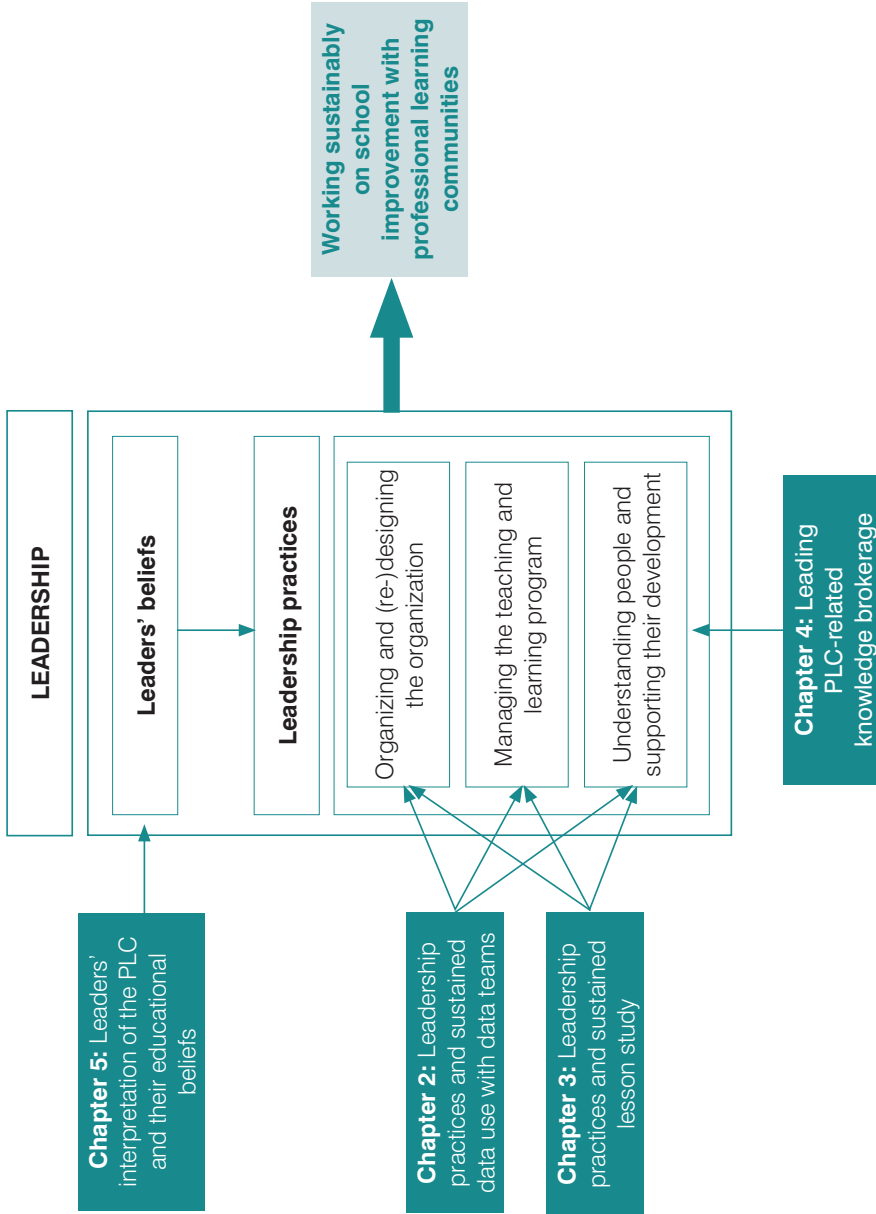
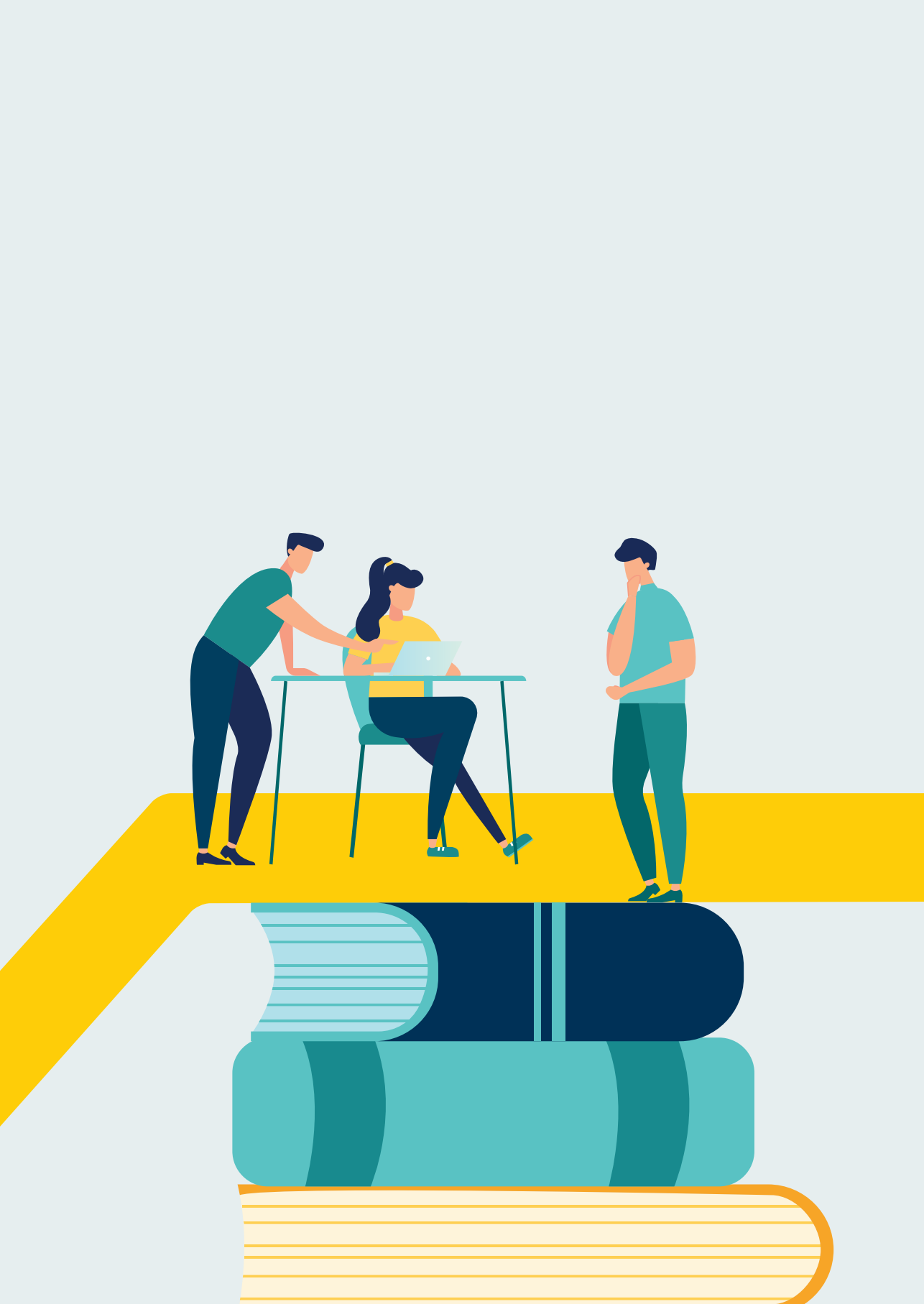


Figure 1.1 Outline of the dissertation



2

Leadership practices and sustained data use with data teams

This chapter is based on

Van den Boom-Muilenburg, S. N., Poortman, C. L., Schildkamp, K., De Vries, S., & Van Veen, K. (2020). *Leadership Practices for Sustainable Data Use through Professional Learning Communities*. Manuscript submitted for publication.

ABSTRACT

This study investigated what sustainable data use and leadership looked like in schools that work on sustainable data use through professional learning communities (PLCs). A case study design was used to gain insights and describe sustainable data use through PLCs and leadership. We conducted over 500 hours of observations in three secondary schools, administered a social network questionnaire, and collected school policy documents. The findings show how the schools differed in the form of sustainable data use they achieved, and that sustainability could be considered more nuanced. Additionally, we identified concrete leadership practices carried out by formal leaders, informal leaders, or both, showing in depth how sustainability and leadership might be related. Suggestions for future research are provided. The insights gained could inspire schools to let teachers and students benefit from PLC work in the long term.

Keywords: data use, leadership, leadership practices, professional learning communities, sustainability, case study

2.1 INTRODUCTION

Data use is increasingly important in schools to inform teachers' and school leaders' decisions for improving student learning (e.g., Marsh & Farrell, 2015; O'Brien et al., 2020; Van Geel et al., 2016). Data use skills can be developed with professional learning communities (PLCs), such as data teams, that are implemented worldwide, for example in New Zealand (Lai & McNaughton, 2016), the USA (Datnow & Park, 2018), and the Netherlands (Poortman & Schildkamp, 2016). Despite data team's effectiveness in terms of teacher satisfaction and learning (Lai & McNaughton, 2016; Poortman & Schildkamp, 2016), sustaining the work is still a challenge (Hubers, 2016). To ensure that all teachers and school leaders in schools benefit from the work of data teams in the long term, this is an important challenge to overcome.

Leadership is crucial for data use (e.g., Lange et al., 2012; Sun et al. 2016) and succeeding and sustaining innovations, such as working in PLCs (Fullan, 2016; Harris & Jones, 2010; Lee & Louis, 2019). Leadership in this study is conceptualized as distributed leadership. From that perspective, school leadership concerns all interaction and practices tied to the core work of the school that are designed by school's staff members to influence the motivation, knowledge, or practices of other staff members (Spillane, 2006; Woods & Roberts, 2016), rather than only the principal.

However, more evidence on school leadership practices is desired (Harris & DeFlaminis, 2016; Leithwood et al., 2020), specifically related to professional learning (Poekert et al., 2020; Talebizadeh et al., 2021), and evidence on achieving sustainability is scattered and scarce (Prenger et al., 2020; Hubers, 2020). This study therefore aims to gain in-depth understanding of what leadership looks like in schools that work on sustainable data use with data teams.

2.2 CONCEPTUAL FRAMEWORK

Below, we firstly review literature on data teams, followed by the sustainability of data teams. Secondly, we review literature on leadership and its relation to sustainability.

2.2.1 Improving data use in schools with data teams

Data are pieces of information that are systematically collected and organized to represent some aspect of schools (Wayman et al., 2012). Examples are assessment data, classroom observations, and student interviews. Using data can help improve the quality of education (e.g., Mandinach, 2012). Due to the importance of data use in education and the fact that teachers often lack data-use skills (e.g., Oláh et al., 2010), professional development initiatives to improve teachers' data use are important (Gummer, 2020) and have been developed and implemented (e.g., Abrams et al., 2020; O'Brien et al., 2020). An example is a data use PLC that is called a

data team. A data team consists of four to six teachers and one or two school leaders, who use data to solve a specific educational problem at their school. Data teams use a structured cyclical procedure of eight steps, which is visualized in Figure 2.1 (for an explanation of the steps, see Appendix). The steps are described in a data team manual, which also includes guidelines and activities. The data team meets at least once a month. The first year a data team starts working at a school, external guidance from a trained data team coach is provided.

The goal of data teams is twofold: to solve a current educational problem based on data, and also to engage in professional development in data use as a way of working, in order to be able to use data when solving future educational problems as well, to enhance school improvement in a sustainable way (Schildkamp & Poortman, 2015). Multiple studies have shown positive effects of data team interventions, for example, on teachers' data literacy (e.g., Kippers et al., 2018) and student achievement (e.g., Poortman & Schildkamp, 2016).

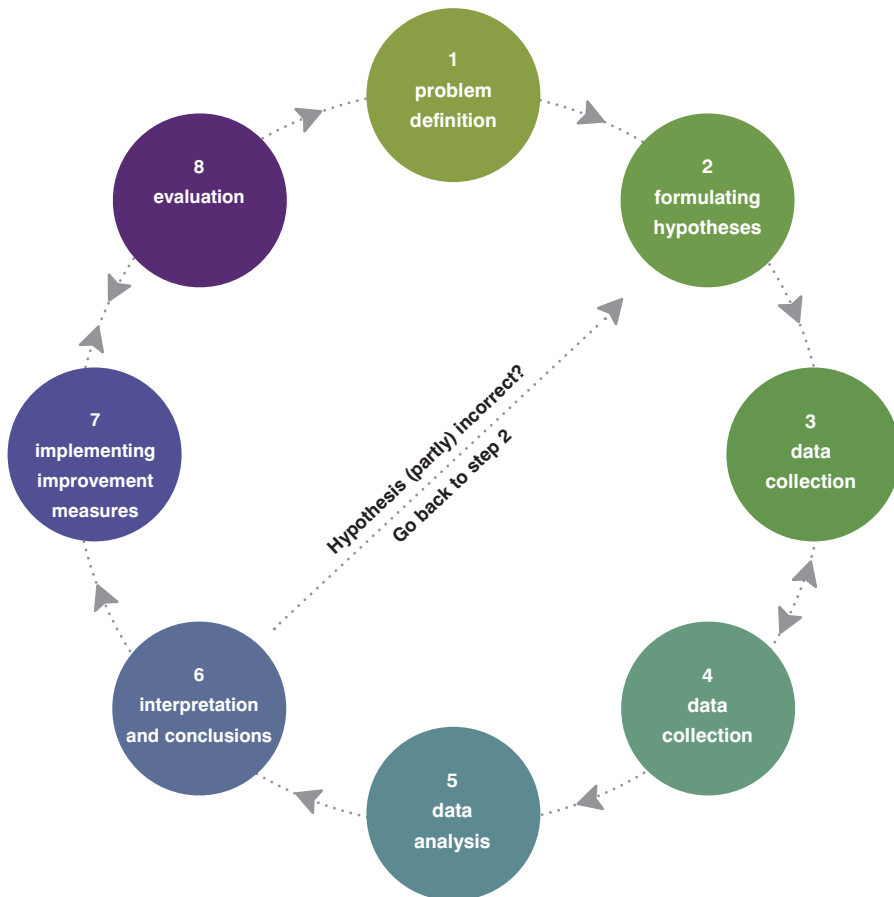


Figure 2.1 Schematic overview of the structured cyclical procedure of data teams.

2.2.2 Sustainability of data use with data teams in the school organization

Sustaining data use with data teams is important for schools to continually monitor the quality of the education provided at that school, and to improve the quality in a timely manner, when necessary. Data teams can help in that respect. In general, sustainability is analyzed in two ways. In the fidelity perspective, sustainability could mean that the professional development approach is understood and performed exactly as is prescribed (Anderson, 2007). In the local adaptation perspective, adjustments to practice are allowed, as long as teachers adhere to the core components of the professional development approach (Quinn & Kim, 2017). We take a local adaptations approach to sustainability, as variability in enactment is inevitable and can be considered a source of effective local design (McNaughton, 2021; McKenney & Reeves, 2012). Initiatives are sustainable when its core components (here, the data team's core components) are evident in organizational routines and aimed at continual improvement (Prenger et al., 2020).

For data use to become sustainable, the school could develop the data use PLC into a self-evident and functional part of the work in the school - or organizational routine. An organizational routine concerns "repetitive, recognizable patterns of interdependent action" (Feldman & Pentland, 2003, p. 96). A data team organizational routine consists of five core components: 1) working with the eight data team steps, 2) using the manual, 3) meeting regularly and at least once a month, 4) embedding data teams in school policy (i.e., policy and vision related to engaging in data teams and using data for school development) and 5) sharing the data team's knowledge and results with others in the school.

The core components need to be developed into an organizational routine. Within the definition of organizational routines, a distinction is made between the ostensive and the performative aspect. The ostensive aspect entails the idea or "perception of what the routine is" (Feldman & Pentland, 2003, p. 101), and is the guide for action. The performative aspect entails the enactment or the "specific actions taken by specific people at specific times when they are engaged in an organizational routine" (Feldman & Pentland, 2003, pp. 101-102), and is the action itself.

Analyzing both aspects of organizational routines is crucial when studying sustainability, because the variation and interplay between them can provide insights into what makes initiatives sustainable (Feldman & Pentland, 2003; Spillane, 2012). A schematic overview of the data team's organizational routine is provided in Table 2.1.

Table 2.1 Framework of the Organizational Routine for Sustainable Data Teams in Schools

| Organizational routine | Ostensive aspect | Performative aspect |
|---|--|---|
| <p>Goal To solve an educational problem based on data, thereby improving the quality of education at the school and professional development in data use to also solve future educational problems (Authors, 2015)</p> | <p>The perception of the data team routine and its core components</p> | <p>The specific actions of specific people concerning the data team routine and the core components</p> |
| <p>Core components</p> <ol style="list-style-type: none"> 1. Use the data team's eight steps 2. Use the data team manual 3. Meet regularly (at least once a month) 4. Share results of the data team with others in the school (who are not members of the data team) 5. Established in (documents concerning) school policy. | | |

2.2.3 Leadership for data use and sustainability

For the organization of sustainable data use through data teams, leadership is assumed to be crucial. In this study, we take a distributed leadership-perspective, and look at leadership as *practice*. Leadership practice is constructed in the interaction of leaders, people in their surroundings, and their situation, in the execution of particular leadership tasks (Spillane et al., 2004). It is not restricted to those with formal leadership positions but influence and agency are shared with informal leaders (Spillane, 2012; Woods & Roberts, 2016). Formal leaders are those with “a formally designated leadership position” (Pitts & Spillane, 2009, p. 3), and informal leaders are those who “exert influence over other group members, but do not receive special compensation or rewards for this role” (Pescosolido, 2001, p. 78).

Numerous authors have written about leadership, and several systematic literature reviews and meta-analyses have also been conducted (Leithwood et al., 2008; Hendriks & Scheerens, 2013; Robinson et al., 2008). In general, leadership can be described through three core functions that emerge from these reviews and meta-analyses: 1) *organizing and (re-)designing the organization*, 2) *managing the teaching and learning program* and 3) *understanding people and supporting their development*. In this study we focus on these three core functions of leadership. Below we summarize the leadership practices related to these core functions that can be found in studies on leadership for sustaining intervention such as PLCs and/or for (sustainable) data use.

With regard to the sustainability of data use in PLCs *organizing and (re-)designing the organization* entails school leaders having a clear vision for data use (Lange et al., 2012; Schildkamp et al., 2019; Sun et al., 2016), making a priority of data use through facilitating resources and/or by writing it down in school plans (Andreou et al., 2015; Brown & Flood, 2019; Sun et al., 2016), and

crafting coherence between data use and the school organization (Pyhältö et al., 2011; Soini et al., 2016).

Managing the teaching and learning program is characterized by planning, monitoring, and evaluating. To our knowledge, activities of this core function have not been studied in conjunction with sustainability or data use. However, we expect that these are connected to sustainable data use, as data teams use data to improve teaching and learning in schools, school leaders have an important role in ensuring the sustainability of these activities.

The practices related to school leaders' third core function, *understanding people and supporting their development*, that contribute to data use and sustainability of interventions are providing individual and external support (Andreou et al., 2015; Kafyulilo et al., 2016; Schildkamp et al., 2019; Sun et al., 2016), being available and approachable (Mullen & Jones, 2008; Prenger et al., 2020; Sun et al., 2016), having the relational skills required to make connections and build the trust needed to improve teaching and learning (Meyer et al., 2017; Sun et al., 2016), and being knowledgeable as well as a model (Park & Datnow, 2009; Schildkamp et al., 2019; Sun et al., 2016). Sharing knowledge related to data use and data teams is a final important leadership practice that is assumed to contribute to data use and sustainability (Andreou et al., 2015; Gaikhorst et al., 2017; Schildkamp et al., 2019).

Inherent in understanding colleagues and supporting their development through the above described practices, are social relations. Through social relations, staff members can access and leverage resources such as knowledge and information (Cole & Weibaum, 2010), here related to data use and data teams. The social relations in a school form a social network (Daly, 2012). Two types of social networks can be distinguished in schools: instrumental networks, through which work-related information and resources circulate; and expressive networks, through which more supportive and personal information and resources circulate (Daly et al., 2010). More relationships (i.e., density of the network), more mutual relationships (i.e., reciprocal) between staff members make it easier to distribute resources (e.g., Daly, 2012).

2.2.4 Current study

Based on our conceptual framework, this study aims to answer the following two questions:

1. What does working on sustainable data use look like in secondary schools that work with data teams, in terms of the organizational routine's ostensive and performative aspects?
2. What does leadership look like in these schools, in terms of organizing and (re-)designing the organization, managing the teaching and learning program, and understanding people and supporting their development?

2.3 METHOD

To describe sustainable data use and the enactment of leadership in secondary schools working on sustainable data use with data teams, a mixed-methods case study design was used (Greene & Caracelli, 1997; Yin, 2014). With this design we aim to explore and describe in-depth what sustainable data use with data teams, and leadership practices in schools that work on sustainable data use with data teams, looks like. In principle, the results need to be treated with caution, since they cannot be generalized to other settings (Yin, 2014). Detailed illustrations, however, do allow others to assess to what extent the results apply to other situations, which is called analytical generalization (Kratwohl, 1998; Poortman & Schildkamp, 2012).

Different sources of data, being observational data, and questionnaire data and documents, were collected and analyzed. They were used to corroborate our findings across different approaches, so that greater confidence could be held in the conclusion. This was used for triangulation purposes, by checking whether independent measures were in agreement, or, at least, did not contradict each other (Burke Johnson & Onwuegbuzie, 2004; Miles et al., 2014). Additionally, it was applied for complementarity reasons, for seeking elaboration, enhancement, illustration, and clarification of the results of one method with results of the other method (Meijer et al., 2002). The data from the observations and documents combined with social network questionnaire formed a more comprehensive view of the phenomena studied.

2.3.1 Participants

Data were collected in three secondary schools located in the Netherlands that all had finished the implementation phase, still considered data teams to be relevant for working on data use and explicitly intended to keep working with data teams. The school system in the Netherlands is decentralized and there is no national curriculum. Teachers teach towards core curriculum standards, but these objectives are general (OECD, 2008, 2010). They thus have freedom to decide what and how they want to teach, and to implement innovations such as a PLC.

The schools in this study, School A, School C, and School D, participated in different large projects on improving data use skills. In total, 29 schools participated in the projects led and trained by two of the researchers in this study. From the 13 schools that had finished the initial implementation phase and that after a minimum of three years were still working with data teams, three were asked whether they wanted to participate by email. After a face-to-face conversation, all schools - Schools A, C and D - accepted. Background information for each school is presented in Table 2.2.

Table 2.2 Background Information per School

| School | Formal school leaders | Teachers | Students | Level |
|----------|-----------------------|----------|----------|--|
| School A | 5 | 71 | 1,029 | senior general, pre-university |
| School C | 4 | 75 | 1,113 | senior general, pre-university |
| School D | 9 | 101 | 1,395 | pre-vocational, senior general, pre-university |

School A had started working with data teams four years before the observation period. Three different data teams had worked on different problems sequentially: low achievement in English language, mathematics, and science. Teachers were asked by assistant principals if they wanted to participate in a data team. The composition of each data team differed compared to each other, but one assistant principal participated in all three data teams. The first and third data team were guided by a data team coach from the university.

School C had also started working with data teams four years before the observation period. One data team had worked on two different problems: student retention in Year 9 and a lack of formative assessment. Teachers could apply for a position in the data team by e-mailing an assistant principal. The composition of the data team remained the same for the four years, except for one teacher who retired and was replaced by a different teacher. One assistant principal also participated. The first data team was guided by a data team coach from the university.

School D had started working with data teams three years before the observation period. Seven different data teams had worked on different problems: for example, low achievement in science, Dutch language and student transition from Year 10 to Year 11. Teachers were asked by assistant principals if they wanted to participate in a data team. The composition of six data teams differed from each other, but an assistant principal was part of each data team. The seventh data team consisted of teachers who had already participated in a data team, with the goal of letting them experience the intervention again so that they could coach teams themselves in the future. The first data team was guided by a data team coach from the university. Afterwards, this school hired an external data team coach to support each data team. Specific data team information for each school is presented in Table 2.3.

Table 2.3 Data Team Information per School

| School | Start data team(s) | External data coach guidance | Number of problems studied | Teacher recruitment | Team composition |
|----------|------------------------------------|------------------------------|----------------------------|---------------------|---|
| School A | 4 years prior to study (2013-2014) | 2013-2014 2016-2017 | 3 | asked | different, one assistant principal constant factor |
| School C | 4 years prior to study (2013-2014) | 2013-2015 | 2 | apply by e-mail | same for the four years |
| School D | 3 years prior to study (2015-2016) | 2015-2019 | 7 | asked | different, one assistant principal constant factor |

2.3.2 Procedure

A unique method for data collection was applied (approved by the ethical committee of the researcher's university, #BCE17595). The first author was present at each of the schools for an extended observation period of approximately 168 hours, divided over 6-8 successive weeks per school. Staff room discussions and behaviors, lessons, and meetings were observed. As a part of the field work, shadowing was also done. Shadowing is defined as "a semi-structured, undisguised, participant observation occurring in the field" (Tulowitzki, 2019, p. 103). The formal school leaders (i.e., principals and vice-principals) from all schools were shadowed for a day. As the observation period was so extended, it was not possible to make recordings. Instead, field notes were taken on paper and digitally. At the end of each day, the information from the field notes was put into an organized form by being entered in a logbook. School (policy-related) documents, such as vision statement documents, year planners, and policy plans, were also collected. When teachers or school leaders mentioned documents (such as emails or data team progress reports) that were related to the subject of this research, they were asked to share these documents.

Before the observation period started, school leaders were introduced to the researcher through an introductory meeting and teachers through an information flyer with information on the researcher and specific study. At the end of the observation period at each school, a social network questionnaire was administered to all teachers and school leaders at the school.

After the observation period ended, a report was written for each school. In this report, a descriptive overview of the observation period and the questionnaire results were provided. This report was discussed in a meeting with the school leaders. Therefore, the report served as member check. Only few minor comments were made, for example regarding formulation.

2.3.3 Instruments

An overview of the data collected per research question is presented in Table 2.4. The instruments used for the observations and the questionnaire are explained in more detail below.

Table 2.4 Overview of the Data Collected per Research Question

| | Sustainability (RQ1) | | Leadership (RQ2) | | |
|---------------|----------------------|--------------|---|--|---|
| | Ostensive | Performative | Organizing and (re-) designing the organization | Managing the teaching and learning program | Understanding people and supporting their development |
| Observations | X | X | X | X | X |
| Documents | X | X | X | X | |
| Questionnaire | | | | | X |

2.3.3.1 Logbook

The logbook consisted of questions related to leadership and the sustainability of the data teams, based on the theoretical framework. Examples of questions were ‘What did you see with regard to the data team using the data team’s steps?’ or ‘What did you see today with regard to leaders’ understanding people and supporting their development?’. The first researcher completed a logbook, based on field notes, for each day.

2.3.3.2 Questionnaire

To gather information on social relations as part of the school leader’s core function understanding colleagues and supporting their development, a non-anonymous questionnaire was administered per e-mail. Two questions were asked. The first question was ‘Whom do you talk to about your work?’ (i.e., instrumental network) and the second question was ‘Whom do you talk to about personal matters (such as your family or weekends)?’ (i.e., expressive network). A list with names of all school leaders and teachers working at that specific school was provided with each question. A follow-up question was given for the instrumental network, concerning the intensity of the relation and conversation: exchanging experiences, aid and assistance, sharing, or joint work (cf. Little, 1990). Finally, generic information about the participants was asked for, such as age and teaching experience.

2.3.4 Analysis

2.3.4.1 Logbook and documents

The logbooks and collected documents were anonymized and coded in Atlas.ti. The coding scheme was based on the theoretical framework. Initially, one researcher identified all segments. Codes were assigned to each segment that contained information about sustainability of the data teams or leadership. If no such information was described (e.g., a description of the feelings of the researcher or a description of an appointment that was made), the segment was not coded.

As for the sustainability of data teams, segments related to the performative and ostensive aspect of each of the five core components were coded. Segments related to the perception of the PLC were coded as the ostensive aspect. Segments related to specific actions were coded as the performative aspect. Because of the decentralized school system in the Netherlands, the school's policy related to the PLC is strongly based upon the school's perception of the routine (i.e., ostensive aspect). Segments related to school's policy were therefore coded as the ostensive aspect too. As for leadership, segments related to leadership practices of the three core functions (i.e., organizing and (re-) designing the organization, managing the teaching and learning program, understanding people and supporting their development) were coded. In total, 53 logbooks and 33 documents were coded.

After an initial round of coding and redefining the coding scheme, the first author and a researcher unfamiliar with the data coded 80 segments (11% of the data). The interrater reliability was found to be substantial (Cohen's $\kappa = .70$; Landis & Koch, 1977). In cases of disagreement, the raters reached consensus on the coding through discussion after finishing the coding. The first author finalized the coding of the transcripts. The final coding scheme is presented in Table 2.5.

After coding the data, first within-case analyses were made by summarizing the codes per case. Based on this analysis, the results for each of the codes (i.e., elements of the theoretical framework) were summarized to describe sustainable data use with data teams and leadership. Then, results per code per case were compared through cross-case analysis, in which similarities and contrasts were identified. Since no audio-recordings could be made, quotations of the notations in the logbook are used to illustrate the findings.

Table 2.5 Coding Scheme for Logbooks and Documents

| LEADERSHIP PRACTICES | | |
|--|---|--|
| Organizing and (re-) designing the organization | Code description | Coded example |
| Vision and goals | The (development of) vision (i.e., an idealized goal that must be achieved by the organization in the future) | "Today, [staff member] told me that in the end s/he ideally wants to appoint one teacher as a 'data team leader', and that function should become part of the school structure." |
| Crafting coherence | Coordinating processes in the organization throughout the whole organization, at different systemic levels, and over time, for example, how to make sure that teachers know what the policy documents entail/translate them into practice | "[staff member] are constantly making the connection to teachers, through which the abstractness of the content disappears." |
| Resourcing and facilitation | Resourcing, such as human resource management and positioning people, and facilitating use of time and other resources (money, hiring experts, purchase new materials) | "[staff member] cleared schedules of data team members so they can attend the data team meetings." |
| Managing the teaching and learning program | | |
| Planning | Planning of the curriculum and teachers' instruction and functioning | "[staff member] tells and shows that data team meetings are taken up in the yearly calendar and placed on the website." |
| Monitoring | Monitoring of the curriculum and teachers' instruction, such as lesson visits or performance interviews | "[staff member] asks others about the process of the data team in the teacher room." |
| Evaluating | Evaluation of the curriculum and teachers' instruction, such as evaluation interviews | "During the yearly meeting between the school leaders and [department], the situation of the [department] is discussed." |

Table 2.5 Continued

| Understanding people and supporting their development | | |
|--|--|--|
| | Code description | Code example |
| Providing support | Providing support, both internal and external, coaching, empowering, motivating, and professional agency | "[staff member] explains, based on a question that was asked, how data can be analyzed in Excel." |
| Being available | Availability, such as being present at the school and participating in meetings, and offering a sympathetic ear for work-related aspects | "[staff member] keeps his office door open as often as possible, so people know where to find him and can reach him." |
| Connecting | Connecting people, such as bringing people together or organizing collaboration (also with partners external to the organization) | "At this school, staff members from different departments are part of a data team, so collaboration across departments can happen." |
| Modeling | Showing how to be involved, engaged and participate in school improvement | "[staff member] participates in the data team." |
| Being knowledgeable | Being well informed about the school improvement effort and having procedural and conceptual knowledge of the new practice to enable sustainability | "[staff member] refers to a scientific publications when explaining the use of data." |
| Knowledge sharing | Aspects of how people communicate, such as clarity, use of language, relational skills, and showing interest | "[staff member] ask different [staff members] informal, personal questions, such as: How are you doing? How are your children?" |
| SUSTAINABILITY | | |
| | Code description | Code example |
| Core components | <p>The data team's core components:</p> <ol style="list-style-type: none"> 1. Use the data team's eight steps 2. Use the data team manual 3. Meet regularly (at least once a month) 4. Share results of the data team with others in the school (who are not members of the data team) 5. Established in (documents concerning) school policy | <p>Ostensive: "Data use in all layers of our school and every department knows the data team way of working" [school team plan document]</p> <p>Performative: "When observing the data team meeting, I noticed that the data team manual was not at hand."</p> |

2.3.4.2 Social network questionnaire

The response rate per school ranged from 68.4% to 73.4%. No apparent differences in grade levels, educational levels being taught, and subjects being taught were evident between the responders and the non-responders. The questionnaire data were analyzed using UCINET software (Borgatti et al., 2002). We looked at how many staff members were part of each network, what type of conversations took place and we calculated density and reciprocity per network (i.e., instrumental and expressive). Density was calculated as the number of ties between staff members divided by the number of possible ties in the network, and was scaled between 0 (no relationships between staff members) and 1 (a social network in which all staff members are connected to one another). Reciprocity was measured by calculating the percentage of reciprocal ties in the network, controlling for the size of the network, and was scaled between 0 (no mutual ties present in the network) and 1 (all ties are reciprocated) (Daly, 2012).

2.4 RESULTS

2.4.1 What does sustainable data use with data teams look like?

To obtain insight into sustainable data use in the participating schools, we identified how the five data team core components were visible in the schools, as presented in Table 2.6.

2.4.1.1 Using the data team's eight steps.

Leaders at all schools had ideas about how to use the eight steps of the data team intervention, the *ostensive aspect* of the first core component. These perceptions however were not always in line with how the intervention was set up. For example, using all eight steps is “not always necessary”, according to two assistant principals at School A and two assistant principals at School C. One assistant principal at School A argued that “data use is always necessary, and not only when a department has a problem” (step 1). This assistant principal felt that analyzing data and drawing conclusions based upon the analyses should become part of each department, independent of a problem. The other assistant principal at School A did not want to limit data use to when a problem arises, either. Two assistant principals at School C found that it depends on the situation and the needs of the school: “implementation of a strategy can be evaluated perfectly well with a data team, but the first steps in the data team process are not always necessary”. The data team members of School D did not mention any ideas or perceptions that deviated from the eight steps. This first core component was not included in school documents in any of the schools. The *performative aspect* of this core component was carried out at School A – they used all eight steps. However, at School C, they were no longer using all steps, and the data team was instead deployed as an evaluation team. That is, the team evaluated the effect of the already implemented formative assessment intervention, and were not addressing the issue (i.e., dissatisfaction with the amount of testing) starting at step 1. At School D, one data team did not come up with improvement measures, and therefore did not conduct an evaluation either.

2.4.1.2 Using the data team manual.

For the *ostensive aspect* of this core component, teachers at both Schools A and C mentioned explicitly that using the data team manual was not necessary for them, because they “know the steps by heart”. The data team members at School D did not mention deviant ideas or perceptions. This core component was not included in school documents, either. Looking at the *performative aspect* of this core component, the data teams at Schools A and C seldomly used the data team manual. They did so when they wanted to “check their own knowledge”, and thus used it more as a reference book. The data teams at School D always used the data team manual: they followed the data team intervention as guided by the data team coach.

2.4.1.3 Meeting regularly (at least once a month).

Looking at the *ostensive aspect* of this core component, at School A, meetings were not included in the school plan. Schools C and D included data teams in the school’s yearly plan by mentioning the days and time when the meetings would take place during that school year. Considering the *performative aspect*, all schools organized meetings regularly, once per month.

2.4.1.4 Sharing results of the data team with others in the school (who are not members of the data team).

Looking at the *ostensive aspect* of this core components, the principals at School A and School C and two assistant principals at School D mentioned that they want this to happen. However, ideas about how were not mentioned. This core component was not included in school documents. Looking at the *performative aspect* of this core component, each school communicated and shared data team results and outcomes through their newsletter. At School A, department meetings were organized to discuss the data team’s results with teachers who were not in the data team as well.

2.4.1.5 Establishing data use with data teams in (documents concerning) school policy.

For the *ostensive aspect* of this core component, at School A, data use in general was part of all policy documents, including team plan and vision documents, while data teams were part of one policy document: a team plan from one of the school leaders. In School C the principal was so enthusiastic about the results of the data team that he ultimately wanted to appoint one teacher as ‘data team leader’. This person would then also have to “connect and share results more explicitly and think about making the data team a more integral part of the school”. Data teams were included in policy documents at School C, namely, in the school’s yearly planner. At School D, data teams were established in school policy. For example, data team meetings were included in the school’s yearly planning (and even published on the website) and discussing the results and improvement measures from the data team was added to the format for department meetings. The staff members of the department have to describe how the expertise they gained

in the data team is being used in this year and need to submit it to the department's yearly plan. School D acted upon this core component, the *performative* aspect, by depicting data use with data teams in policy plans (see above). Additionally, school D also started working in a school board data team, in which teachers at different schools from one school board participate, thereby establishing data teams in the larger organization. At Schools A and C, the establishment of data teams in the school organization was made evident by the monthly meetings that were held.

Table 2.6 Data Teams' Core Components in Practice

| Core components | School A | | School C | | School D | |
|--|----------------------|---------------------------|----------------------|---------------------------|----------------|-------------------|
| | Osten- sive | Perfor- mative | Osten- sive | Perfor- mative | Osten- sive | Perfor- mative |
| 1. Using the data team's eight steps | Not always all steps | √ | Not always all steps | X | √ | Nearly all |
| 2. Using the data team manual | "Know by heart" | Seldom; only as reference | X | Seldom; only as reference | X | X |
| 3. Meeting regularly (at least once a month) | X | √ | √ | √ | √ | √ |
| 4. Sharing results of the data team with others in the school (who are not members of the data team) | X | √ | X | √ | X | √ |
| 5. Establishing in (documents concerning) school policy | √ | √ | √ | √ | √ | √ |

2.4.2 What does leadership look like?

2.4.2.1 Organizing and (re-)designing the organization

All schools had their own *vision* for working on data use with data teams. At School A, data teams were used to develop staff members' data use skills. Data teams were started because of problems that were experienced (e.g., disappointing mathematics results in the third grade). At School C, one and the same data team was deployed to work on school-wide problems (e.g., evaluate implemented formative assessment intervention). Leaders of School C wanted to use data teams to evaluate an already implemented intervention and omitted the first step. This data team had the expertise, so— according to the school — it is not necessary to start new data teams repeatedly. At School D, data teams were used to develop staff members' data use skills. The principal and assistant-principals mentioned that they wanted "everyone at some point to participate in a data team." With that goal in mind, they asked different departments per year to start a data team. Those visions were, however, mainly known by (part of) the formal leaders

and barely documented nor communicated throughout all schools. For example, the principal of School C mentioned that he wanted to appoint a 'data team leader' for data teams, as a permanent part of the school. Neither assistant principals nor teachers were aware of this wish.

Crafting coherence was observed at Schools A and D. At School A, formal leaders mentioned that data teams were implemented because of their vision (also part of the school vision plan) to work with formative assessment. Data teams were thus used as a tool to work on a specific goal. At School D, formal leaders mentioned that data teams were implemented to improve teachers' data use skills. Data teams were used here as a tool to work on a more general goal. The connections between data teams and the school goals and vision were, however, not communicated throughout the school. At School C, data teams were implemented as such, and not related to the school's vision.

Resourcing and facilitation were observed at all schools. In all schools, schedules were cleared so staff members could participate in the data team meetings. Additionally, at School D, task-hours for each data team member were provided. They also hired an external data team coach, who guided and assisted the data teams in their process.

All leadership practices in this category (for an overview, see Table 2.7) were enacted by formal leaders, often in the same way across schools. Although facilitation took place and two of the three schools crafted coherence between data teams and the school's vision and goals, the vision and goals related to data teams were not explicitly communicated.

Table 2.7 Leadership Practices Related to Organizing and (Re-)Designing the Organization per School

| | School A | School C | School D |
|------------------------------------|--|--|--|
| Vision and goals | <ul style="list-style-type: none"> - Data teams to develop staff members' data use skills for formative assessment - In one team plan (of four) - Not explicitly communicated | <ul style="list-style-type: none"> - One data team to work on schoolwide problems - Neither explicitly documented nor communicated | <ul style="list-style-type: none"> - Data teams to develop staff members' data use skills - Neither explicitly documented nor communicated |
| Crafting coherence | <ul style="list-style-type: none"> - Data teams connected to specific goal: working with formative assessment | <ul style="list-style-type: none"> - Not connected to school's vision | <ul style="list-style-type: none"> - Data teams connected to more general goal: improving data use skills |
| Resourcing and facilitation | <ul style="list-style-type: none"> - Cleared schedules | <ul style="list-style-type: none"> - Cleared schedules | <ul style="list-style-type: none"> - Cleared schedules - Task-hours for each data team member - External data team coach |

2.4.2.2 Managing the teaching and learning program

Planning was done in several ways. For example, at School D, the department meeting agendas of the departments that had worked with data teams were extended with data team-related points. These departments were, for example, asked to formulate how the expertise they achieved through the data team would be used in the coming year and incorporated in the department's yearly plan. At Schools C and D, teacher participation in the data team was submitted to the yearly plan, so teachers already knew for the whole year when the meetings would take place. Although this had happened in previous years at School A as well, this year it happened ad hoc: meetings were planned per month, and lessons were cancelled. That frustrated the teachers, because they did not know when to catch up on the lessons that had been cancelled.

With regard to *monitoring*, at all schools data use and (the progress of the) data teams were discussed during weekly meetings, for example between staff members of one department or during the weekly school leader meeting, as well as in the staff room. At School C, for example, one data team member was keen on monitoring by checking whether the improvement measures that had been developed were still being implemented. After noticing that the data team's improvement measures were no longer being carried out, she notified an assistant-principal. They discussed "how the improvement measures could be implemented again".

Evaluating was observed during yearly department meetings between department heads and formal school leaders, teacher interviews and performance interviews. During those meetings, areas that could be improved by means of a data team were identified, and data teams as a solution for an identified problem in the school (e.g., disappointing results) was suggested.

Leadership practices in this category were all observed (for an overview, see Table 2.8), often in the same way across schools. Planning was enacted by formal leaders only. Monitoring and evaluating were enacted by both formal and informal leaders.

Table 2.8 Leadership Practices Related to Managing the Teaching and Learning Program per School

| | School A | School C | School D |
|-------------------|---|---|--|
| Planning | - Meetings planned ad hoc | - Meetings in yearly calendar | - Meetings in yearly calendar - Part of department meeting |
| Monitoring | - Discussed during weekly meetings - Discussed in staff room | - Discussed during weekly meetings - Discussed in staff room - Implementation improvement measures checked | - Discussed during weekly meetings - Discussed in staff room |
| Evaluating | - Yearly department meetings between leaders and teachers used to identify improvement areas - Mentioned data team as problem solver | - Yearly meetings between leaders and teachers used to identify improvement areas - Mentioned data team as problem solver - Used data team as evaluation team | - Yearly meetings between leaders and teachers used to identify improvement areas - Mentioned data team as problem solver |

2.4.2.3 Understanding people and supporting their development

Support regarding data use and data teams was provided through answering questions or giving advice related to data analysis. For example, at School A, a non-data team member emailed a data team member to express her enthusiasm about data analysis, but also shared her concerns about where to start. The data team member replied with some tips and suggestions, and the offer to make an appointment with the teacher to discuss data further.

General *appreciation* and *availability* were observed often, for example, through formal and informal leaders complimenting those responsible for effort that was put into organizing activities focused on professional development, formal leaders having open office doors so teachers or colleagues could walk in and offering a sympathetic ear, and informal leaders working at a central place in the school so people could reach them. It was not observed in relation to data teams or data use in particular.

Connections with regard to data teams were manifold. For example, at Schools C and D, teachers from different departments were connected through their participation in the data team. At School A, teachers from different locations of the school were connected, and at School D different schools were connected as a school board data team was established.

Modeling was observed as assistant principals at all schools and a team leader at School D participated actively in data teams. During those meetings, some formal leaders chose to chair

the meetings; others deliberately let others chair the meetings. Additionally, they helped with data analyses and were involved in discussions about data use.

Knowledgeability was observed by leaders who knew how the data team works, could chair and guide the data team meeting and could answer questions about the data team's way of working. Examples of such questions were where to look for specific data or what data to use for certain steps of the data team.

Knowledge sharing was for example observed through leaders spreading information, such as by talking about data teams, or by mentioning results or the team as such during conversations with staff members that did not participate in the data team, and by communicating the data teams' results in a newsletter.

Leadership practices in this category (for an overview, see Table 2.9) were all observed often in the same way across schools, and were enacted by both formal and informal leaders.

The leaders at Schools A, C and D carried out all leadership practices related to understanding people and supporting their development. The practices are also reflected in the *social networks* of the three schools (for descriptive statistics, see Table 2.10). The composition of the social networks within the three schools was more or less similar. Almost all schools' staff members were involved in conversations about work and personal matters. The instrumental network was the densest and had more reciprocal ties compared to the expressive social network. Conversations in the instrumental network were mainly about exchanging experiences. These data show, similar to the qualitative data collected, that the schools have dense and close teams, based on which their leaders can easily reach out -as they do, for example, for sharing knowledge- and be reached out to -as is done, for example, when colleagues want to ask questions.

Table 2.9 Leadership Practices Related to Understanding People and Supporting their Development per School

| | School A | School C | School D |
|-------------------------|---|--|--|
| Provide support | <ul style="list-style-type: none"> - Answered questions about data use - Gave advice about data use - Willing to make appointments to discuss data | <ul style="list-style-type: none"> - Answered questions about data use - Gave advice about data use | <ul style="list-style-type: none"> - Answered questions about data use - Gave advice about data use |
| Be available | <ul style="list-style-type: none"> - Opened office doors - Offered sympathetic ear - Not directly related to data teams | <ul style="list-style-type: none"> - Opened office doors - Offered sympathetic ear - Not directly related to data teams | <ul style="list-style-type: none"> - Opened office doors - Offered sympathetic ear - Not directly related to data teams |
| Connect | <ul style="list-style-type: none"> - Connections to university - Connections between different locations of the school | <ul style="list-style-type: none"> - Connections to university - Connections between departments within school | <ul style="list-style-type: none"> - Connections to university - Connections between departments within school - Connections between schools |
| Model | <ul style="list-style-type: none"> - Participated actively - Staff members from all but one organizational layer in data team - Presented data analyses during PD activities | <ul style="list-style-type: none"> - Participated actively - Staff members from all but one organizational layer in data team | <ul style="list-style-type: none"> - Participated actively - Staff members from all but one organizational layer in data team |
| Be knowledgeable | <ul style="list-style-type: none"> - Knew content and procedures - Recognized problem that might be solved with data teams - Answered questions about data use | <ul style="list-style-type: none"> - Knew content and procedures - Recognized problems that might be solved with data teams - Answered questions about data use | <ul style="list-style-type: none"> - Knew content and procedures - Recognized problems that might be solved with data teams - Answered questions about data use |
| Share knowledge | <ul style="list-style-type: none"> - Showed interest - Spread information - Shared data team results in newsletter | <ul style="list-style-type: none"> - Showed interest - Spread information - Shared data team results in newsletter | <ul style="list-style-type: none"> - Showed interest - Spread information - Shared data team results in newsletter |

Table 2.10 Descriptive Statistics Regarding the Social Networks per School

| | School A | | School C | | School D | |
|-------------------------------------|----------|------|----------|------|----------|------|
| | I | E | I | E | I | E |
| Staff members in network | 76 | 74 | 79 | 79 | 110 | 109 |
| Staff members not in network | 0 | 2 | 0 | 0 | 0 | 1 |
| Density | .175 | .080 | .254 | .143 | .209 | .090 |
| Total ties | 1009 | 457 | 1601 | 885 | 2538 | 1101 |
| Exchanging experiences ties | 507 | - | 960 | - | 1665 | - |
| Aid and assistance ties | 180 | - | 295 | - | 357 | - |
| Sharing ties | 97 | - | 118 | - | 178 | - |
| Joint work ties | 225 | - | 228 | - | 338 | - |
| Reciprocity | .238 | .209 | .271 | .186 | .242 | .190 |

Note. I = instrumental network, E = expressive network

2.5 DISCUSSION

Achieving sustainable data use with PLCs is a challenge for schools (Hubers, 2016). Leadership plays an important role therein (e.g., Fullan, 2016; Lange et al., 2012; Sun et al. 2016). We used a case study design to intensively explore and describe sustainability and leadership in three schools that sustained data use with data teams to gain in-depth understanding of the enactment of both. Our overall results suggest two broad themes: the nuance in sustainability and the interplay of leadership practices in schools that worked on sustainable data use with data teams.

2.5.1 The nuance in sustainability

Our first research question was: What does working on sustainable data use look like in secondary schools that work with data teams? The core components of the data team intervention combined with an organizational routine-lens helped us in identifying the sustainability of the data team work in these schools. Altogether, we found that all three schools in this study differed in the form of sustainability they achieved. Although all schools organized regular meetings, established data use and data teams in school (policy) documents, and shared results of the data team with others in the school, the ostensive aspect of, or the policy related to, the core components was less profound. Previous research also identified the ostensive aspects as an area that needs a stronger focus (Hubers et al., 2017). The first steps that the schools in this study made in that respect (e.g., embedding data teams and data use in the school's policy documents), might help apply that focus.

Two of the three schools adapted the data team intervention to their needs. They did not use all steps or used the manual as a reference book and not as guide. Variability can be considered a source of effective local design (McNaughton, 2021; McKenney & Reeves, 2012). Further investigation is needed whether we can still talk about an “effective” local design (partly) when omitting one of the core components.

The schools in this study thus showed a nuance in sustainability of educational interventions. They show how certain aspects of the data team’s core components are part of an organizational routine in different manners. For example, in one of the schools not all steps of the data team were used and in another school the data team manual was used more as a reference book. We better not ask if schools did or did not achieve sustainability, but we should ask what aspects of sustainability are achieved and in what manner.

2.5.2 The interplay of leadership practices in schools that worked on sustainable data use with data teams

Our second research question was: What does leadership look like in schools that worked on sustainable data use with data teams? The leaders in the three schools of this study all showed an interplay of leadership practices corresponding to the three core functions of leadership identified in our conceptual framework (Leithwood et al., 2008; Hendriks and Scheerens, 2013; Robinson et al., 2008). Previous research (Brown & Flood, 2019) also showed that an interplay of leadership practices is necessary for continuing the work of PLCs. The schools in this study had a clear vision and facilitated time, and therewith organized and designed the school to work with data teams; they planned, monitored and evaluated the teaching and learning program while considering data teams; they provided support, were available, connected, modelled, were knowledgeable and communicated to understand people and support their development for working with the data teams. Since these three core functions of leadership in principle contribute to school improvement in terms of student outcomes (Leithwood et al., 2008; Hendriks and Scheerens, 2013; Robinson et al., 2008), it seems that these core functions also contribute to sustainably working on data use with data teams (Schildkamp & Poortman, 2015).

Another finding is that the leadership practices in the schools in our study were not carried out in the same way. Our study showed in detail how the practices were carried out across the three schools. For example, the leadership in all schools had a vision for working with data teams, but the specifics of the vision differed. One school used data teams as a tool to specifically work on formative assessment; the other two schools used data teams as tool to work on more general goals, such as staff members’ data use skills or schoolwide problems. Another example, as for planning, one school added data teams to the format of department meetings, whilst the other schools did not. Not only the way in which leadership practices were enacted, but also the

school contexts differed: for example, the level and size of the schools, how long they worked with data teams, and the number of staff members that worked with the data team.

Additionally, our results showed that the leadership practices in these three schools were not only carried out by formal leaders, but that they were shared with staff members who did not have a formal leadership position, so-called informal leaders. All schools had one main initiator regarding data teams. This person was a formal or informal leader, and took care specifically of continuing to work with the data teams. Each initiator had a strong vision regarding data teams, was knowledgeable, talked about data teams with colleagues regularly, and mentioned data teams as a possible solution for problems. This comes with a risk: when this person decides to go and work at another school, taking his or her knowledge and vision with him or her (Andreou et al., 2015), then this can jeopardize sustainability (e.g., Bean et al., 2015).

Although the main initiator at one of the schools was an informal leader, another finding is that only the formal leaders of the schools in this study carried out the leadership practices related to organizing and (re-)designing the organization and planning. The other leadership practices (e.g., providing support and modelling) were carried out by both formal and informal leaders. Formal leaders are apparently needed for a sustainable organization and planning of data teams, which is in line with Schildkamp et al. (2019).

2.5.3 Limitations

The present study had its limitations. First, working on sustainable data use with data teams was only investigated in one setting, the Dutch context, and in three schools. Additionally, the schools in our study differed on several aspects: for example, the level and size of the schools, how long they worked with data teams, the data team's composition and the vision on data teams. Our results therefore are not statistically generalizable, which was also not the aim of the study, and need to be treated with caution. Our in-depth and detailed descriptions of the schools and leadership practices, however, do allow researchers and school staff members to assess to what extent the results apply to their schools or contexts, and therefore analytical generalizability is applicable (Poortman & Schildkamp, 2012).

Second, the core components were analyzed based upon their presence and visibility in the schools, but we did not look at the quality of the enactment of the core components. The way in which these are carried out can influence the effectiveness of data use (Kippers et al., 2018). For example, a sloppy interpretation of the first step of the data team intervention (i.e., identifying the problem) could lead to implementing measures that do not address the cause of the problem, and eventually concluding in the evaluation phase (step eight) that the action implemented does not lead to the desired results. Developing and investigating the role of quality-related aspects

of performing the core components could be helpful for schools who wish to move towards working on sustainable and effective data use with data teams.

2.5.4 Future research

This study aimed at exploring and describing sustainable data use with data teams and leadership. When comparing and contrasting the three cases in this study, we got the impression that these phenomena might be connected on certain aspects. For example, at all three schools, data team meetings were held once a month and leaders facilitated through clearing the schedules of staff members that were participating in the data team. Meetings could take place as teachers were not hindered by conflicting schedules. Our first working hypothesis for future research would, therefore, be that clearing staff members' schedules contributes to meeting regularly, which is one of data team's core components, and thus contributes to sustainability.

Another example is the use of the data team's eight steps, which differed per school. The data teams at School A used all steps, the data teams at School D used nearly all steps, and at School C the data team did not use all steps. We also noted that the leaders' vision for the data teams and data use differed: for example, at Schools A and D the data teams were used to improve teachers' data use skills, while at School C the data team was used as an 'evaluation team'. Our second working hypothesis for future research would, therefore, be that leaders' vision for working on data use with data teams enables or hinders carrying out the data team's eight steps, which is one of data teams core components, and thus enables or hinders sustainability.

These are two examples of working hypotheses based on our study that might be tested in future research, so (causal) links between in-detail observed leadership practices and sustainability could be developed. It is therefore necessary to further study possible intervening context aspects as well as rival explanations. As the leaders in this study carried out an interplay of leadership practices, we expect that multiple leadership practices might contribute to each of the core components. Establishing such links is important to move the field forward and so directed support can be provided to schools that aim for sustainability.

2.6 CONCLUSION

In sum, the results of this study increase understanding and insight into sustainable data use and leadership, as it was able to explore and describe both phenomena in depth. The formal and informal leaders of the three schools in this study carried out a broad set of leadership practices in interplay. Furthermore, the data of these three schools showed that both their leadership and sustainability were more complex and nuanced than sometimes described in the literature.



3

Leadership practices and sustained lesson study

This chapter is based on:

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ABSTRACT

Continually improving teaching and learning is vital for schools in order to meet the rapid changes in the world around us. Lesson study is considered a valuable professional development approach in that regard. It is focused on teachers collaboratively studying live classroom lessons. Sustaining lesson study, by making its core components part of the school's organizational routines, will help schools to continually and systematically improve student learning and teaching. However, despite the value of this approach, sustaining lesson study turns out to be complex. Leadership seems to play a crucial role therein, but the question is: how? A case study design was used to gain in-depth insight into what leadership looks like in secondary schools that sustained lesson study. We conducted over 300 hours of observations, collected school policy documents and interviewed the school leadership. The findings show both schools carried out various leadership practices for sustained lesson study. For example, at both schools a lesson study coordinator was appointed, lesson study meetings were placed in the school's yearly calendar, and the leadership could answer questions about lesson study right away. Whether and how leadership practices were carried out seemed to depend on the schools' context, for instance by the policy reasons for working with lesson study. This study's insights could help school leadership to sustain lesson study in their schools.

Keywords: leadership, leadership practices, lesson study, sustainability, case study

3.1 INTRODUCTION

Continually improving teaching and learning is vital for schools in order to meet the rapid changes in the world around us. Lesson study is considered a valuable professional development approach in that regard (e.g., Lewis et al., 2006; Lewis & Perry, 2014). Lesson study originated in Japan, where it has been used in the majority of the schools since the late 1990s (Saito, 2012), and is now used worldwide (Stigler & Hiebert, 2016). Lesson study involves a research cycle with phases during which teachers collaboratively investigate their student learning and teaching practice through live observations (Lewis et al., 2006). It is considered “a process for optimizing innovation, development and implementation of effective classroom learning” (Dudley et al., 2019, p. 215). Sustaining lesson study will help schools to continually and systematically improve student learning and teaching (Ermeling & Graff-Ermeling, 2016). However, despite the value of this approach, sustaining lesson study turns out to be complex (Akiba, 2016; Wolthuis et al., 2020).

Leadership is assumed to be crucial for successful and sustainable professional development (Fullan, 2016; Harris & Jones, 2010; Lee & Louis, 2019), such as lesson study. It is necessary to support, assist and motivate staff members (Leithwood et al., 2020; Robinson et al., 2008). In this study, we consider school leadership from a distributed leadership perspective. School leadership, from this perspective, concerns all activities tied to the core work of the school that are designed by the school’s staff members to influence the motivation, knowledge, or practices of other members of the school organization and that can be carried out by different staff members (Harris & DeFlaminis, 2016; Spillane, 2006; Woods & Roberts, 2016).

Although leadership has been pinpointed by a number of studies as important for sustaining lesson study (e.g., Groves et al., 2016; Lim et al., 2011; Perry & Lewis, 2009), how leadership should be enacted still remains unclear. Schipper et al. (2020), for example, stated in their discussion that: “it would be relevant to find out how school leaders currently fulfill this role and how they could promote lesson study practices, not only focusing on *implementing* lesson study, but also on *sustaining* lesson study practices” (p. 125, italics added for emphasis). This study will therefore focus on describing and exploring leadership in secondary schools that sustained lesson study. Therewith, we can help schools and school leaders ensure that teachers and students benefit from professional development initiatives such as lesson study in the long term. More generally, insights will be provided into the complexities of sustained professional development and the role leadership can play.

3.2 CONCEPTUAL FRAMEWORK

Below, we first review literature on lesson study and its sustainability, followed by literature on leadership for sustained lesson study.

3.2.1 Systematically improving teaching and student learning with sustained lesson study

3.2.1.1 Lesson study

Lesson study is a professional development approach focused on collaboratively studying live classroom lessons (Lewis et al., 2006). Small groups of teachers investigate their students' learning and teaching practice, with the aim to systematically improve teaching and student learning in classrooms (Lewis et al., 2006; De Vries et al., 2016), while going through a research cycle that consists of five phases (cf. Stepanek et al., 2007). First, a clear research goal is defined. Second, a research lesson is planned. A research lesson is a lesson that is observed live and "researched" by the lesson study team (Murata, 2011). Third, the research lesson is taught and observed live. Fourth, the members of the lesson study team engage in a post-lesson discussion about the research goal. Fifth, the research lesson is adjusted and taught again, followed by another post-lesson discussion, a final reflection and sharing the results.

The characteristics of lesson study are closely connected with features of effective professional development (Perry & Lewis, 2009), such as focus on content and evidence, collective participation, coherence between activities, active learning and covering a longer time span (e.g., Lewis et al., 2006; Penuel et al., 2007; Van Driel et al., 2012). Lesson study has been found to be an effective and widely accepted professional development approach. Several small-scale studies found effects on teachers' knowledge and skills in general (e.g., Brosnan, 2014; Lee & Tan, 2020; Lewis & Perry, 2017; Vermunt et al., 2019; Willems & Van den Bossche, 2019), and more specifically, on pedagogical content knowledge (Coenders & Verhoef, 2019). This can, in turn, affect student learning (Dudley et al., 2019; Lewis & Perry, 2017).

3.2.1.2 Sustained lesson study

When lesson study is used schoolwide and continually, and thus is sustained, it helps schools to systematically and sustainably work on school improvement. But what does sustained lesson study entail? Considering sustainability from a fidelity approach (Anderson, 2017) could mean that lesson study is understood and performed exactly as it is done in Japan. As lesson study has been a part of Japanese schools for decades, lesson study became a "cultural practice that evolved in a context that, almost by definition, supports it" (Stigler & Hiebert, 2016, p. 584). Lesson study as such might therefore be hard, even impossible, to implement in other settings (Akiba, 2016; Stigler & Hiebert, 2016; Wolthuis et al., 2020). Various scholars (e.g., Perry & Lewis, 2009; Stigler & Hiebert, 2016; Takahashi & McDougal, 2016) therefore proposed to look at the most

important elements, or core components, of lesson study. Taking the local adaptations approach allows for adjustments to the practice as long as teachers adhere to its core components (Quinn & Kim, 2017). This is in line with previous studies on sustainability, that identify sustainability of professional development approaches as achieved when its core components (in this case, lesson study's core components) are part of the organizational routines (e.g., Bambara et al., 2012; Bean et al., 2015; Larsen & Samdal, 2008; Tam, 2009).

Based on various studies (e.g., Goei et al., 2021; Perry & Lewis, 2009; Stigler & Hiebert, 2016; Takahashi & McDougal, 2016; Wolthuis et al., 2020), we have identified the following core components of lesson study:

1. Question or issue from teaching practice related to student learning as starting point;
2. Use of publications, lesson material and expertise;
3. Designing of research lesson (including observation forms);
4. Live observation of student learning during research lesson;
5. Post-lesson discussion;
6. Adjustment and re-teaching of research lesson based upon post-lesson discussion, followed by a final reflection;
7. Sharing of results with others outside the lesson study team.
8. For lesson study to become sustainable, we expect these core components to become part of the school's organizational routines. Organizational routines are described as "repetitive, recognizable patterns of interdependent action, carried out by multiple actors" (Feldman & Pentland, 2003, p. 96), structuring *who* acts and *how* someone acts in *interaction* with others (Spillane, 2012). An example of an organizational routine within the school context can be a regular department or leadership meeting (Sherer & Spillane, 2011) and the setting-up of lesson study meetings (Wolthuis et al., 2020).

Within the definition of organizational routines, a distinction is made between the ostensive and the performative aspects. The ostensive aspect refers to the idea or "perception of what the routine is" (Feldman & Pentland, 2003, p. 101). The performative aspect refers to the enactment or the "specific actions taken by specific people at specific times when they are engaged in an organizational routine" (Feldman & Pentland, 2003, pp. 101-102). In this study, we zoom in on an important part of the ostensive aspect, namely, the school's policy related to lesson study; the performative aspect refers here to the actions of the school's staff members that are related to lesson study.

Analyzing both aspects of organizational routines is crucial when studying the sustainability of professional development. It provides insights into both the policy and actions related to the professional development. In that way, how professional development, in this case lesson study, can be organized and supported can be pinpointed. The variation and interplay between

both of these aspects can thus provide insights into what makes this professional development approach sustainable (Feldman & Pentland, 2003; Spillane, 2012).

3.2.2 Leadership for sustained lesson study

For sustainable professional development, leadership is vital (e.g., Harris & Jones, 2010; Lim et al., 2011; Prenger et al., 2020). We study leadership with a distributed leadership lens. Distributed leadership is not perceived as the actions of one leader, but rather as the process of executing particular leadership practices in interactions between leaders, followers and the environment (Spillane, 2012; Spillane et al., 2004; Woods & Roberts, 2016). This perspective allows for a deeper understanding of how leadership functions in the organization and specifically in implementation processes.

In general, leadership has three core functions: organizing and (re-)designing the organization, managing the teaching and learning program, and understanding people and supporting their development (Hendriks & Scheerens, 2013; Leithwood et al., 2008, 2020; Robinson et al., 2008). Below we summarize the leadership practices related to these core functions that can be found in studies on leadership for sustaining professional development approaches and/or for (sustained) lesson study.

3.2.2.1 Organizing and (re-)designing the organization

For the first core function, it is important to have a *vision* related to lesson study (Lee & Tan, 2020; Perry & Lewis, 2009), making it clear why the school works with lesson study. Additionally, making a priority of lesson study through *facilitating the availability of resources* (Brown & Flood, 2020; Lim et al., 2011) is vital, especially since lesson study is a very time-consuming activity (Saito, 2012). Crafting *coherence* between lesson study and the school's goals is important, too (Perry & Lewis, 2009; Pyhältö et al., 2011), because it makes lesson study part of the school organization and teachers' daily lives (Datnow, 2005). This is done by coordinating new processes in the school throughout the whole school, at different systemic levels, and over time (Pyhältö et al., 2011).

3.2.2.2 Managing the teaching and learning program

This core function is characterized by the practices of *planning*, *monitoring*, and *evaluating* the teaching and learning program, in this case with reference to lesson study. To our knowledge, leadership practices related to this core function have not been studied in conjunction with sustainability or sustained lesson study. However, we expect that these practices are connected with sustained lesson study, as lesson study focuses on improving teaching and learning in schools.

3.2.2.3 Understanding people and supporting their development

Regarding the last core function, *providing support* is important. This could, for example, be done by acting as cheerleaders and thinking along during the process (Perry & Lewis, 2009), and can help lesson study to take root in the school and flourish (Lim et al., 2011). Leadership's *availability* contributes to a positive school culture (Hollingworth et al., 2018) and helps them gather teachers' input in formal and informal ways (Mullen & Jones, 2008), so possible concerns come forward and can be responded to. Leadership's *knowledgeability* and *modelling* can help support the values of lesson study (Groves et al., 2016), such as "a culture of self-criticism, openness to the ideas of others and willingness to embrace mistakes" (Hart & Carriere, 2011, p. 37), and help show the value of the success of the program to the school (Larsen & Samdal, 2008). Establishing *connections* with external experts, such as recognized researchers or trained coaches, contributes to staff members' intellectual stimulation that is important for sustainability (e.g., Andreou et al., 2015; Bean et al., 2015).

3.2.3 Current study

Based on our conceptual framework, this study aims to answer the following two questions:

- a. What does sustained lesson study look like in secondary schools, in terms of the organizational routine's ostensive and performative aspects?
- b. What does leadership look like in these schools, in terms of organizing and (re-) designing the organization, managing the teaching and learning program, and understanding people and supporting their development?

3.3. METHOD

To obtain insight into sustained lesson study and leadership in secondary schools that sustained lesson study, we qualitatively studied two cases in depth (Yin, 2014). Therefore, an extended observation period and semi-structured interviews were used. The different data sources were used for triangulation purposes, by checking whether independent measures were in agreement, or, at least, did not contradict each other (Burke Johnson & Onwuegbuzie, 2004; Miles et al., 2014). Moreover, they were used for complementarity reasons, for seeking elaboration, enhancement, illustration, and clarification of the results of one method with results of the other method (Meijer et al., 2002). We chose this design for specific purposes: namely to explore and describe in-depth sustainable lesson study and leadership practices in schools with sustained lesson study. We will take great restraint in interpreting the data and drawing conclusions (see also Discussion).

3.3.1 Participants

Two schools participated in this study: Schools B and E. These schools were selected based upon purposive sampling, based on the criterion that kept working with lesson study after

the implementation phase, considered lesson study to be relevant for school improvement and explicitly intended to keep working with lesson study. Both schools were located in the Netherlands. The school system in the Netherlands is decentralized and there is no national curriculum. Teachers teach towards core curriculum standards, but these objectives are general (OECD, 2008, 2010). Schools thus have the freedom to decide what and how they want to teach, and to implement professional development approaches such as lesson study.

The schools were selected based upon purposive sampling out of two different projects. The first project, led by one of the researchers in the study, was a Lesson Study Professional Learning Network project with 14 schools, for teachers of math and Dutch, who were trained to work with lesson study and prepared to disseminate it in their own school. Two of these schools with whom the university had good contacts were asked whether they wanted to participate by email. After face-to-face conversations, School E agreed, but the other decided not to participate because, so they said, their focus was elsewhere for the coming years. Another lesson study project, led by two of the researchers in this study, started with five schools under one board. Face-to-face conversations were held with several of these schools, and School B agreed to participate in the study.

School B was a secondary pre-vocational level school and was part of a school board with four schools. With approximately 200 students, 20 teachers and two school leaders, it could be considered a small school. School B had a strong focus on students' wellbeing and personal development. Four years ago, the inspectorate of education assessed the education at School B as unacceptable. There was an urgency to improve. The school board decided that all of their schools should start working with lesson study. To prepare for this, a four-day training course was organized by the university, in which participating teachers and school leaders from the different schools conducted lesson study in the afternoon under the guidance of an experienced facilitator. In-between meetings, arrangements were made to perform the research lesson at their own school. Six teachers and the school leader from school B took part in this, and together formed a lesson study team. As a start for lesson study at all schools, a lesson study event for all teachers and school leaders was organized in the local theater at the beginning of the following year. School B did not immediately start with lesson study, but used this year to prepare well for a school-wide start with lesson study the following year.

School E was a secondary senior general and pre-university level school. With approximately 800 students, 50 teachers and two school leaders, it could be considered an average-sized school. School E had a strong focus on students' intellectual stimulation. Nine years before the end of this study, three teachers from school E voluntarily participated in a four-year cross-school lesson study team (for more information, see De Vries & Prenger, 2017), at the request of a school leader. There, teachers were guided towards becoming a lesson study facilitator at

their own school. At the end of that four-year process, these three teachers continued with lesson study in consultation with the school leader at the school. As the school management saw the added value, they decided to scale up to include all teachers.

3.3.2 Procedure

Before the observation period started, the first author was introduced to school leaders through an introductory meeting and to teachers through an information flyer with information on the researcher and specific study. The study was approved by the ethical committee of the researcher's university (#BCE17595 and #200391).

We employed a unique method for data collection. The first author was present at each of the schools for an extended observation period of approximately 170 hours, divided over 6 successive weeks per school. Staff room discussions and behaviors, lessons, and meetings were observed. As the observation period was so extended, it was not possible to make recordings. Instead, field notes were taken on paper and digitally. At the end of each day, the information from the field notes was put into an organized form by being entered in a logbook. As a part of the field work, shadowing was also done. Shadowing is defined as "a semi-structured, undisguised, participant observation occurring in the field" (Tulowitzki, 2019, p. 103). The formal school leaders (i.e., principal and assistant-principal) were shadowed for a day. Policy-related documents, such as vision statement documents and policy plans, were also collected. When teachers or school leaders mentioned documents that were related to the subject of this research, such as the lesson study coordinator's document on the current state of affairs of lesson study at School E, they were asked to share these documents.

After the observation period ended, a report was written for each school. In this report, a descriptive overview of the observation period was provided. This report was discussed in a meeting with the school leaders. Therefore, the report served as a member check. Only a few minor comments were made, for example, regarding formulation.

Three leaders were identified and invited for a semi-structured interview about lesson study at their school one year after the observation period, based upon a social network questionnaire that had been administered earlier (Van den Boom-Mullenburg et al., 2021). We invited one formal leader (i.e., the school principal) and two staff members who were central actors in the social network that focused on conversations considering lesson study. The digital video-interviews had an average duration of one hour, were audio-recorded and transcribed verbatim. The transcripts were sent back to leaders for a member check and no adjustments had to be made.

3.3.3 Instruments

3.3.3.1 Logbook

The logbook included prompts related to leadership and the sustainability of lesson study, as described in the theoretical framework. Examples of prompts were "What was observed with regard to sharing lesson study results?" or "What was observed with regard to leaders' understanding of people and supporting their development?" The first author completed a logbook, based on field notes, for each day of observation at the school.

3.3.3.2 Interview protocol

We used a semi-structured interview protocol (see Appendix), in which we asked the leadership about lesson study at the school. We focused on the ostensive aspect (i.e., policy related to lesson study) and the performative aspect (i.e., actions related to lesson study's core components). The protocol was pre-tested with a researcher colleague who was also a teacher. No adjustments had to be made.

3.3.4 Analysis

The logbooks, collected documents and interviews were analyzed and compared in Atlas.ti for exploratory and confirmatory analysis. To address transferability (validity), we elaborated on the choice of these specific schools in the procedures section and explained the context in depth. Additionally, we worked on dependability (reliability) by explaining the steps we used to perform the comparative analysis. Finally, we corroborated (objectivity) our findings by using quotes from the interviews to illustrate our findings, and discussed them amongst each other (as described below). This helped us to stay sharp in not deviating from what was observed or said (cf. Lincoln & Guba, 1989).

Our analysis technique consisted of multiple steps (Creswell, 2013). First, the data were prepared, organized, and anonymized. Second, the data were coded. Initially, one researcher identified all segments. Codes were assigned to each segment that contained information about the study's focus. These codes were based on sensitizing concepts related to (sustained) lesson study (i.e., core components, ostensive aspect, performative aspect) and leadership (i.e., organizing and (re-)designing the organization, managing the teaching and learning program, and understanding people and supporting their development), which provided a general sense of reference and guidance in approaching our data (Blumer, 195; Bowen, 2006). If no such information was described (e.g., a description was given of the researcher's feelings or of an appointment that was made), the segment was not coded. Our final coding schema can be found in Table 3.1. Subsequently, the codes were compared and categories were identified in order to confirm the findings in our conceptual framework. For example, categories were 'similar leadership practices' and 'differences in leadership practices'. Lastly, we combined the categories into themes. The segments, codes and categories were discussed thoroughly among

Table 3.1 Coding Scheme for Logbooks, Documents, and Interviews

| LEADERSHIP PRACTICES | | Code description | Code example (Translated from Dutch) |
|---|--|--|---|
| Organizing and (re-)designing the organization | | | |
| Vision and goals | | The (development of) vision (i.e., an idealized goal that must be achieved by the organization in the future) | "Every school uses lesson study to enhance teachers' professional development. The lesson's quality is the foundation of the school's quality, which in turn is reflected in the students' results." (document) |
| Crafting coherence | | Coordinating processes in the organization throughout the whole organization, at different systemic levels, and over time, for example, making sure that teachers know what the policy documents entail/translate them into practice | "We combined it with formative assessment. It is a focus of our school and we use lesson study as a tool to look at the effects of formative assessment on student learning." (interview) |
| Resourcing and facilitation | | Resourcing, such as human resource management and positioning people, and facilitating use of time and other resources (money, hiring experts, purchase new materials) | "Staff members who participate in lesson study are supported with 10 task-hours." (logbook) |
| Managing the teaching and learning program | | | |
| Planning | | Planning of the curriculum, teachers' instruction and functioning, and lesson study | "Lesson study meetings are added to the school's yearly calendar." (logbook) |
| Monitoring | | Monitoring of the curriculum and teachers' instruction, such as lesson visits or performance interviews, and lesson study | "During the yearly department meeting, the staff members are asked about the state of affairs of lesson study in the department." (logbook) |
| Evaluating | | Evaluation of the curriculum and teachers' instruction, such as evaluation interviews, and lesson study | - |

Table 3.1 Continued

| Understanding people and supporting their development | | Code description | Coded example |
|--|--|--|---|
| Providing support | Providing support, coaching and empowering | | "We help lesson study members with developing, for example, observation forms." (interview) |
| Being available | Availability, such as being present at the school and participating in meetings, and offering a sympathetic ear for work-related aspects | | "Staff members reach out to each other and the principal. The principal's office door is often open and staff members walk in and ask questions or discuss problems." (logbook) |
| Connecting | Connecting people, such as bringing people together or organizing collaboration (also with partners external to the organization) | | "Luckily, we know [university employee]. We can reach out and ask her for literature related to the subject of our lesson study." (interview) |
| Modeling | Showing how to be involved, engaged and participate in lesson study | | "The assistant principal and all teachers participate in lesson study." (logbook) |
| Being knowledgeable | Being well informed about lesson study and having procedural and conceptual knowledge about it | | "The lesson study coordinator answers questions about lesson study." (logbook) |
| Motivating | Providing someone with a reason for performing lesson study or showing why lesson study is important | | "During the lunch break, two staff members were moping about lesson study. The lesson study coordinator then picked up on the conversation and talked enthusiastically about lesson study and what various departments gained from it." (logbook) |
| SUSTAINABILITY | | | |
| Core components | | Code description | Coded example |
| | | Lesson study's core components: | "Let's talk about the observation form. We used that always and thoroughly, because that is what lesson study is about: observing students." (interview) |
| | | 1. Lesson with a question or issue from teaching practice related to student learning | |
| | | 2. Study data, publications, lesson material and share expertise | |
| | | 3. Design research lesson (including observation forms) and write out research lesson plan | |
| | | 4. Teach research lesson, live observation of student learning, and collection of data | |
| | | 5. Engage in post-lesson discussion | |
| | | 6. Adjust and re-teach the research lesson, engage in post-lesson discussion, followed by a final reflection | |
| | | 7. Share results with others outside the lesson study team | |

the researchers to reach agreement on how they perceived the codes and categories and what both sustained lesson study and leadership looked like in the two schools.

3.4 RESULTS

Below, we answer our research questions: what sustained lesson study looked like (question 1), and what leadership looked like (question 2) at Schools B and E. The results form a picture based on both the observations and the interviews. Additionally, quotes from the interviews are used to illustrate and explain data resulting from the observations. The results for each topic are first described per school, followed by a comparison for confirmatory case analyses.

3.4.1 Sustained lesson study

3.4.1.1 School policy related to lesson study

3.4.1.1.1 School B

Lesson study is part of School B's policy in various manners. First, we identified that it is part of the school board's four-year plan. It is stated that "each school uses lesson study to promote the professional development of teachers". Second, lesson study is also found in the school's yearly planning: meetings and an afternoon to share results are included in their calendar

3.4.1.1.2 School E

At School E, lesson study was mentioned in their four-year plan as a way for teachers to work on professional development. Additionally, lesson study was part of the school's yearly planning: meetings and an afternoon to share results were included in their calendar.

3.4.1.2 Actions related to lesson study

3.4.1.2.1 School B

At School B, all of lesson study's core components were performed. The performance of two core components stood out. Since the principal had decided to use lesson study to work on formative assessment, which was part of the school vision, teachers were asked to link their own question or issue (core component 1) to this. Studying data, publications, lesson materials, and sharing expertise (core component 2) was experienced as difficult by teachers. One teacher, for example, mentioned, "How do I do that? (...) How do I do that *well*?". School B's teachers, "luckily" according to one of them, had close contacts with a researcher at the university whom they asked for help in searching for publications.

3.4.1.2.2 School E

At School E, all lesson study's core components were performed. The second core component, studying data, publications, lesson materials, and sharing expertise, was "skipped", according to the principal and lesson study coordinator. This core component could make lesson study

“too theoretical”, and was described as “administrative hassle”. The principal mentioned that making the core component mandatory “makes it extra tricky, (...) and might lead to resistance”. Although they did not use publications, they did share expertise and looked at lesson materials to develop the research lesson; therefore, the second core component was still partly performed.

3.4.1.3 Comparison

An overview of the performative aspect of lesson study’s core components is presented in Table 3.2. Both schools had realized a form of sustained lesson study. Considering the ostensive aspect, both schools had taken up lesson study in their yearly calendar/planning (i.e., the activities that would take place were summed up). At School B, lesson study was part of the school board’s plan (i.e., four-year plan, focused on goals, for all schools falling under the school board). At School E, lesson study was part of the school plan (four-year plan for the specific school). Looking at the performative aspect, all core components were used at both School B and School E.

Table 3.2 Performative Aspects of Lesson Study at Schools B and E

| Core component | School B | School E |
|--|----------|----------|
| Question or issue from practice | √ | √ |
| Study data, publications, lesson material, and share expertise | √ | √ |
| Design research lesson (incl. observation form) | √ | √ |
| Teach research lesson, observe, collect data | √ | √ |
| Engage in in-depth conversation | √ | √ |
| Re-teach and discussion, final reflection | √ | √ |
| Share results with others outside lesson study team | √ | √ |

3.4.2 Leadership

3.4.2.1 School B

Regarding organizing and (re-)organizing the organization, School B’s *vision* for lesson study was that it should be used as a tool to realize the school’s educational goals, namely, formative assessment. However, it was regularly emphasized that lesson study had been introduced by the school board. The principal, for example, mentioned, “It does take some doing, because I must honestly say that here at school there is still the idea that lesson study is imposed on us by the school board” and the lesson study coordinator saw it as “a professionalization method for teachers that was chosen by the school board’s director”. Lesson study thus entered the school top-down. School B’s leadership tried to make the best of it, and took one year to find out how to do this. Their focus was strongly on *crafting coherence*. In relation, they created connections between lesson study and other activities in the school, to “make lesson study attractive” and useful. All staff members agreed to work with formative assessment for improving their classroom

practices. Therefore, lesson study was positioned as a tool for working on formative assessment and every lesson study was supposed to be focused on that. As a result, staff members were “intrinsically motivated to realize that combination”. Lesson study was *facilitated* by clearing schedules for lesson study meetings and sharing lesson study results, and for teachers to participate in coaching and training related to lesson. Additionally, the assistant principal was appointed as a lesson study coordinator. Lesson study was added to his task assignment, which for him meant that “apart from the fact that I personally like it very much, I also want lesson study to succeed and that we can benefit from it from a professional point of view.” He organized lesson study, communicated about lesson study and served as the primary contact for lesson study within the school.

To manage the teaching and learning program, the leadership planned, monitored and evaluated education according to the PDCA cycle. They *planned* lesson study meetings one year beforehand and placed them in the yearly calendar. These meetings were planned during a shortened time schedule (lessons of 40 instead of 50 minutes), so the staff members had more time to engage in lesson study. *Monitoring* took place by means of lesson observations. During those observations, the leadership identified improvement areas related to “for example, classroom management”. Lesson study was deployed as a method for working on those areas with formative assessment. The use of lesson study was not formally *evaluated*.

We found that School B’s leadership was *available* for understanding and developing people: they had open office doors, offered a sympathetic ear when necessary and were often present in the teacher room. There, “can I ask you real quick...” is the start of a sentence that was often heard. The leadership was also *knowledgeable*, which was shown by their knowledge about lesson study’s content and procedures and their ability to answer questions about lesson study. Questions they answered, for example, were about “the performance of the steps”. School B’s assistant principal, for example, had attended an international lesson study conference to improve his knowledge about lesson study. The leadership *established connections* between the school and the university. For example, they asked their contacts at the university to give a presentation about lesson study, organized a study day and asked them for publications that could push their lesson studies to another level and be used for the second core component. The leadership *modelled* by actively engaging in lesson study, thereby modeling what they wanted to see from their staff members. *Support* was mainly provided through lesson study booklets that gave in-depth explanation of the steps and by organizing meetings for staff members to discuss issues. Examples of such issues were “the second step” and “how to facilitate the lesson study discussion in the right way”. They also answered questions about lesson study. Finally, they were found to *motivate* staff members for lesson study, for example, by “talking about the benefits of lesson study and formative assessment”.

3.4.2.2 School E

Lesson study came into the school as a result of interplay between leaders and teachers. The *vision* for lesson study at School E, which is part of organizing and (re)designing the organization, was that of promoting professional dialogue and professional learning. One of the principals mentioned as a result of this, “developing lessons together, discussing the lessons and talking about what they want to achieve” with lessons and education in general. *Crafting coherence* between lesson study and school goals was not identified at School E. Lesson study was *facilitated* by clearing schedules for different reasons, for example, for lesson study meetings, sharing lesson study results, and participation in a lesson study professional development program. At the start, teachers were given 10 hours for a lesson study cycle. Later, this was changed to one afternoon per month to perform lesson study. In addition, a lesson study coordinator was appointed, namely, one of the teachers who had participated in the earlier cross-school trajectory. She got 70 hours per year to organize lesson study, communicate about lesson study and serve as primary contact for lesson study within the school.

To manage the teaching and learning program, the leadership planned, monitored, and evaluated teachers’ functioning during performance reviews and assessment interviews between the principals and teachers: during the performance review every other year and during the assessment review that was held once per four years. The leadership *planned* lesson study meetings one year beforehand and placed them in the yearly calendar. During the performance review, lesson study was a topic of conversation. They then asked about the teachers’ experience with and results from lesson study. Additionally, lesson study was a topic of conversation in the yearly meetings between the principals and each department. The use of lesson study was thus *monitored*; it was not *evaluated*, however.

We found that the leadership was *available* for understanding and developing people: they had open office doors, offered a sympathetic ear when necessary and were present in the teacher room. Leaders had their lunch there and were always open for questions. They were also *knowledgeable*, which was shown by their knowledge about lesson study’s content and procedures and their ability to answer questions about lesson study – for example, “the development of observation forms”. One principal and a teacher at School E attended an international lesson study conference, at which they improved their knowledge about lesson study. One of School E’s principals read about lesson study in magazines, which she photocopied and spread throughout the school. Additionally, the lesson study coordinator celebrated the results, for example, “with cupcakes” because “Pete Dudley said it is important to celebrate successes” (i.e., President of the World Association of Lesson Studies). The leadership *modelled* by actively engaging in lesson study, thereby showing what they wanted to see from their staff members. *Support* was provided by providing lesson study booklets that gave in-depth explanation of the steps; observation formats were checked and collaboratively developed with the lesson study

team, questions about lesson study were answered, and inspiration for foci for lesson study were shared based on previous lesson study experiences. For the latter, they talked about ideas for future lesson study questions or problems at the end of each cycle and these ideas were written down on cards. These ideas could be used as input for subsequent lesson study. Finally, they were found to *motivate* staff members for lesson study, for example, by mentioning the added value for the school and “stressing the importance of each staff member’s participation”.

3.4.2.3 Comparison

The leadership practices for the schools are summarized in Table 3.3. Similarities were observed in leadership’s facilitation, planning, availability, and knowledgeability. Regarding facilitation, schedules were cleared for lesson study meetings, sharing lesson study results, and participation in a lesson study PD program, and a lesson study coordinator was appointed. Regarding planning, lesson study meetings were placed in the yearly calendar. The leadership at both schools was available: they had open office doors, offered a sympathetic ear when necessary, and were often present in the teacher room. That seemed like an accessible way to reach out and be reached. All were also knowledgeable, which was shown by their knowledge about lesson study’s content and procedures and their ability to answer questions about lesson study.

Differences in leadership were identified too, more specifically in (the enactment of) vision and goals, crafting coherence, monitoring, connecting, and providing support. At School B, lesson study was used as a tool for school goals, namely, formative assessment. For that reason, the leadership focused strongly on crafting coherence. At School E, lesson study was used for promoting professional dialogue and professional learning. Crafting coherence was not identified at School E. At School E, lesson study was monitored and present as a conversation topic during performance reviews; this was not observed at School B. The leadership at School B monitored by lesson observations. Areas that could be improved were identified, and lesson study was used to do so. Additionally, the leadership at School B established connections between the school and the university and experts. Such connections were not observed at School E. The leadership of both schools provided a lot of support; the way in which they did that, however, differed. At School B, support was mainly provided by the principal and was focused on facilitating. At School E, support was mainly provided by the lesson study coordinator and teachers, and was more strongly focused on inspiring and helping.

Table 3.3 Leadership Practices at Schools B and E

| | School B | School E |
|---|--|--|
| Organizing and (re-)designing the organization | | |
| Crafting coherence | Connected lesson study to current affairs within the school (i.e., formative assessment and differentiation) | - |
| Resourcing and facilitation | Cleared schedules for lesson study meetings Cleared schedules for sharing lesson study results Cleared schedules for teachers to participate in lesson study PD program Appointed lesson study coordinator | Cleared schedules for lesson study meetings Cleared schedules for sharing lesson study results Cleared schedules for and financed teachers to participate in lesson study professional development program At first, teachers compensated with hours for their participation in lesson study, now mandatory, everyone works on it Facilitated lesson study coordinator |
| Vision and goals | Deliberately chose teachers of core subjects to participate in the lesson study PD program Lesson study not the goal; used as tool to achieve other goals in the schools (i.e., formative assessment and differentiation) Lesson study part of school board's plan | Involved different schools in lesson study Lesson study used as tool to let staff members talk about education with each other Lesson study part of the school plan |
| Managing the teaching and learning program | | |
| Planning | Worked with PDCA cycle Lesson study meetings placed in yearly calendar Planned lesson study during shortened time schedule (40- instead of 50-minute lessons) | Lesson study meetings placed in yearly calendar |
| Monitoring | Worked with PDCA cycle Lesson study used as a tool for observing lessons and identifying areas that could be improved | Performance review between teacher and principals once every two years Lesson study topic of conversation during the yearly meetings between department and principals and during teachers' years performance review |

| | | |
|------------|--|---|
| Evaluating | Worked with PDCA cycle Lesson study not evaluated | Assessment interview between teacher and principals once every four years Lesson study not evaluated |
|------------|--|---|

Understanding and developing people

| | | |
|---------------------|---|---|
| Being available | Opened office doors when possible Often present in teacher room Offered sympathetic ear | Opened office doors when possible Often present in teacher room Offered sympathetic ear |
| Being knowledgeable | Knew lesson study's content and procedures Answered questions about lesson study | Knew lesson study's content and procedures Answered questions about lesson study |
| Connecting | Connected to university/experts (i.e., invited speakers, asked for literature to use in lesson study's second core component) | - |
| Modeling | Participation in lesson study by staff members from all organizational layers | Involvement in lesson study by staff members from all organizational layers |
| Providing support | Meetings organized by lesson study facilitators to discuss their groups with each other Organized meetings to refresh teachers' knowledge about lesson study or to introduce teachers to lesson study Answered questions about lesson study Thought along with problems teachers face ("sparring partner") | Provided inspiration for lesson study Provided lesson study booklets Answered questions, made comments, and developed observations forms related to lesson study Thought along with problems teachers faced ("sparring partner") |
| Motivating | Talked about the results to motivate people to keep working with lesson study | Talked about the results/was enthusiastic to motivate people to keep working with lesson study |

3.5 CONCLUSION AND DISCUSSION

This study focused on leadership and sustained lesson study. We used a case study design to intensively explore and describe sustained lesson study and leadership in two schools that sustained lesson study to gain in-depth understanding of the enactment of both phenomena. Due to the design, we want to stress that restraints need to be taken when interpreting our conclusions. We found that both schools embedded lesson study in the school as organizational routine and that various leadership practices were enacted. Our results suggest two themes: an interplay of leadership practices for sustained lesson study, and leadership tailored to the school's context. We discuss these below.

3.5.1 An interplay of leadership practices for sustained lesson study

Several leadership practices were observed at both schools that sustained lesson study. These practices were related to all three core functions of leadership. Regarding leadership's first core function, organizing and (re-)designing the organization, *resourcing and facilitation* was observed in two forms. First, leadership put effort into scheduling. Lack of scheduling is an often-found aspect that inhibits the continuation of lesson study (Saito, 2012; Wolthuis et al., 2021). In these schools, leadership put lesson study on the school's yearly calendar one year beforehand, and cleared schedules of staff members to participate in lesson study and share lesson study's results. Embedding the professional development approach at hand in human resource management (HRM), as was done at those schools, is important for continuing to work with it (De Jong et al., 2021). Teachers were not hindered by structural resources such as time or space, which are important for continuing the work of a professional development approach (Stoll et al., 2006), especially since lesson study is a time-consuming activity (e.g., Lim et al., 2011). Second, leadership at both schools appointed a lesson study coordinator: the coordinator organized, communicated about, and supported staff members. These are all practices that are important for lesson study (e.g., Lim et al., 2011; Perry & Lewis, 2009) and sustaining professional development approaches (e.g., Prenger et al., 2020). Assigning these practices to a staff member apparently helped by making someone professionally responsible for the execution of lesson study. Third, the leadership at both schools had a *clear vision and goals* for lesson study and added this to school policy plans. Although the vision at both schools differed, it helped set the direction for working with lesson study as well as helping with setting priorities, which was also found to be beneficial for sustainability in previous studies (e.g., Andreou et al., 2015; Larsen & Samdal, 2008).

Related to leadership's second core function, managing the teaching and learning program, leadership *planned lesson study*, for example, by placing the meetings in the yearly calendar and therewith established policy for regular meetings. Planning in combination with the scheduling discussed above could contribute to lesson study's continuation. Additionally, the leadership at both schools *monitored* lesson study or monitored the teaching and learning program while considering lesson study, for example by using lesson observations. This helped make lesson study part of the school organization and showed that leadership was engaged with and valued lesson study (Bambara et al., 2012).

Leadership practices related to leadership's third core function, understanding people and supporting their development, were observed at both schools as well. *Support* was provided by leadership at both schools, but the manner in which this happened differed. Both types of support, at the one school more facilitative and at the other more helpful and inspirational, helped enhance staff members' motivation and enthusiasm. Additionally, the leadership was *available* and *knowledgeable* about lesson study: they were often available in the teacher room,

knew lesson study's content and procedures, and could answer questions about lesson study right away. This helped support the values of lesson study (Groves et al., 2016). Leadership's *motivating*, which was done by talking about lesson study's results and being enthusiastic about them, might have helped convince others of lesson study's importance and value. Their *modeling*, by being involved and participating in lesson study, showed the importance and value of lesson study to the school (Larsen & Samsal, 2008).

In short, the interplay of these leadership practices, which resemble each of the core functions of leadership, was carried out by the leaders in two schools that sustained lesson study.

3.5.2 Leadership tailored to the school's context

In addition to the leadership practices that were carried out by the leadership at both schools, we also identified leadership practices that were enacted at only one of the schools. These were crafting coherence and connecting. Moreover, differences in the enactment of leadership practices were identified, as seen in the differences in the support that was provided, for instance. These differences in school leadership might partly be explained by the differences in school context, or, more specifically, the policy reasons for working with lesson study and the school size.

The policy reasons for working with lesson study are important for implementing and continuing working with it (Akiba, 2016). School B started working with lesson study because of the urgency to improve the school's quality, and a top-down approach was used to implement lesson study. At School E, lesson study was implemented because of the added value experienced from lesson study (i.e., stimulation of professional dialogue among teachers), so they implemented lesson study in an interplay with the teachers. The sense of policy urgency might also be the reason why School B's leadership focused strongly on crafting coherence between lesson study and the school's goals and made connections with the university, while School E's leadership did not do this explicitly.

The differences in leadership enactment could also partly be explained by the school size. School B was considered small with 20 teachers and two school leaders; especially compared to School E that had approximately 50 teachers and two school leaders. At schools that are smaller, staff members are physical closer to each other, resulting in more opportunities for unplanned encounters (Shirrell et al., 2019). These unplanned encounters could provide more inspiring and helping support. That type of support therefore does not have to be given by the leadership, so they could focus on other types of support. The leadership then tailored their support to the school's context.

Previous studies showed that the organizational context is important for explaining the effectiveness of professional development (Coburn et al., 2009; Kennedy, 2010; Wolthuis et al., 2021), and sustainability (e.g., Askill-Williams & Koh, 2020; Bellei et al., 2020; McNaughton, 2019). This study adds that the school's context might also be vital for *leading* sustained professional development. Namely, leadership can be tailored to the school's context to achieve sustained lesson study. Although carried out leadership practices can be determined, there is no one single success formula for leadership that sustains lesson study – it depends on the school's context. Or, as Bryk (2015, p. 25), stated: "Improving schools entails coherent, orchestrated action (...). Put simply, there is no one silver bullet."

3.5.3 Practical implications

For leadership at schools that aim for sustained lesson study, it is important to schedule lesson study, to be available, and to have knowledge about lesson study. Additionally, appointing a staff member as lesson study coordinator, who can serve as primary contact for lesson study within the school and organize and communicate about it, seems vital too. This helps staff members in different ways, as they know where to go for organizational, collaborative or content-related struggles or questions. Whether and how these are carried out are related to the school's context. For example, the way leadership provides support might differ based on the policy reasons for working with lesson study.

3.5.4 Limitations and future research

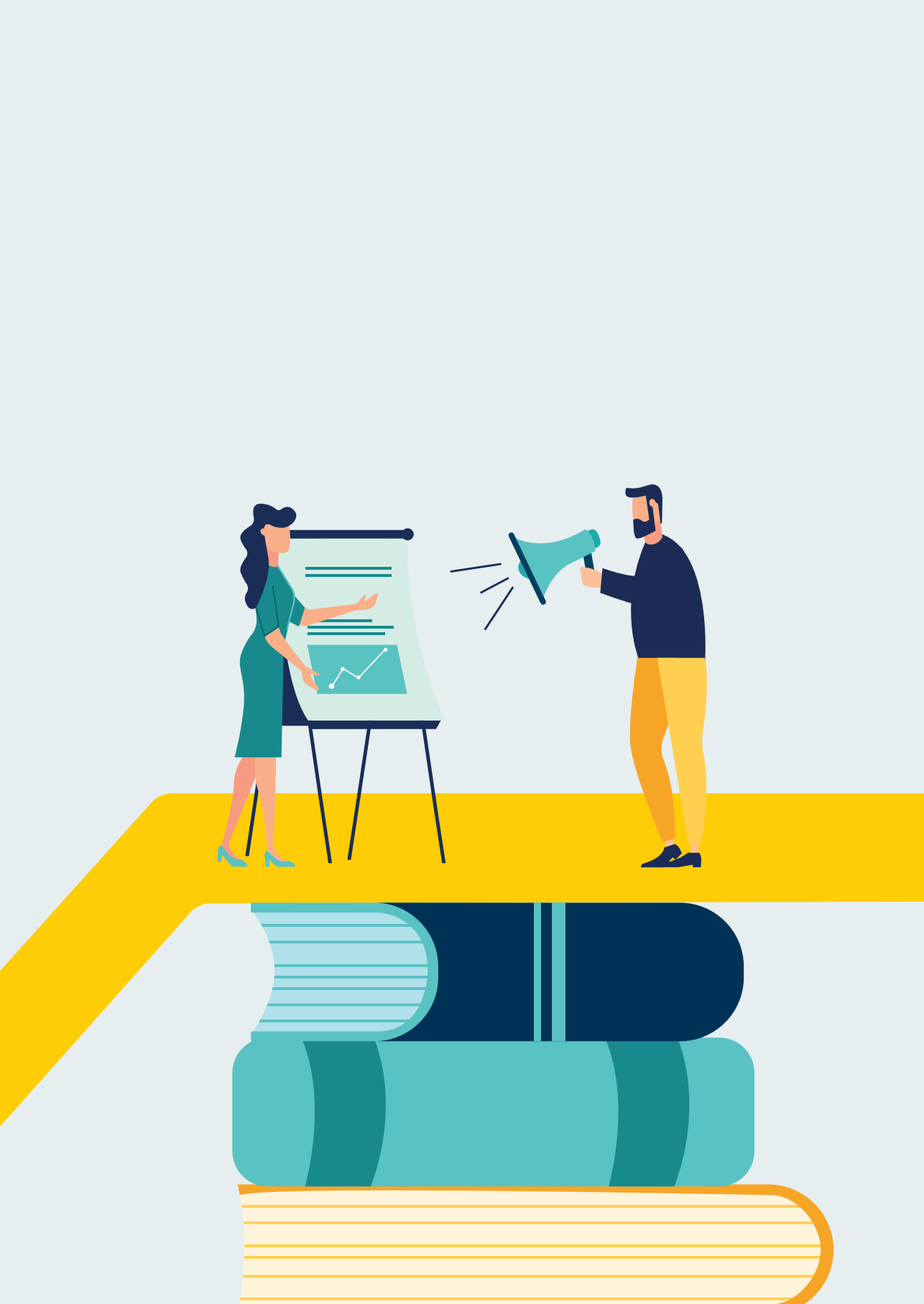
We acknowledge several limitations of our study. First, our research focused on the Dutch context. In this context, a school's staff members have the freedom to decide what and how they want to teach, and to implement curriculum innovations (OECD, 2008, 2010), which might affect their involvement in lesson study. Studies in other contexts in which teachers and schools do not have this kind of autonomy (see, for instance, Cohen et al., 2018) are necessary to develop a more comprehensive understanding of essential leadership practices and contextual characteristics that support sustained lesson study.

Additionally, sustainability is a process rather than a state (Van den Boom-Muilenburg et al., 2020; McNaughton, 2019). Another limitation, therefore, is that although schools were observed and leaders were interviewed on another point in time, the focus was solely on schools that were already further along in the sustainability process. A longitudinal study into leaders' practices related to different stages of the process of sustaining lesson study could yield more insights into leadership practices necessary for each stage.

The small-scale exploratory qualitative design provided us with in-depth insights into leaders' practices in schools that sustained lesson study, though it addressed only two schools. Our conclusions should therefore be taken with caution, although several other studies have come

to similar conclusions (e.g., Askeff-Williams & Koh, 2020; Lim et al., 2011; Perry & Lewis, 2009; Wolthuis et al., 2021). Future studies could repeat a similar study in another context to further validate our findings (local proof route, cf. Lewis et al., 2006). Additionally, future studies could contrast our findings with leadership practices at schools that have not (yet) sustained lesson study to gain insight into hindering leadership practices or mismatches between leadership and context – in that way, the argument made could be strengthened.

In conclusion, an interplay of practices was carried out by leaders in these schools that sustained lesson study. Whether and how these leadership practices were carried out also seemed to depend on the schools' context. As such, it is important to examine the school and its leadership in context when considering sustainability. This can lead to more successful future processes for sustaining professional development approaches (Harris, 2020) such as lesson study.



4

Leading PLC-related knowledge brokerage



This chapter is based on:

Van den Boom-Muilenburg, S. N., Poortman, C. L., Daly, A. J., Schildkamp, K., De Vries, S., Rodway, J., & Van Veen, K (2020). *Key Actors as Leaders in Knowledge Brokering Processes for Sustainable School Improvement with PLCs*. Manuscript submitted for publication.

ABSTRACT

This study investigated those who led knowledge brokerage processes, or key actors, in schools that realized sustainable school improvement through professional learning communities (PLCs). To gain insight into what knowledge key actors brokered and how they brokered knowledge, key actors at five secondary schools that worked sustainably with PLCs participated in an in-depth mixed-method study. The findings showed what types of knowledge were brokered and through what activities, what characteristics of key actors were important for knowledge brokerage, and how key actors fit different profiles. These insights can help schools improve their knowledge brokerage as they work towards sustainable school improvement.

Keywords: knowledge brokerage, sustainable school improvement, distributed leadership, key actor, professional learning communities, mixed methods

4.1 INTRODUCTION

Professional learning communities (PLCs) are promising as a way to realize school improvement (Stoll et al., 2006). PLCs are groups of school staff members who meet regularly. Those groups discuss theory, practices, and experiences on a specific theme related to their own school, aiming to apply the knowledge that they have created and learned to improve teaching and student learning (Bruns & Bruggink, 2016; Stoll et al., 2006). These discussions help challenge teachers' thinking, which is a fundamental part of changing their practice (Daly & Stoll, 2018) and thus of school improvement.

It is important to sustain the PLC's way of working, because then schools work continually on school improvement. To achieve this, the PLC's core components, that is, the most important elements of working with the PLC, need to be sustained. This is hereafter referred to as sustainable school improvement. A PLC's core components are sustained when they are intentionally and permanently woven throughout the organization (Prenger et al., 2020). An example of a core component is that the knowledge learned and created in the PLC is brokered throughout the school.

Knowledge brokerage (KB) is key for sustainable school improvement (e.g., Coburn et al., 2009; Stoll et al., 2006). In brief, KB is the communication and discussion of knowledge that is acquired and further developed in the PLC between PLC members and their colleagues outside the PLC in the school (Farley-Ripple et al., 2017; Malin et al., 2018; Malin, Brown, & Trubceac, 2018). Discussion of the knowledge that is constructed by the staff members who participated in the PLC is aimed at helping all staff members to improve their teaching. KB can thus ensure that the whole school learning community becomes engaged, thereby ensuring group learning, a necessary aspect of sustainability (Hubers, 2020).

Sustainable school improvement and KB seem challenging (e.g., Fullan, 2016; Prenger et al., submitted). Schools can stop working with the PLC or no longer carry out all core components (e.g., Hubers, 2016; Sterman, 2012). Distributed leadership is assumed to play an important role in both sustainable school improvement and KB (Azorín et al., 2019; Hubers, 2020; Lee & Louis, 2019). From a distributed leadership perspective, leadership concerns all activities tied to the core work of the school that are designed by the school's staff members to influence the motivation, knowledge, or practices of other members of the school and that can be carried out by different staff members (Harris & DeFlaminis, 2016; Spillane, 2006; Woods & Roberts, 2016). Distributed leadership might affect sustainability, because it can contribute to supporting and motivating staff members (e.g., Leithwood et al., 2020; Prenger et al., 2020). Moreover, distributed leadership might affect KB because it can contribute to access to and motivation for

brokering knowledge (e.g., Brown et al., 2020). Those who lead KB processes, also called key actors, seem therefore important for sustainable school improvement.

To date, research on key actors in both KB processes in general (Ward, 2017) and KB processes in relation to distributed leadership and sustainability (Malin & Brown, 2020; Prenger et al., 2020) is scarce. This study therefore aims to identify key actors and their KB in schools that realized sustainable school improvement with PLCs, as this can help schools improve their KB (Farley-Ripple & Grajeda, 2020; Ward, 2017). In our research model (see Figure 4.1), we focused on the following questions:

1. *Who* are the key actors in KB in schools that have realized sustainable school improvement with PLCs?
2. *What* knowledge do these key actors broker?
3. *How* do these key actors perform KB?

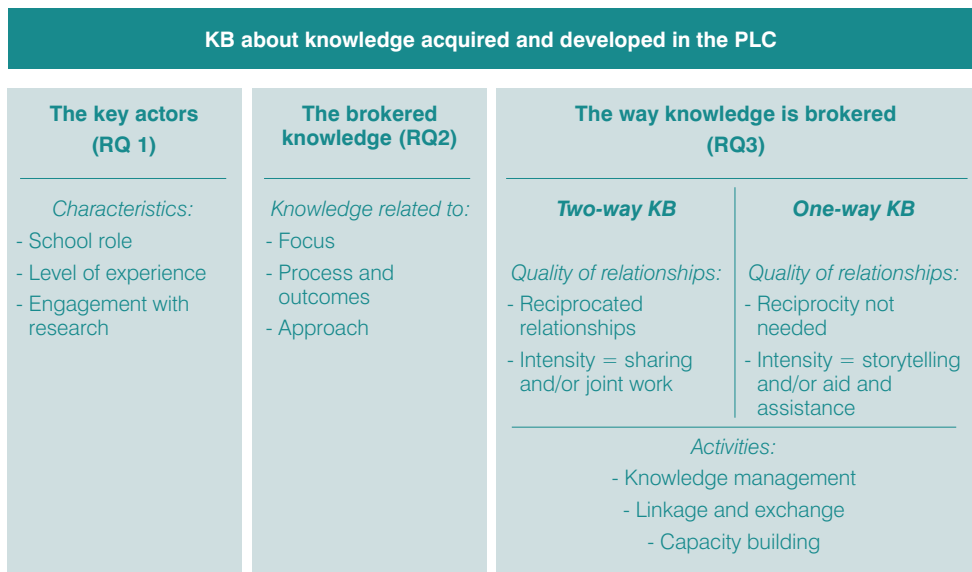


Figure 4.1 Research Model.

4.2 CONCEPTUAL FRAMEWORK

We will briefly review the literature around PLCs for sustainable school improvement and KB to clarify our research model. We will zoom in on the school staff members who engage in KB, on the types of knowledge that can be brokered, and how that knowledge can be brokered.

4.2.1 PLCs for sustainable school improvement

PLCs can be an important context for professional development. The premise is that teachers develop professionally in PLCs because they discuss teaching and learning, which fosters the collective construction of knowledge and leads to improved student learning and school improvement (Dobie & Anderson, 2015; Doğan & Adams, 2018; Lomos et al., 2011; Vescio et al., 2008).

Often, PLC members also carry out practice-based research focusing on the improvement of teaching and student learning in order to achieve that goal. Examples of such PLCs are data teams and lesson study teams. In data teams, a group of teachers and school leaders use data to solve a classroom level (e.g., low mathematics achievement) or school level (e.g., grade retention) problem through a cyclic procedure (Schildkamp et al., 2016). The goal is thereby both to improve the quality of education at their school and to encourage professional development in data use to help solve future educational problems (Schildkamp & Poortman, 2015). In lesson study teams, a group of teachers develop and observe live lessons with a focus on student learning (De Vries et al., 2016). The goal of lesson study teams is to systematically improve teaching and student learning in classrooms (Lewis et al., 2006). Both types of PLCs engage in what can be called an inquiry research cycle, based on data.

Research shows that both types of PLC can improve teacher and student learning, making it important to sustain the school improvement they produce. Data teams have been found to improve teachers' data literacy (Kippers et al., 2018), for example, as well as student achievement (Poortman & Schildkamp, 2016). Lesson study teams have been found to improve teachers' knowledge and skills (e.g., Willems & Van den Bossche, 2019) and their meaning-oriented learning (i.e., wanting to know *why* something works; Vermunt et al., 2019), which in turn can affect student learning (Dudley et al., 2019). Schools working with these types of PLCs will be the focus of this study.

While the work of the PLC is important, the flow of knowledge is critical in order to involve all staff members in the process (Stoll et al., 2006) and thereby move towards sustainability (Hubers, 2020). Several studies show that the flow of knowledge can influence sustainability (e.g., Andreou et al., 2015; Benz et al., 2015; Gaikhorst et al., 2017; Prenger et al., 2020). To be able to weave the PLC's core components intentionally and permanently throughout the school organization, the work of the PLC needs to spread throughout the school organization – independent of the level of the problem the PLC is focusing on. For example, although the results of a PLC that focusses on teaching fractions might not be directly applicable for a physical education teacher, this teacher can challenge the work of the PLC, pose critical questions, and engage in a dialogue of discussing different opinions and practices. This helps getting others involved and is an opportunity to receive feedback and support for the work of the PLC (Gaikhorst et al., 2017), but also helps the non-PLC members to think critically about and refine their own practices (Brown

et al., 2020). Additionally, the flow of knowledge helps others become aware of the benefits of working with the PLC (Benz et al., 2015), possibly making others enthusiastic about working with the PLC too. The flow of knowledge related to the PLC is thus crucial for the PLC to become an integral part of the daily school routines, and thus sustainable.

PLC members can work together and involve colleagues with PLC-related knowledge through social interactions and exchanges (Liou & Daly, 2013). According to social capital theory, knowledge is namely constrained in the relationships between individuals (Lin, 2009). This can be “extracted” through social networks (Liou & Daly, 2013). Social networks in the context of a school consist of relationships among the school staff members – school leaders, team leaders, teachers, and so on (e.g., Borgatti & Halgin, 2011). These relationships represent the social dynamics within the school and can support or constrain the spread of knowledge throughout the school (Daly, 2010). The spread of PLC-related knowledge can be analyzed in a specific social network, namely a ‘reform network’ (cf. Cole & Weibaum, 2010). This social network specifically contains information on the relationships concerning the spread of PLC-related knowledge.

The position of each person within a social network, or the social structure, determines the opportunities for and circumstances of social relationships (Casciaro, 1998). An important structural position, especially for sustainable school improvement, is being what is known as a knowledge broker.

4.2.2 Knowledge brokerage

Knowledge brokers are important for sustainable school improvement, as they are involved in KB. We define KB, in line with Malin et al. (2018) and Farley-Ripple et al. (2017), as a dynamic and complex set of actors, activities, and motivations within which knowledge created within the PLC is exchanged, transformed, and otherwise communicated with colleagues who did not participate in the PLC. KB thus implies the movement of resources through connections between individuals, and knowledge brokers make that happen.

For the KB related to the PLC to take place, the staff members who are knowledge brokers, the knowledge that is brokered and the brokerage process are important. These will be discussed separately below.

4.2.2.1 Key actors leading the KB process (RQ1)

Staff members differ in their significance as far as KB, with some being more structurally important than others within a social network (Scott, 2017) and thus more important for the KB process for sustainable school improvement. These more important staff members in terms of social structure are called key actors and are identified based upon their prominence in the network (Rodway, 2018). Key actors’ prominent position in the network makes them leaders.

Their position permits them to access and broker knowledge more easily compared to others who are not prominent in the network (Rodway, 2018), so key actors can influence the motivation, knowledge, or practices of other organizational members (Harris & Spillane, 2008; Spillane, 2006), especially related to the PLC and its results.

There are different ways to identify key actors, and social network measures are used to do so (Downey, 2020). For sustainability, it is important that the constructed and acquired knowledge reaches others who did not participate in the PLC intervention. Identifying the staff members in schools who together reach the broadest spread of staff members seems crucial, therefore. Measures that help with that are degree centrality and betweenness centrality. *Degree centrality* measures the direct influence of each person in the network. Higher degree centrality means that a person is connected to more people (Daly, 2012). *Betweenness centrality* measures the number of times each person sits between two persons who are otherwise disconnected in the network. Higher betweenness centrality means that a person is connected to more other persons who are otherwise isolated from the social network that is researched (Daly, 2012).

Characteristics of key actors. Previous research has looked at school role, level of experience, and engagement with research (e.g., Farley-Ripple & Grajeda, 2020) as characteristics of key actors. *School role* indicates the role the staff member occupies at the school, such as teacher of a certain subject or principal. A staff member's school role is assumed to have an influence on the number of colleagues they are in contact with. For example, a staff member in a leading position is more likely to reach out to more and different people compared to an individual who teaches one subject. More contacts make reaching others in the school easier.

Level of experience indicates the numbers of years a staff member has been working in education and how many years they have worked at the current school. The less experience a staff member has, the less they are assumed to be part of the school's network (Van Waes et al., 2018). The more experience a staff member has, the more time they have had to craft relationships and become part of the school's network. This makes it easier to reach others in the school.

Engagement with research indicates the research activities the staff member is involved in (Farley-Ripple & Grajeda, 2020), which in this study is the inquiry research conducted in the data team or lesson study team. We therefore look at *participation in the PLC*. It is easier for a staff member to engage in KB when they participated in the PLC, as they have direct access to and were involved in creating the knowledge (Van den Bossche et al., 2011).

Although these characteristics seem beneficial for KB, not all studies have found relationships between these characteristics and being a key actor in KB (Farley-Ripple & Grajeda, 2020). Further research into these characteristics is therefore necessary.

4.2.2.2 The knowledge being brokered (RQ2)

By participating in PLCs, staff members acquire and further develop their knowledge (e.g., Popp & Goldman, 2016; Stoll et al., 2006). Brokering this 'PLC' knowledge ensures that more and more staff members engage with this knowledge and improve their teaching by means of this knowledge, which is essential for sustainability (Hubers, 2020).

Based on the work of Hubers et al., (2019), we consider that staff members who participate in a PLC acquire and develop three types of knowledge that can be brokered.

1. Knowledge related to the *focus* of the PLC is knowledge about the problem or question the PLC is focusing on. For data teams, this can, for example, be disappointing mathematics results. For lesson study teams, this can, for example, be students' failure to use a specific reading strategy.
2. Knowledge related to the *process and outcomes* of the PLC is knowledge about the results of the different steps taken during the specific PLC process of this PLC. For data teams, this could be their experience with the measures implemented based on data to improve their mathematics results. For lesson study teams, this can, for instance, be their experience with using didactics to improve their students' use of a specific reading strategy.
3. Knowledge related to the *approach* of the PLC is knowledge about the method used in the PLC process. Contrary to the types of knowledge described before, this type of knowledge is about the approach in general and does not provide specifics on the results or process of a particular team. Knowledge related to the data teams approach is defined as data literacy. Data literacy is the ability to use data, and consists of five components: set a purpose, collect data, analyze data, interpret data, and take instructional action (Beck & Nunnaley, 2020; Gummer & Mandinach, 2015; Kippers et al., 2018b). Knowledge about the lesson study approach concerns the ability to carry out lesson study and relates to the steps of the lesson study cycle. This cycle consists of six phases: formulate lesson and student goals and a research question, plan the lesson, give the lesson, observe the lesson and interview students about their learning and the research goal, discuss the lesson and interview results, revise the lesson and teach it again, and reflect on the entire lesson study process (Stepanek et al., 2007).

4.2.2.3 How knowledge is being brokered (RQ3)

KB can happen in two ways. First, when PLC members communicate the knowledge that has been developed to their colleagues who did not participate in the PLC, this is called *one-way KB* (Malin et al., 2018). One-way KB helps colleagues to get to know about the PLC, but does not necessarily mean they are going to use the knowledge. Second, when colleagues who did not participate in the PLC also discuss the developed knowledge with PLC members, and describe challenges or emerging trends, this is interactive, and is called *two-way KB* (Malin et al., 2018).

These discussions are more likely to challenge teachers' thinking. As challenging teachers' thinking is important for changing practice (Daly & Stoll, 2018a), it is our assumption that two-way KB is more effective compared to one-way KB.

4.2.2.3.1 Quality of relationships

The quality of relationships in social networks can be considered an important aspect of how KB takes place. Namely, the relation between two persons can help or obstruct the actual brokering of knowledge. Higher quality relationships make it easier to broker knowledge (Daly, 2010). Two central aspects related to relationship quality in this respect are reciprocity and intensity.

Reciprocity is present in mutual relationships through which mutual exchange of resources and the creation of norms between staff members can take place, and can be determined by means of social networks (Daly, 2012). Reciprocated relationships thus seem necessary for two-way KB (Malin et al., 2018), and are associated with the likeliness of organizational change (Mohrman et al., 2003) and sustaining change efforts (e.g., Daly & Finnigan, 2011).

The intensity of relationships can be considered in terms of the type of interaction involved. According to Little (1990), teachers tell stories, provide aid and assistance, share, or engage in joint work – with the last being the ideal form of interaction. Storytelling and providing aid and assistance can be considered one-way KB (Malin et al., 2018), as those types of interaction only need activity from one person (Little, 1990). Sharing or joint work is necessary for two-way KB (Malin et al., 2018), as here the “ground is laid for productive discussion and debate” (Little, 1990, p. 518). The two latter types of interaction make relationships more intense and are more likely to lead to the desired changes in practice.

To sum up, the combination of reciprocated and high-intensity relationships is crucial for two-way KB.

4.2.2.3.2 Activities

The lack of research into concrete activities that make KB happen has been identified as a gap in the literature (Ward, 2017). The activities that previous research did identify (Farley-Ripple & Grajeda, 2020; Ward et al., 2009) can be categorized as:

1. *Knowledge-management* activities, which are related to navigating, managing and disseminating research and other evidence, for example, through facilitating discussion or sending a newsletter. Dissemination can be supported by artifacts, which help communication by creating shared vocabulary and identity (Star, 2010). Examples are documents and tools.
2. *Linkage and exchange* activities, which focus on the development of positive relationships between the PLC participants and their colleagues outside of the PLC, for example,

through providing assistance or support, evaluating the needs of staff members, and translating research into understandable language or format.

3. *Capacity-building* activities, which are related to educating colleagues who did not participate in the PLC and developing in them the skills learned in the PLC, for example, through offering formal learning opportunities such as workshops.

These activities can be either one-way or two-way KB.

4.3 METHOD

To identify key actors and describe and explore the knowledge that they broker and the activities they use to do so in KB processes in secondary schools that realized sustainable school improvement with a PLC intervention, we used a mixed methods case study approach, in order to better grasp the complex phenomena of KB in schools compared to using only a qualitative or quantitative approach (Creswell & Clark, 2007; Greene & Caracelli, 1997). Observational, questionnaire and interview data were collected and analyzed.

4.3.1 Participants

Five secondary schools ($M_{\text{number of teachers}} = 65$; $M_{\text{number of students}} = 954$) in the Netherlands were the focus of this study. The school system in the Netherlands is decentralized and there is no national curriculum. Teachers teach towards core curriculum standards, but these objectives are general (OECD, 2008, 2010). School staff members thus have the freedom to decide what and how they want to teach, and to implement curriculum innovations. Background information for each school is presented in Table 4.1.

Each school in this study started working with either a within-school lesson study team or a data team two to five years ago and were still working with it, three with data teams, and two with lesson study teams. The schools were not in contact with one another, nor were part of some kind of consortium. All of the schools were coached by a university employee on working with the PLC during the first year the school worked with it. The researchers were no part of the PLCs.

One school working with data teams kept the composition of the data team the same over the years; the other two schools changed the composition of the data team over time. Both schools working with lessons study teams involved new colleagues in lesson study each year, in addition to colleagues who kept working with lesson study. All schools sustainably worked on school improvement as the schools were still working with the PLC after more than 2 years, even when the external coaching was finished.

A total of 248 teachers and 20 formal school leaders at these five schools completed a social network questionnaire (described below). Based upon the questionnaire results, three key actors per school were selected. They were invited for interviews.

4.3.2 Procedure

Participating schools were selected based on purposive sampling (Creswell & Clark, 2007). These schools were part of two larger projects, one focused on introducing data teams and the other focused on introducing lesson study in the schools. The schools were selected because they a) finished the initial implementation phase and b) considered the PLC to be relevant for school improvement and c) explicitly intended to keep working with the PLC. The study was approved by the ethical committee of the researcher's university.

At each school, activities that might contribute to sustainable school improvement with PLCs were observed over an extended observation period of approximately 168 hours, divided over 6-8 successive weeks per school. This observation period focused on an entire cultural group, here all staff members in one school, and was intended to describe the shared patterns of values, behaviors, and beliefs through immersion in their day-to-day lives. This is also called fieldwork (Wolcott, 2012) or shadowing (Tulowitzki, 2019). Lessons, meetings and staff room discussions were observed. Field notes were taken on paper and digitally and were organized by entering them in a logbook at the end of each day.

At the end of the observation period at each school, a social network questionnaire was administered digitally once to all teachers and school leaders at the school.

Key actors were selected per school out of all staff members that were currently working at the school, based upon their degree and betweenness centrality as measured by the social network questionnaire. They were invited for an interview by e-mail. The digital video-interviews had an average duration of one hour, were audio-recorded and transcribed verbatim. The transcripts were sent back to leaders for a member check. Adjustments were not necessary.

4.3.3 Instruments

4.3.3.1 Logbook

The logbook that was kept during the observation period was developed for a study into the role of leadership in sustaining a PLC's core components (see Van den Boom-Muilenburg et al., submitted), and addressed questions related to different activities that might influence sustainability. Notes about KB, specifically about the knowledge that was brokered and the activities that were used to broker knowledge, were made as well.

Table 4.1 Background Information per School

| School | Level | Staff members | Students | PLC | Start PLC | Staff members worked with PLC | Composition PLC |
|--------|--|---------------|----------|--------------|---------------------------------------|-------------------------------|---|
| A | Senior general Pre-university | 76 | 1,000 | Data team | 5 years prior to study (2013-2014) | 5 | Differed over years One PLC at the time |
| B | Pre-vocational | 23 | 200 | Lesson study | 2 years prior to study (2017-2018) | 4 | Differed over years Multiple PLCs at the same time |
| C | Senior general Pre-university | 79 | 1,100 | Data team | 5 years prior to study (2013-2014) | 5 | Stayed the same One PLC at the time |
| D | Pre-vocational Senior general Pre-university | 110 | 1,400 | Data team | 3 years prior to study (2015-2016) | 20 | Differed over years Multiple PLCs at the same time |
| E | Senior general Pre-university | 58 | 800 | Lesson study | 5 years prior to study (2015-2016) | 29 | Differed over years Multiple PLCs at the same time |

4.3.3.2 Social network questionnaire

Participants were asked to select the names of colleagues from a list of all teachers and school leaders in response to the question 'Whom do you talk to about [the PLC]?'. This helped to capture the reform network (Cole & Weibaum, 2010). The second question, 'What was the nature of the contact about the PLC with these colleagues?', was presented in a matrix format, and used to capture the intensity of the relationship. The colleague names that were selected in the first question appeared on the x-axis. On the y-axis, four categories of relationship intensity were presented: exchanging experiences, aid and assistance, sharing, joint work (cf. Little, 1990). Finally, generic information about the participants was asked for, such as whether they participated in the PLC, their role and teaching experience.

4.3.3.3 Interview protocol

A semi-structured interview scheme was used to ask the identified key actors about what knowledge they brokered and how they brokered knowledge. Example questions are: 'What was the most recent conversation you had regarding [the PLC] with others who did not participate in [the PLC] about?' and 'Did you ever develop material about [the PLC] and share this with your colleagues?'.

4.3.4 Analyses

4.3.4.1 Key actors in the KB process (RQ1)

The response rate per school ranged from 68.4% to 91.3%. No apparent differences in grade levels, educational levels being taught and subjects being taught were evident between the responders and the non-responders. The questionnaire data were analyzed using UCINET software (Borgatti et al., 2002). To determine each staff member's prominence in the network, we calculated degree centrality and betweenness centrality per staff member per school. The five staff members who had the highest score on degree centrality and the five staff members who had the highest score on betweenness centrality were selected. Although we planned to average those scores and select the three staff members who had on average the highest degree + betweenness centrality score, it appeared that the three staff members who scored highest on degree centrality also scored highest on betweenness centrality. The three staff members with the highest degree centrality and betweenness centrality per school had the most prominent positions in the network and were identified as key actors.¹ We normalized the scores to allow for comparison across schools.

Regarding the characteristics of the key actors, the demographic information from the questionnaire was used to describe their school role (i.e., (in)formal leader, teacher, what

¹ Christopher no longer worked at School C and could not be interviewed. For that reason, four staff members were selected as key actors at School C. In that way, three staff members at all schools could be interviewed.

subject), their level of experience (i.e., how many years of experience in education and at the school), and their participation in the PLC.

4.3.4.2 The knowledge key actors brokered (RQ2)

We used Atlas.ti to analyze and code the logbooks and interviews for the knowledge related to the school improvement and PLC intervention that the key actors brokered. The types of knowledge were used as sensitizing concepts (i.e., knowledge related to focus of the PLC, to process and outcomes of the PLC, and to the PLC's approach, Hubers et al., 2019), by means of which a general sense of reference and guidance in approaching our data was provided (e.g., Bowen, 2006).

The three types of knowledge that served as our sensitizing concepts came up as our main code categories. Additionally, several segments could not be coded with those concepts as they did not cover the segments' content. A selection of these codes was discussed amongst the first author and a researcher outside of the project. They identified two extra types of knowledge in a bottom-up manner, being 'the advantages of working with the PLC' and 'the PLC's organizational matters'. After this initial round of coding and redefining the coding scheme, the first and second authors independently coded 21 segments (16% of the data) to check the reliability of the coding. The interrater reliability was found to be substantial (Cohen's $\kappa = .817$; Landis & Koch, 1977). In cases of disagreement, the raters reached consensus on the coding through discussion, after finishing the coding. The first author finalized the coding of the transcripts (for the final coding scheme, see Table 4.2).

4.3.4.3 How key actors broker knowledge (RQ3)

4.3.4.3.1 Quality of relationships

For each key actor and staff member, we looked at the conversations they reported to have with colleagues with whom they did not share membership in the PLC (reciprocated relationships - this is a prerequisite for KB; e.g., Malin et al., 2018). The social network questionnaire data were analyzed with UCINET to calculate reciprocated relationships and level of KB [1 = storytelling (lowest); 2 = aid and assistance; 3 = sharing; 4 = joint work (highest), cf. Little, 1990]. Descriptive statistics were calculated.

Additionally, through three independent-samples *t*-tests in SPSS, we analyzed whether key actors had more reciprocated relationships compared to other staff members, whether they brokered knowledge on a higher level compared to other staff members and whether they used more two-way KB compared to other staff members. Due to the difference in group size (16 key actors vs 330 other staff members), we used an effect size measure that corrects for this, namely Hedges' *g* (Enzmann, 2015).

Table 4.2 Coding Scheme for Knowledge Key Actors Brokered

| Knowledge related to... | Fragments concerning... |
|--|---|
| ..the focus of the PLC | Knowledge about what problem or question the PLC is focusing on |
| ..the process and outcomes of the PLC | Knowledge about the results of the different steps taken during the PLC process |
| ..the approach of the PLC | Knowledge about data team steps/data literacy (set a purpose, collect data, analyze data, interpret data, and take instructional action) or lesson study cycle (formulate lesson and student goals and a research question, plan the lesson, give the lesson and interview students about their learning and the research goal, discuss the lesson and interview results, revise the lesson and teach it again, and reflect on the entire lesson study process) |
| ..the advantages of working with the PLC | Knowledge about how the PLC adds value to the school organization |
| ..the PLC's organizational matters | Knowledge about how the PLC process should or can be carried out within the school organization (e.g., related to planning or facilitating the PLC's work) |

4.3.4.3.2 Activities

Regarding the activities key actors used to broker knowledge, the logbooks and transcript of the interviews were analyzed. The activities were coded using Atlas.ti. The categories of KB activities (i.e., knowledge management, linkage and exchange, capacity building, cf. Farley-Ripple & Grajeda, 2020; Ward et al., 2009) served as sensitizing concepts (e.g., Bowen, 2006).

The categories of KB activities were used as our main code categories. The codes within each code category were derived bottom-up. The segments were provided with a very detailed code at first (e.g., 'ask colleagues for advice on hypotheses' or 'ask others to provide input on specific question of PLC on whiteboard'). After all segments were coded, similar codes were grouped and/or merged (e.g., previous mentioned codes were, along with others, merged into 'involve school staff members'). After an initial round of coding and redefining the coding scheme, the first and second authors coded 21 segments (13% of the data) to check the reliability of the coding. The interrater reliability was found to be substantial (Cohen's $\kappa = .784$; Landis & Koch, 1977). In cases of disagreement, the raters reached consensus on the coding through discussion, after finishing the coding. The first author finalized the coding of the transcripts (for the final coding scheme, see Table 4.3).

Table 4.3 Coding Scheme for Activities Key Actors Used to Broker Knowledge

| Knowledge management | |
|----------------------------------|---|
| Oral dissemination | Disseminating knowledge in oral form, for example, through a presentation or conversation |
| Written dissemination | Disseminating knowledge in written form, for example, through an email or newsletters |
| AND | |
| With artifact | Disseminating knowledge supported with a boundary object |
| Without artifact | Disseminating knowledge without a boundary object |
| Linkage and exchange | |
| Involve school staff members | Building connections with the school staff members, for example, by asking them for input and involving them in the PLC |
| Provide assistance and support | Helping school staff members with content of the PLC, such as discussing difficult steps, answering questions or connecting them to others who can help them with questions or problems |
| Make PLC part of school policy | Making PLC part of school policy, for example, through formally adding the PLC to (department) meetings as [agenda point] or planning moments to discuss the PLC |
| Link school organization and PLC | Discussing the link between the school organization and the PLC, for example, through discussing how the PLC can benefit a department, recognizing problem areas and discussing how the PLC can help in that respect or mentioning the importance of the PLC (when resistance is expressed) |
| Organize the PLC in the school | Discussing how the PLC is organized in the school, for example, the composition of the PLC and inviting new participants |
| Capacity building | |
| Capacity building | Educating colleagues who did not participate in the PLC, and developing in them the skills learned in the PLC, for example, through inviting experts or organizing a "small version" of the PLC |

4.4 RESULTS

4.4.1 Key actors in the KB process (RQ1)

In Table 4.4, an overview of the key actors' normalized centrality values and characteristics is presented. The normalized scores allowed us to compare scores across contexts, as it takes into account the different sizes of the networks across the schools. The average degree centrality of the key actors was .296 ($SD = .164$). This indicates that each key actor was on average connected to 29.6% of all staff members in their school. The average betweenness centrality of the key actors was 7.084 ($SD = 5.259$). Key actors thus connected on average to seven otherwise disconnected staff members. Regarding key actors' *school role*, at least one key actor at each school had a formal leadership role and at least one key actor did not. The informal leaders ($n = 10$) were teachers of different subjects, mostly mathematics ($n = 4$) and Dutch

language arts ($n = 4$). Key actors had on average 19.5 years of *experience* in education (range = 5 to 39) and 11.8 years at their school (range = 4 to 28). Regarding key actors' *participation in the PLC*, all but two key actors in the reform networks of all five schools participated in the PLC. The key actors who did not participate in the PLC were (assistant-)principal.

4.4.2 The knowledge key actors broker (RQ2)

Table 4.5 shows that key actors brokered all three types of knowledge identified in the theoretical framework, and two additional types. First, 12 key actors brokered knowledge related to the *focus* of the PLC. For example, key actors told their colleagues the problem the PLC was focusing on and why, as when Debbie stated that it was very important to explain the problem and why the PLC was focusing on that problem. KB about focus provided context for others to understand the reason for and results of the PLC, even when they were not directly experiencing the problem. Amber shared the focus of the PLC in smaller teams, aiming to brainstorm with colleagues who were not part of the PLC about possible causes. The focus of the PLC was often shared in combination with the processes and outcomes of the PLC.

Second, 14 key actors brokered knowledge related to the *process and outcomes* of the PLC. For example, key actors brokered results to others, such as approved or rejected hypotheses or improvement measures that had been developed, or explained how they came to those results. Danielle mentioned how results were discussed during a meeting of school leader, followed by discussion of how the results could be implemented in the organization. Five key actors mentioned that they used anecdotes related to successes, enthusiasm, or lessons learned to broker this type of knowledge. For example, Esther mentioned that some colleagues were afraid that when they observed lessons as part of the PLC cycle, students behaved differently compared to normal classroom situations. She then explained: "(...) We give an example and explain what happened previously. Once, during a lesson observation, all students were talking out loud and (...) did not even notice us". According to Amber, these anecdotes helped colleagues understand the PLC's context: "You can refer to previous experiences, (...) that helps and gives recognition".

Third, 12 key actors brokered knowledge related to the *approach* used in the PLC. For example, key actors explained the PLC cycle to their colleagues and what working with this specific PLC meant for the school. Cecilia said to mention "how [the PLC] works". Doreen explained that at School D, the PLC's approach is so common, because "a large group already worked with [the PLC]", that elaborating on the approach was not always necessary.

Table 4.4 Key Actors in the KB Process Concerning School Improvement and PLC Intervention per School and their Characteristics

| School | Key actor | Degree centrality | Betweenness centrality | Participated in PLC? | School role | Level of experience (years) |
|--------|-------------|-------------------|------------------------|----------------------|--|--|
| A | Amber | .400 | 13.008 | Yes | Assistant principal | In education: 17 At this school: 16 |
| | Andrew | .173 | 2.549 | Yes | Science teacher | In education: 13 At this school: 11 |
| | Arthur | .120 | 2.078 | Yes | Mathematics teacher | In education: 35 At this school: 25 |
| B | Belinda | .273 | 7.720 | Yes | Dutch language teacher | In education: 5 At this school: 4 |
| | Bryan | .364 | 15.332 | No | Principal | In education: 27 At this school: 5 |
| | Bob | .364 | 7.937 | Yes | Mathematics teacher/ Deputy principal | In education: 18 At this school: 4 |
| C | Carol | .410 | 11.048 | Yes | Mathematics teacher | In education: 10 At this school: 9 |
| | Christopher | .167 | 1.678 | Yes | Assistant principal | In education: 20 At this school: 6 |
| | Cecilia | .141 | 1.004 | Yes | Mathematics teacher | In education: 18 At this school: 12 |
| | Charlotte | .218 | 5.435 | Yes | Dutch language teacher | In education: 8 At this school: 7 |
| D | Danielle | .174 | 4.002 | Yes | Assistant principal | In education: 39 At this school: 8 |
| | Debbie | .138 | 2.452 | Yes | Assistant principal | In education: 32 At this school: 18 |
| | Doreen | .165 | 2.165 | Yes | English language teacher | In education: 9 At this school: 8 |
| E | Emily | .421 | 7.942 | Yes | Dutch language teacher | In education: 12 At this school: 12 |
| | Esther | .526 | 11.796 | Yes | Dutch language teacher | In education: 19 At this school: 15 |
| | Evelyn | .684 | 17.194 | No | Assistant principal | In education: 31 At this school: 28 |

Table 4.5 A Schematic Overview of the Knowledge Key Actors Brokered

| School | Key actor | Knowledge related to the PLC's ... | | | | |
|--------|-------------|------------------------------------|----------------------|----------|------------|------------------------|
| | | Focus | Process and outcomes | Approach | Advantages | Organizational matters |
| A | Amber | X | X | X | X | X |
| | Andrew | - | X | - | - | - |
| | Arthur | X | X | - | - | - |
| B | Belinda | - | X | - | - | - |
| | Bryan | - | X | - | X | X |
| | Bob | X | X | X | X | - |
| C | Carol | X | X | X | X | - |
| | Christopher | X | X | X | - | - |
| | Cecilia | X | X | X | - | X |
| | Charlotte | X | X | X | - | - |
| D | Danielle | X | X | X | X | X |
| | Debbie | X | X | X | X | X |
| | Doreen | X | X | X | - | - |
| E | Emily | X | X | X | X | - |
| | Esther | X | X | X | X | - |
| | Evelyn | X | - | X | - | X |

In addition to these three categories, we found that eight key actors brokered knowledge related to the *advantages of working with the PLC*. For example, Amber explained to a colleague that the PLC “can help with providing answers to questions you face in your daily practice” and Danielle explained that “the data team helped [her] become aware of the fact that [she] acted on her gut feeling often, while this was not always correct, and now look[s] more at data.” Esther explained that through lesson study “the department was better able to collaborate” and she “gained more insight into what the students are doing in the lessons” which she used to prepare and adjust her lessons. Key actors also explained the advantages of working with the PLC to resolve conflict when a colleague expressed resistance or to convince someone to participate.

We also found that six key actors brokered knowledge related to the *PLC's organizational matters*. This happened mainly when a colleague asked questions about it. For example, key actors mentioned how many hours were compensated to participate in the PLC, when meetings should take place, or if changes should be made in the organizational structure. The last happened when one PLC was not running well (i.e., less motivation to work with the intervention), and the principal asked Danielle whether the department leader was the cause of this and if they should be replaced, and when Carol discussed with the principal the possibility of getting more compensation for PLC members.

4.4.3 How key actors broker knowledge (RQ 3)

4.4.3.1 Quality of relationships

The results concerning the nature of the relationships of each key actor can be found in Table 4.6.

4.4.3.1.1 Reciprocity

For two-way KB to take place, reciprocated relationships are necessary. We conducted an independent samples *t*-test to compare the proportion of reciprocated ties (i.e., the indicated number of reciprocated ties in the questionnaire divided by the number of all possible reciprocated ties) for key actors to that for their colleagues. The difference was statistically significant and large, $t(15.056) = 4.286$, $p = .001$, Hedges' $g = 3.768$. Hedges' g is an effect size measuring the magnitude of the difference; here, 3.768 standard deviations. This means that key actors had more reciprocated ties with school staff members with whom they did not share membership in the PLC ($M = .059$, $SD = .052$) than did their colleagues ($M = .004$, $SD = .010$).

4.4.3.1.2 Intensity

The room for discussion that is necessary for two-way KB could take place through sharing and joint work. We conducted an independent samples *t*-test to compare the proportion of incoming sharing and joint work ties (i.e., the indicated number of incoming sharing and joint work ties in the questionnaire divided by the number of all possible sharing and joint work ties) for key actors to that for their colleagues. The difference was statistically significant and large, $t(15.192) = 4.764$, $p < .001$, Hedges' $g = 2.900$. This means that school staff members chose to share and perform joint work related to the PLC intervention more often with the key actors ($M = .049$, $SD = .036$) than with their other colleagues ($M = .006$, $SD = .013$).

We also conducted an independent samples *t*-test to compare the proportion of outgoing sharing and joint work ties (i.e., the indicated number of outgoing sharing and joint work ties in the questionnaire divided by the number of all possible sharing and joint work ties) for key actors to that for their colleagues. The difference was statistically significant and large, $t(15.044) = 3.584$, $p = .003$, Hedges' $g = 3.327$. This means that key actors more often shared and performed joint work related to the PLC intervention with school staff members who were not in a PLC with them ($M = .079$, $SD = .084$) than did their colleagues ($M = .004$, $SD = .015$).

Table 4.6 Proportions of Incoming, Outgoing, Reciprocated, Intense and Two-Way KB Ties per Key Actor

| School | Key actor | Incoming ties | Outgoing ties | Reciprocated ties | Intense incoming ties ¹ | Intense outgoing ties ¹ | Two-way KB ties ² |
|--------|-------------|---------------|---------------|-------------------|------------------------------------|------------------------------------|------------------------------|
| A | Amber | .197 | .352 | .183 | .113 | .239 | .085 |
| | Andrew | .135 | .027 | .000 | .027 | .000 | .000 |
| | Arthur | .069 | .028 | .014 | .014 | .014 | .000 |
| B | Belinda | .263 | .158 | .105 | .105 | .158 | .105 |
| | Bryan | .158 | .211 | .105 | .053 | .211 | .053 |
| | Bob | .158 | .368 | .105 | .105 | .211 | .105 |
| C | Carol | .230 | .284 | .122 | .041 | .108 | .014 |
| | Christopher | .122 | .054 | .054 | .041 | .000 | .000 |
| | Cecilia | .081 | .014 | .000 | .000 | .000 | .000 |
| | Charlotte | .068 | .149 | .041 | .027 | .054 | .014 |
| D | Danielle | .125 | .115 | .073 | .063 | .083 | .042 |
| | Debbie | .082 | .061 | .041 | .041 | .041 | .010 |
| | Doreen | .039 | .108 | .020 | .000 | .098 | .000 |
| | Emily | .233 | .067 | .033 | .067 | .000 | .000 |
| E | Esther | .100 | .233 | .033 | .067 | .033 | .033 |
| | Evelyn | .067 | .182 | .018 | .006 | .018 | .000 |

¹Intense ties are interactions that in the social network questionnaire were identified as 'sharing' or 'engaging in joint work'.

²Two-way KB ties are ties that are both reciprocated and intense.

4.4.3.1.3 Two-way knowledge brokerage

For two-way KB to take place, ties need to be both reciprocated and intense (i.e., sharing or joint work). We conducted an independent samples *t*-test to compare the proportion of those two-way KB ties (i.e., the indicated number of two-way KB ties in the questionnaire divided by the number of all possible two-way KB ties) for key actors to that for their colleagues. The difference was statistically significant and large, $t(15.042) = 2.870, p = .012$, Hedges' $g = 2.681$. This means that key actors ($M = .029, SD = .038$) did engage more in two-way KB compared to their colleagues ($M = .001, SD = .007$). Nine key actors did and seven key actors did not engage in two-way KB.

4.4.3.2 Activities

In Table 4.7, an overview of the activities key actors used to broker knowledge is presented.

4.4.3.2.1 Activities related to knowledge management

All key actors used activities related to this category. All activities had to do with dissemination of knowledge related to the PLC. More detailed insight into the activities key actors used to broker knowledge related to knowledge management is presented in Table 4.8.

The form in which dissemination happened differed. All key actors used oral dissemination. Oral dissemination took place in the teacher staff room, in hallways between lessons, during formal meetings, or during a presentation. Seven key actors used written dissemination. Written dissemination happened through emails and newsletters, and by disseminating minutes of PLC meetings.

Three key actors used oral dissemination accompanied by artifacts; five key actors used written dissemination accompanied by an artifact. Artifacts that were used included an instruction booklet based on which all school staff members could implement the improvement measures that resulted from the PLC. The process and outcomes of the PLC were presented in brief, as well as guidelines for implementing the improvement measures. The key actors at School C developed a flyer in which they presented the results of their PLC. They placed them on the tables in the teacher staff room. These flyers often led to conversations about the PLC. Staff members asked PLC members about details or asked in-depth questions. At School E, posters about the PLC approach and a research article were placed on the walls throughout the school. Although the dissemination activities sometimes led to two-way KB, these activities themselves were one-way KB.

Table 4.7 A Schematic Overview of the Activities Key Actors Used to Broker Knowledge

| School | Key actor | Activities related to... | | |
|--------|-------------|--------------------------|----------------------|-------------------|
| | | Knowledge management | Linkage and exchange | Capacity building |
| A | Amber | 1, 2 | 5, 6, 7, 8, 9 | 10 |
| | Andrew | 1 | - | - |
| | Arthur | 1 | - | - |
| B | Belinda | 1 | 6 | - |
| | Bryan | 1 | 8, 9 | 10 |
| | Bob | 1 | 5, 6, 7 | 10 |
| C | Carol | 1, 2, 3, 4 | 5, 6, 8 | - |
| | Christopher | 1, 4 | 6, 7 | 10 |
| | Cecilia | 1, 4 | 5, 6, 8 | - |
| | Charlotte | 1, 2, 3, 4 | 5, 6, 8 | - |
| D | Danielle | 1, 3 | 5, 6, 7, 8, 9 | 10 |
| | Debbie | 1, 3 | 6, 7, 9 | 10 |
| | Doreen | 1, 3 | 5, 8 | - |
| E | Emily | 1, 3, 4 | 5, 6 | 11 |
| | Esther | 1, 3, 4 | 5, 6, 7, 8 | 11 |
| | Evelyn | 1, 3, 4 | 7, 8, 9 | 10 |

Note. Each number represents an activity. 1 = Oral dissemination, without artifact; 2 = Oral dissemination, with artifact; 3 = Written dissemination, without artifact; 4 = Written dissemination, with artifact; 5 = Involve school staff members; 6 = Provide assistance and support; 7 = Make PLC part of school policy; 8 = Link school organization and PLC; 9 = Organize the PLC in the school; 10 = Invite experts to educate all staff members on (content related to) the PLC; 11 = Arrange for all staff members to experience a “small version” of the PLC

Table 4.8 In-Depth Description of Activities Related to Knowledge Management Used by Key Actors

| School | Key actor | Knowledge management | | | |
|--------|-------------|---------------------------------|---|---|---|
| | | Oral, without artifact | Oral, with artifact | Written, without artifact | |
| A | Amber | - In teacher room | - In department meeting, artifact = Tables with data from student tracking system | - | |
| | | - During presentation | | | |
| | | - During department meetings | | | |
| | | - During school leader meetings | | | |
| Andrew | Andrew | - In teacher room | | - | |
| | | - During presentation | | | |
| | | - In teacher room | | - | |
| Arthur | Arthur | - In teacher room | | - | |
| | | - During presentation | | | |
| B | Belinda | - In teacher room | | - | |
| | | - In teacher room | | - | |
| | | - In teacher room | | - | |
| | | - During presentation | | - | |
| C | Carol | - In teacher room | - In teacher room, artifact = flyer | - Email, artifact = instruction booklet | |
| | | - During presentation | | - News letter | |
| | | - In teacher room | | - Email, artifact = instruction booklet | |
| | | - During presentation | | | |
| | Christopher | Christopher | - During school leader meetings | | |
| | | | - In teacher room | | |
| | Cecilia | Cecilia | - In teacher room | | - Email, artifact = instruction booklet |
| | | | - In hallway between lessons | | |
| | | | - During presentation | | |
| | | | - In teacher room | - In teacher room, artifact = flyer | - Email, artifact = instruction booklet |
| | Charlotte | Charlotte | - In teacher room | | |
| | | | - During presentation | | - News letter |

| | | | | |
|---|----------|---|---|--|
| D | Danielle | - In teacher room - During presentation - During department meetings - During school leader meetings | - | |
| | Debbie | - During presentation - During department meeting - During school leader meetings | - News letter | |
| | Doreen | - In teacher room - In hallway between lessons - During presentation | - Email - Email, artifact = PLC manual | |
| | E | Emily | - In teacher room - In hallway in between lessons - During presentation | - Email - Email, artifact = example observation schemes |
| | | Esther | - In teacher room - In hallway between lessons | - Email |
| | | Evelyn | - During presentation - During department meetings | - Email, artifact = posters (on classroom walls as well) |

4.4.3.2 Activities related to linkage and exchange

Fourteen key actors used activities related to this category. Five types of activities were identified. More detailed insight into the activities key actors used to broker knowledge related to linkage and exchange is presented in Table 4.9.

First, nine key actors brokered knowledge by *involving school staff members*. For example, School C's key actors together placed a whiteboard in the teacher staff room with a question related to the PLC that all staff members could reply to. These suggestions were discussed later in a meeting. This happened at School B and E as well, but with sticky notes, and at School D through individual conversations with teachers from different departments. Additionally, Amber added a brainstorm-moment to some of the team meetings she initiated. She then asked the staff members to think along concerning a question the PLC was facing. Although she mentioned that it might not have generated ideas immediately, "it makes people think and sometimes staff members came with ideas a day or a week later." Another example was that the key actors of School C invited the staff members who were directly experiencing the problem the PLC members were investigating to attend some of the PLC meetings so that they could think along with the team. These activities all comprised two-way KB.

Second, 11 key actors brokered knowledge by *providing assistance and support*. Key actors answered questions school staff members had about the PLC. These questions were about the outcomes or the execution of the PLC, for example. Other key actors took it a step further and helped colleagues with the execution of the PLC process. For example, Doreen developed an Excel document that helped a colleague organize test results and run analyses. Others helped by connecting staff members to colleagues or other PLC members who could help them out, for example when a key actor had no time or knew that someone else was more knowledgeable on that subject. Discussing the PLC approach in depth, and more specifically steps that were up for discussion or considered difficult, was another example of helping with the PLC content. For example, Belinda discussed one step of the PLC approach in depth with other staff members; more specifically, she talked about how to carry it out (or not). These activities all comprised two-way KB.

Third, six key actors brokered knowledge by *making the PLC part of school policy*. For example, this was done by the key actors at School C through making the PLC part of the department plans for the departments that worked in a PLC. These departments were asked to elaborate on the implementation of what they learned in the PLC within their departments each school year and add this to their plans. These plans were discussed multiple times per year in meetings with each other and with the school leaders. In those meetings the staff members of the department evaluated their plans and thus how the implementation of that what was learned was going. At Schools A, C, D, and E, key actors made the PLC a repeating item on the agenda of formal

meetings, such as yearly meetings between department and school management. Finally, the key actors at all schools added moments to the yearly calendar to present the outcomes of the PLC where all staff members got the opportunity to ask questions. This helped, according to Evelyn, because “you plan something (...) and the last years we also had something to eat and drink while we were discussing (...), and because of this [specially organized] afternoon, no one had an excuse not to be there.” These activities all comprised two-way KB.

Fourth, nine key actors brokered knowledge by *linking the school organization and PLC*. For example, key actors explained what the advantages of the PLC were for a specific department or team and discussed whether the PLC could also have those benefits for the department of the staff members to whom the key actor was talking. Amber triggered her team members with questions such as “(...) can you imagine that within your subject area these [aspects that were researched with the PLC] also play a role, and do you want to research this in a group too?”. Key actors also discussed the implications of the results of the PLC for the school or other departments with staff members. They discussed the importance and advantages (described above) of working with the PLC with staff members as well. This often happened when resistance was expressed. Bryan explained to one of his colleagues who had issues because of time that “I put it in the yearly calendar, and although it might cost you your lessons, it does not cost you extra time and you learn from it.” Danielle added that she sometimes agreed with criticism from colleagues, such as that a PLC cannot perform generalizable research. She said: “(...) that they are right. But it is more about the teacher’s awareness, not react based upon their gut feeling, and to look at the data that is available. And I try to explain that to them.” Additionally, key actors recognized problem areas a staff member was explaining that could possibly be worked on with a PLC. In such conversations, they mentioned what the PLC was and how it could help solve the problem a staff member was facing. These activities all comprised two-way KB.

Fifth, five key actors brokered knowledge by *organizing the PLC in the school*. Key actors invited school staff members to participate and engaged in discussions about the PLC. Moreover, key actors purposefully composed the PLCs. For example, Debbie explained how she aimed to let every department work in a PLC. She purposefully asked staff members from specific departments whether they wanted to participate. Over three years, staff members of each department then worked with the PLC.

4.4.3.2.3 Activities related to capacity building

Seven key actors used activities related to this category. Activities in this category were observed least often. Two types of activities were identified. Key actors at School E let all school staff members experience a “miniature” version of the PLC. They organized an afternoon with a walkthrough of the full cycle of the PLC. Emily explained that this was done because only a few staff members were working with the PLC, and they wanted to let

Table 4.9 In-Depth Description of Activities Related to Linkage and Exchange Used by Key Actors

| Linkage and Exchange | | | | | | |
|----------------------|-----------|---|---|---|---|--|
| School | Key actor | Involve school staff members | Provide assistance and support | Make PLC part of school policy | Link school organization and PLC | Organize the PLC in the school |
| A | Amber | - Ask colleagues for input (e.g., for hypotheses) during a team meeting | - Answer questions about data use | - Add the PLC as a discussion point to the agenda of various meetings - Plan meetings to share PLC-results | - Mention how and why a PLC might help find a solution to an experienced problem and suggest starting a PLC. - Explain the advantages of working with the PLC - Discuss the PLC-results with colleagues who did not participate in the PLC in-depth | - Explain why a colleague can be an asset for the PLC and invite them to participate |
| | Andrew | - | - | - | - | - |
| | Arthur | - | - | - | - | - |
| | Belinda | - | - Answer questions about specific PLC-steps | - | - | - |
| | Bryan | - | - | - | - When resistance is expressed, explain the advantages of working with the PLC and how the compensation in time makes it not an extra burden for the teaching job | - Invite staff members to participate in the PLC and follow PLC-related courses |
| | Bob | - Ask colleagues for input on the next PLC | - Answer questions about the PLC | - Plan meetings to share PLC-results | - Explain the advantages of working with the PLC | - |
| B | | | | | | |

| | | | |
|--------------------|---|---|---|
| <p>Carol</p> | <ul style="list-style-type: none"> - Ask colleagues for input on the next PLC and the problem under investigation, by asking the actions they would take based on different situation sketches - Ask colleagues who are experiencing the problem that the PLC is investigating to attend PLC meetings and think along | <ul style="list-style-type: none"> - Answer questions about data use | <ul style="list-style-type: none"> - Explain to colleagues what the PLC is investigating and how the results can be beneficial for the school |
| <p>Christopher</p> | <ul style="list-style-type: none"> - | <ul style="list-style-type: none"> - Answer questions about data use and the the PLC | <ul style="list-style-type: none"> - Add the PLC as a discussion point to the agenda of various meetings - Plan meetings to share PLC-results |
| <p>Cecilia</p> | <ul style="list-style-type: none"> - Ask colleagues for input on possible causes of or solutions for the problem under investigation by the PLC - Ask colleagues for their opinion, for example, about the suggested improvement measures | <ul style="list-style-type: none"> - Answer questions about data use and the the PLC | <ul style="list-style-type: none"> - Discuss the PLC-results with colleagues who did not participate in the PLC in-depth |
| <p>Charlotte</p> | <ul style="list-style-type: none"> - Share ideas for problems that might be interesting to focus on in future PLCs and ask colleagues for thoughts about these ideas - Ask colleagues that are experiencing the problem that the PLC is investigating to attend PLC meetings and think along | <ul style="list-style-type: none"> - Answer questions about data use | <ul style="list-style-type: none"> - Discuss the PLC-results with colleagues who did not participate in the PLC in-depth |

C

Table 4.9 Continued

| | | | | | |
|---|---|--|--|---|---|
| D | <p>Danielle</p> <ul style="list-style-type: none"> - Ask colleagues of departments that are not experiencing the problem for input on causes and solutions | <ul style="list-style-type: none"> - Answer questions about data use - Find someone who can help a colleague with data use | <ul style="list-style-type: none"> - Add PLC to department meetings plan, so it is discussed at each meeting - Ask about the PLC and what the results mean to the department during formal meetings - Plan schoolwide meetings to present the PLC-results - Add PLC as a formal discussion point to different meeting formats (e.g., department meeting) | <ul style="list-style-type: none"> - When resistance is expressed, explain the advantages of working with the PLC - Discuss the PLC-results with colleagues who did not participate in the PLC in-depth | <ul style="list-style-type: none"> - Explain why a colleague can be an asset for the PLC and invite them to participate - Deliberately choose the PLC-composition - Invite colleagues to participate |
| E | <p>Doreen</p> <ul style="list-style-type: none"> - Ask colleagues for input on causes or solutions for the problem that is under investigation by the PLC | <ul style="list-style-type: none"> - | <ul style="list-style-type: none"> - | <ul style="list-style-type: none"> - When resistance is expressed, explain the advantages of working with the PLC | <ul style="list-style-type: none"> - |
| | <p>Emily</p> <ul style="list-style-type: none"> - Ask colleagues about problems they are experiencing as input for the next PLC. | <ul style="list-style-type: none"> - Answer questions about the PLC | <ul style="list-style-type: none"> - | <ul style="list-style-type: none"> - | <ul style="list-style-type: none"> - |
| | <p>Esther</p> <ul style="list-style-type: none"> - Ask colleagues about problems they are experiencing as input for the next PLC. | <ul style="list-style-type: none"> - Answer questions about the PLC | <ul style="list-style-type: none"> - Add PLC as a formal discussion point to different meeting formats (e.g., department meeting) - Plan schoolwide meetings to present the PLC-results | <ul style="list-style-type: none"> - When resistance is expressed, explain the advantages of working with the PLC | <ul style="list-style-type: none"> - Invite colleagues to participate |
| | <p>Evelyn</p> | <ul style="list-style-type: none"> - | <ul style="list-style-type: none"> - | <ul style="list-style-type: none"> - When resistance is expressed, explain the advantages of working with the PLC | <ul style="list-style-type: none"> - Invite colleagues to participate |

everyone experience what they were doing and why they were doing it. Key actors at all schools invited experts to talk about (content related to) the PLC, for example, to give a workshop or act as coach of the PLC. These activities were two-way KB.

4.4.4 Overview

An overview of the results incorporated in our research model is presented in Figure 2. In sum, we found that all but one characteristic seemed to influence whether a staff member became a key actor. We identified, on top of the three knowledge types that were established in previous research, two additional types of knowledge that key actors brokered. The quality of key actors' relationships appeared to be higher compared to their colleagues. And, last but not least, we identified in detail what activities were used to broker knowledge, complementing the categories that were established in previous research. When comparing all these aspects that are important for KB, similarities and differences between key actors became apparent. This will be discussed further in the next section.

4.5 CONCLUSION AND DISCUSSION

In this study we investigated the role of those leading the knowledge brokerage (KB) processes in five secondary schools that sustainably worked on school improvement with PLCs. KB is key for sustainable school improvement (e.g., Coburn et al., 2009; Stoll et al., 2006), as the flow of knowledge related to the PLC seems to be important for the PLC to become an integral part of the daily school routines, and thus to become sustainable. A social network questionnaire, observations, and interviews helped us obtain insight into their characteristics (RQ1), the knowledge they brokered (RQ2), the quality of their relationships and the activities they used for KB (RQ3). Our overall results suggest four broad themes: experience is an important factor, while formal position is not as critical for being a key actor in KB; the importance of brokering the PLC's advantages and organizational matters; key actors supported a high-quality infrastructure for KB; and key actors fit different profiles.

4.5.1 Experience is an important factor, while formal position is not as critical for being a key actor in KB

Our findings suggest that tenure in position is an important area to consider. Results indicate that the vast majority of the key actors, in addition to participating in the PLC, were mid- to late career. Key actors' level of experience thus seemed to be critical for being a key actor in KB in the schools in our study. As proficient understanding of the educational system (e.g., budgets, resources, myriad other issues) seems to be necessary for brokerage (Cooper et al., 2020), novices might lack the credibility and expertise to become efficient brokers. Van Waes et al. (2018) and Liou et al. (2014) also showed that more experienced staff members were more often sought out by colleagues for advice. Based on our study it seems that these staff members are more likely to take up an important role in KB processes related to sustainability as well.

| KB about knowledge acquired and developed in the PLC | | |
|--|--|---|
| The key actors (RQ1) | The brokered knowledge (RQ2) | The way knowledge is brokered (RQ3) |
| <p><i>Characteristics:</i></p> <ul style="list-style-type: none"> - School role: both formal and informal leaders - Level of experience: mid- to late-career - Engagement with research: all but two participated in PLC | <p><i>Knowledge related to:</i></p> <ul style="list-style-type: none"> - Focus - Process and outcomes - Approach - Advantages - Organizational matters | <p><i>Quality of relationships:</i></p> <p>Compared to non-key actors, key actors:</p> <ul style="list-style-type: none"> - had more intense relationships - had more reciprocated relationships - used more two-way KB <p><i>Activities:</i></p> <ul style="list-style-type: none"> - Knowledge management: <ul style="list-style-type: none"> - Oral dissemination - Written dissemination - Linkage and exchange: <ul style="list-style-type: none"> - Involving school's staff members - Providing assistance and support - Making the PLC part of school policy - Linking the school organization and the PLC - Organizing the PLC in the school - Capacity building: <ul style="list-style-type: none"> - Arranging for all school staff members to experience a miniature version of the PLC - Inviting experts to talk about (content related to) the PLC |

Figure 4.2 Summary of the Outcomes (in Bold) based on Our Research Model.

Perhaps surprisingly, key actors' school role was not critical for KB in the schools we studied. Each of the schools in this study had key actors who played formal and informal leadership roles. On the one hand, it might be easier for formal leaders to reach out to others because of the higher number of colleagues they are in contact with. On the other hand, informal leaders might be necessary to arrive at the trust-level that is necessary to realize school improvement (Fairman & MacKenzie, 2015). Informal leaders namely are found to offer encouragement and support (Roby, 2011). Both types of leaders seem important for KB (e.g., Sinnema et al., 2020b) and realizing sustainability (Harris et al., 2013; Lee & Louis, 2019).

4.5.2 The importance of brokering the PLC's advantages and organizational matters

KB about the PLC's focus, process and outcomes, and approach is well established in these five schools and each type of KB was present in our research. These results are in line with Hubers et

al. (2019). However, our data yielded two additional types of knowledge that key actors brokered that are rarely discussed in the literature. First, we found that key actors brokered knowledge related to the advantages of working with the PLC in their schools.. This shows the importance of the PLC and its results for the school. Brokering the advantages helped to convince others of its importance. Additionally, it helped build staff members' trust: by showing how the PLC had improved aspects at the school, staff members saw that it was more than just another intervention that was being implemented. It was an effective one that would be beneficial for the school, which may help to convince them to act in accordance with the PLC. This is especially critical if colleagues are hesitant or even resistant towards (the work of) the PLC. Previous studies have shown that trust and being explicit about the PLC's importance contribute to sustainability (Meyer et al., 2017; Prenger et al., 2020). This study adds that the perception of advantages of working with the PLC seems to be important for sustained work, too.

We also found that key actors brokered knowledge related to the PLC's organizational matters in their schools. Creating the right organizational conditions is crucial for sustainability (Prenger et al., 2020), and talking about organizational matters helps create these conditions. For example, this can be done by prioritizing the work of the PLC through facilitating the use of resources (Brown & Flood, 2019), a topic that was brokered as well. Discussing possible obstacles, such as time, is the first step in finding solutions to overcome them. Talking about organizational matters thus helped contribute to keeping the core components of the PLC as part of the organization.

4.5.3 Key actors supported a high-quality infrastructure for KB

Key actors not only reached more (diverse) staff members compared to their colleagues, but the quality of their relationships was also higher (i.e., more reciprocated, more intense, and more two-way KB). The infrastructure that these key actors created in their networks was high quality, based upon which they could perform KB easily and in greater depth (Daly, 2010). This indirectly suggests that key actors might be highly trusted by their colleagues, as trust is critical for establishing this type of infrastructure (Liou et al., 2014b).

Although two-way KB was rarely reported in the questionnaire, observing and interviewing key actors about KB showed that they carried out ample activities involving two-way KB. This once again shows the importance of combining quantitative and qualitative approaches, especially in connection with considering the actual content and meaning of interactions (Froehlich et al., 2020), which is important for KB.

Key actors made use of this high-quality infrastructure through various activities. All activities could be categorized as either knowledge management (one-way KB), linkage and exchange (two-way KB), or capacity building (two-way KB). This is in line with Farley-Ripple and Grajeda (2020) and Ward et al. (2009). The last category was used least often by the key actors. Because

the schools in this study were already some years along in the process of sustainability, brokers might think they no longer need to focus on this.

4.5.4 Key actors fit different profiles

When we combined the results for our three research questions, we noted that there are different categories of knowledge brokers. We identified three different profiles in the schools in our study, which we call: super-traders, transceivers and transmitters.

Super-traders scored highest per school on at least five out of six proportion scores (i.e., incoming ties, outgoing ties, reciprocal ties, intensity incoming ties, intensity outgoing ties, two-way KB). They brokered knowledge about focus, processes, approach, and advantages of the PLC. They used relatively much two-way KB and the most different types of activities to broker the knowledge. We identified five super-traders: Amber, Bob, Carol, Danielle, and Esther. One key actor at each of the schools in this study was a super-trader.

Transceivers (cf. Supovitz et al., 2018) were more often chosen by their colleagues as an interlocutor than they were broadcasting information (higher proportion of incoming ties compared to outgoing ties). This study showed a dichotomy between transceiver types. Plain transceivers (here Andrew, Arthur and Belinda) mainly brokered knowledge related to process and outcomes. They used only one to two different activities, mostly related to knowledge management and thus one-way KB. The exchange and transfer of information stayed rather basic. Advanced transceivers (here Christopher, Cecilia, Debbie, and Emily) brokered knowledge related to the PLC's focus and its process and outcomes. They used four or more different activities to broker knowledge. This indicates that they vary more in type of knowledge and the activities used to broker knowledge were more often related to linkage and exchange, which is two-way KB. Because of this difference, we think of them as more advanced. Although their level differed, at least one key actor at each of the schools in this study was a transceiver.

Transmitters (cf. Supovitz et al., 2018) were more often broadcasting information than they were chosen as interlocutor by their colleagues (higher proportion of outgoing ties than incoming ties). Transmitters (here Bryan, Charlotte, Doreen, Evelyn) differed tremendously in the types of knowledge they brokered and the variety of activities they used to broker knowledge. Their common focus was on broadcasting information. At all but one school in this study, one key actor was a transmitter.

4.5.5 Practical implications

Brokering different types of knowledge (e.g., with regard to the focus and advantages of the PLC) helped the leaders of the schools in this study to engage the whole school learning community, which is necessary for sustainability (Stoll et al., 2006). Additionally, our results show that more

experienced staff members seem to be important for KB. Including one or two mid- or late-career staff members in a PLC might be beneficial for KB and sustainable school improvement. Finally, the activities that were identified in this study shaped the KB processes in five different schools. School staff members can draw from these concrete examples to improve KB at their schools, by incorporating activities related to the different categories.

4.5.6 Limitations and future research

We acknowledge several limitations of our study. First, we only administered the questionnaire once, so no conclusions could be drawn about stability or change over time.

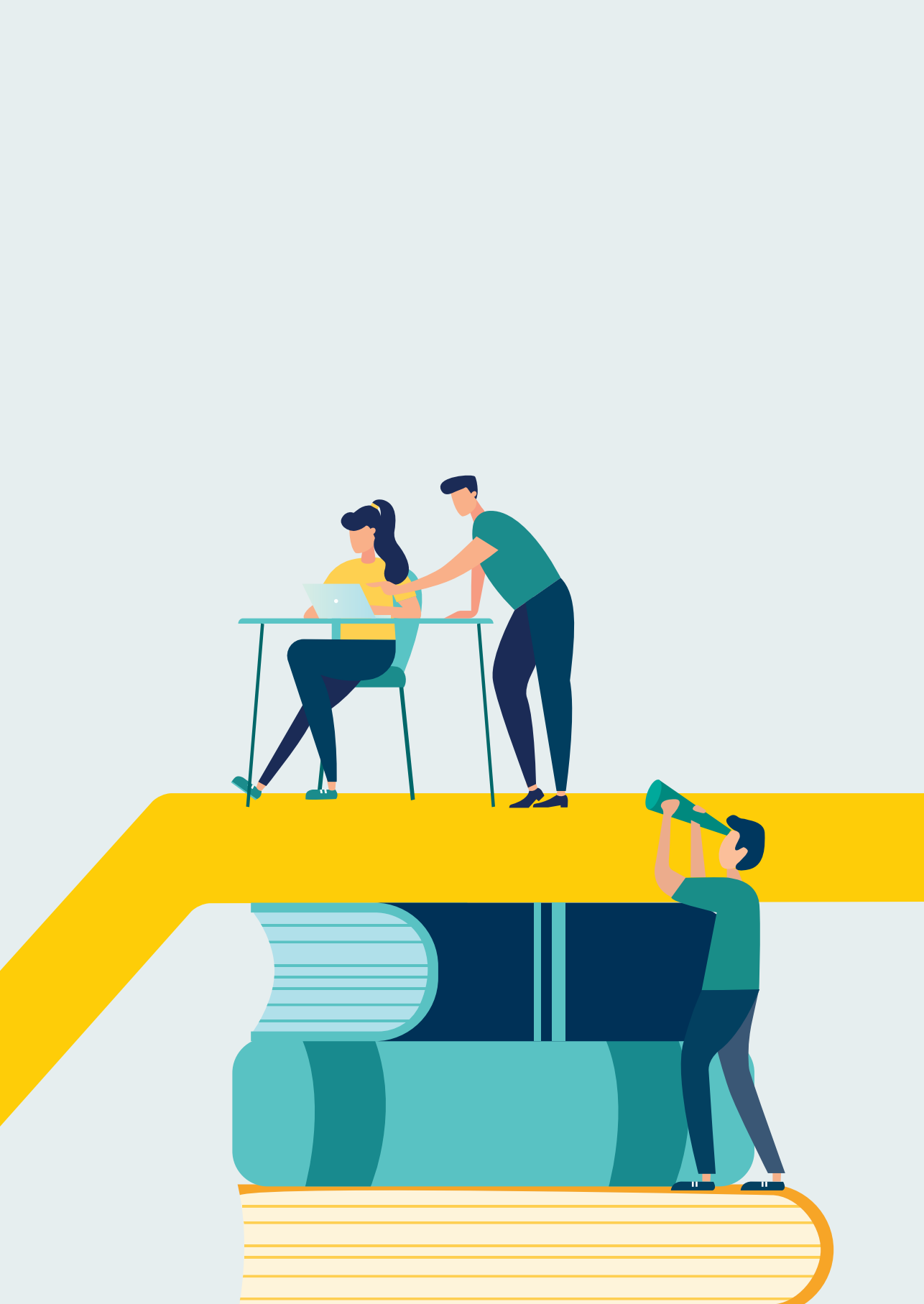
Previous research showed that central brokers who build trust (Kolleck, 2014) and who concentrate on the focus of the PLC in their schools. (Hubers et al., 2019) are present at the start of the sustainability trajectory. We showed that further along in the sustainability trajectory, KB is more diffused. The type of knowledge brokers necessary in each phase when realizing sustainable school improvement might differ. Different types of knowledge brokers might be necessary in different phases of the school improvement process. Longitudinal studies in which the social network questionnaire is administered and key actors are interviewed once or twice a year may broaden our knowledge of different phases of sustainability and the key actors in KB processes who help with sustainability. The identified profiles can help in that respect. These profiles can be refined, tested on a larger scale, and in different phases of the sustainability trajectory. This helps to identify key actor profiles necessary for each phase, so that schools can better shape the KB processes for sustainable school improvement.

Second, our research focused on one context: the Dutch context. In this context, school staff members have the freedom to decide what and how they want to teach, and to implement curriculum innovations (OECD, 2008, 2010), which might affect their involvement in the PLC and related KB processes. Additionally, the schools in our study differed on several aspects: the level and size of the schools, the type of PLC they used, how long they worked with the PLC, the PLCs composition and the number of staff members that worked with the PLC. Analytical generalizability instead of statistical generalizability is therefore applicable to case studies. Our in-depth and detailed descriptions of the schools allow researchers and school staff members to assess to what extent the results apply to their schools or contexts (Poortman & Schildkamp, 2012). The schools and key actors, within this context, were however similar in the fact that they brokered the same types of knowledge and used the same activities to do so. Studies in other contexts are necessary to develop a more comprehensive understanding of KB processes for sustainable school improvement.

The question why certain PLC participants engage in a lot of KB and become key actors, and others with the same characteristics do not, remains. This is an important question, especially

when advising schools on to best select staff members for the PLC. Future studies might therefore focus on key actors' motives and perception of the PLC to find answers to that question. Motives “underpin traits such as enthusiasm, commitment, courage and creativity, all of which are recognized as important qualities for knowledge [brokers]” (Ward, 2017, p. 487), and perception influences willingness to fully engage in the PLC (Wolthuis et al., 2020).

In sum, our study highlights who the key actors are, what knowledge they broker and how they broker knowledge at schools that have realized sustainable school improvement with PLCs. These insights can help schools in building and improving KB to sustain school improvement.



5

Leaders' interpretation of the PLC and their educational beliefs

This chapter is based on:

Van den Boom-Muilenburg, S. N., De Vries, S., Van Veen, K., Poortman, C. L., & Schildkamp, K. (2021). Understanding sustainable professional learning communities by considering school leaders' interpretations and educational beliefs. *International Journal of Leadership in Education*. Advance online publication. doi:10.1080/13603124.2021.1937705

ABSTRACT

The way in which school leaders implement professional learning communities (PLCs) is important for realizing sustainable school improvement. The assumption is that school leaders act based on their interpretation of the PLC, which is based on their underlying educational beliefs. In this study, we explored these latter aspects by interviewing six formal and informal school leaders, discussing the school's sustainable working on school improvement with PLCs in two secondary schools that had each worked with PLCs for seven years. The results of this in-depth qualitative study show that the schools differed in the degree of sustainability they achieved: one still used the PLC as intended; the other now omitted one step of the original format. This can be explained by the leaders' interpretations of the PLC and their educational beliefs. Furthermore, we found that student- and collaboration-oriented beliefs are critical for continuing the work of a the PLCs. Finally, we found that the organizational context mediates whether leaders act upon their beliefs. Tensions between leaders' beliefs and the organizational context, such as fear of colleagues' resistance, appeared to influence their choice to act or not concerning specific aspects of the PLC. These findings can give school leaders insights into conditions for working sustainably on school improvement with PLCs.

Keywords: distributed leadership, beliefs, interpretation, professional learning community, sustainability

5.1 INTRODUCTION

Schools are urged to seek continual improvement. They must keep up with the rapidly changing environment and increasing diversity in their (student) population, with the aim of supporting student learning in the best way possible. Professional learning communities (PLCs) are promising tools in that regard (Doğan & Adams, 2018). PLCs are groups of staff members at a school who meet regularly and discuss and explore theory, practices, and experiences in connection with a specific theme related to their own school (Little, 2012; Stoll et al., 2006). The general assumption behind PLCs is that school staff members develop professionally in PLCs because they discuss and explore teaching and learning, which leads to changes in their skills and knowledge and how these are applied, through which school improvement will take place (Lomos et al., 2011; Van Veen et al., 2010; Vescio et al., 2008).

In order to work on continual school improvement in this way, the most important elements of working with the PLC, in other words, the core components, need to become sustainable. A PLC's core components are sustained when they become a self-evident and functional part of the work at the school (Prenger et al., 2020), thereby becoming an organizational routine (Feldman & Pentland, 2003). Here, sustainability thus refers to sustaining the PLC's core components, hereafter referred to as sustainable school improvement through PLCs.

School leadership plays an important role in initiating, organizing and sustaining working on school improvement with interventions such as PLCs (e.g., Coburn, 2005; Harris & Jones, 2010; Spillane, 2012). From a distributed leadership perspective, leadership is about all activities tied to the core work of the school that are designed by the school's staff members to influence the motivation, knowledge, or practices of other members of the school organization (Harris & DeFlaminis, 2016; Spillane, 2006; Woods & Roberts, 2016). These activities can be performed by formal and informal leaders. Formal leaders are those with a leadership position that is formally assigned, and informal leaders are those who influence other staff members without a leadership position that is formally assigned (Pescosolido, 2001; Pitts & Spillane, 2009). Both formal and informal leaders can support, assist and motivate staff members (Leithwood et al., 2020; Robinson et al., 2008; Van den Boom-Muilenburg et al., 2020a).

School leaders act based on their interpretation of an intervention, in this case the PLC and its core components, as well as based on their educational beliefs (e.g., Burch & Spillane, 2003; Fishbein & Ajzen, 2010). Leaders of schools that have sustained the PLC's core components are therefore expected to have interpreted the PLC as intended and to hold educational beliefs that are in line with that intention. To date, research on leadership and sustainable school improvement (Prenger et al., 2020) and on the combination of interpretations of the PLC and sustainable school improvement is scarce (Maitlis & Christianson, 2014). Assuming that school leaders'

interpretations of the PLC and their underlying educational beliefs are important for realizing sustainable school improvement (Maitlis & Christianson, 2014), and because sustainability has been found to be a challenge for schools (e.g., Cohen & Mehta, 2017; Hubers, 2016), we therefore aim to explore the following question: How do school leaders' interpretations of the PLC and their educational beliefs explain the sustainability of PLCs aimed at school improvement?

5.2 CONCEPTUAL FRAMEWORK

In this section we will clarify our research model (see Figure 5.1). Therefore, we briefly review the literature around the types of PLCs that are central in this study: data teams and lesson study teams. Then, we will zoom in on the literature around interpretations and educational beliefs, and relate that to PLCs.

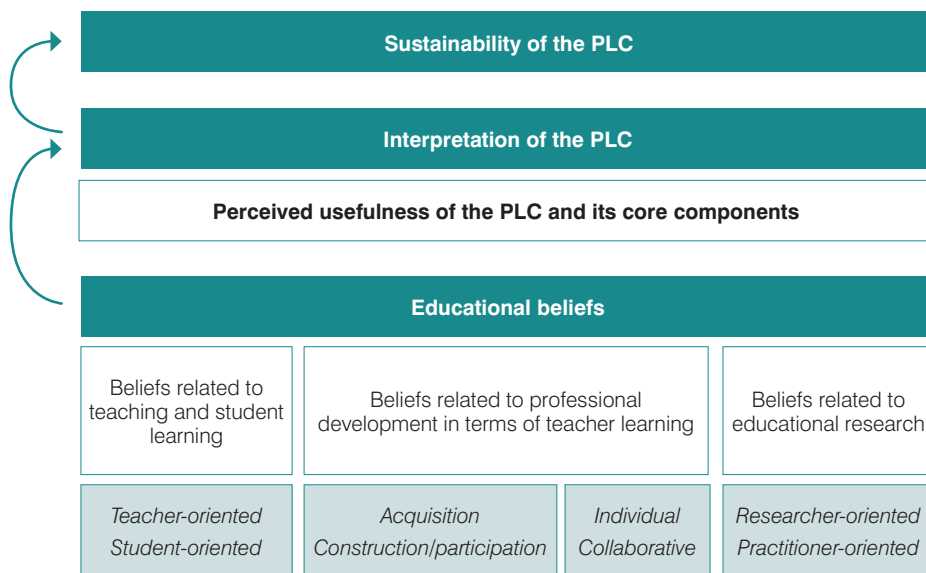


Figure 5.1 Research Model.

5.2.1 PLCs and their core components

In this study, we focus on data teams and lesson study teams, PLCs in which the school's staff members discuss and explore teaching and learning by researching their own practice. These approaches and their core components are discussed below.

5.2.1.1 Data teams

In data teams, a group of teachers and school leaders use data to solve a classroom-level (e.g., low mathematics achievement) or school-level (e.g., grade retention) problem (Schildkamp et al., 2016). The goal of this intervention is to improve the quality of education at the school and to provide professional development in data use in order to solve future educational problems as well (Schildkamp & Poortman, 2015). Data teams have been found to improve teachers' data literacy (Kippers et al., 2018), as well as student achievement (Lai & McNaughton, 2016; Poortman & Schildkamp, 2016).

A cyclical procedure consisting of eight steps is used for implementation of the data team approach (Schildkamp et al., 2016):

1. Define problem
2. Formulate hypotheses
3. Collect data
4. Check quality of data
5. Analyze data
6. Formulate interpretations and conclusions
7. Implement improvement measures
8. Evaluate

The content of the steps is important for understanding and using data effectively (Gummer & Mandinach, 2015). Data team members meet on average once a month, and use a manual containing guidelines and activities to guide the process. These aspects of the approach help arrange a substantial amount of time and a focus, which are both important for effective professional development (Van Driel et al., 2012). The core components of data teams are therefore using all steps of the data team intervention, using the data team manual, and meeting at least once a month (Van den Boom-Muilenburg et al., 2020a).

5.2.1.2 Lesson study teams

In lesson study, small groups of approximately four teachers investigate their own teaching practice (Lewis et al., 2006; De Vries et al., 2017). The goal of lesson study is to systematically improve teaching and student learning in classrooms (Lewis et al., 2006). Lesson study teams have been found to improve teachers' knowledge and skills (e.g., Vermunt et al., 2019; Willems & Van den Bossche, 2019), which in turn can affect student learning (Dudley et al., 2019).

A research cycle consisting of six phases is used in implementation of lesson study (Stepanek et al., 2007). The phases are:

1. Define clear research goal
2. Study data/publications/lesson material and share expertise
3. Design research lesson (including observation forms) and write out research lesson plan
4. Teach research lesson, observe live, and collect data
5. Engage in in-depth conversation
6. Repeat elements of steps 4 and 5, followed by a final reflection

These phases entail different characteristics of effective professional development approaches, such as collective participation, active learning, and a focus on evidence – namely, through live student observation (Lewis et al., 2006; Van Driel et al., 2012). In addition, a question or issue from daily teaching practice is used as the starting point. A focus on content related to classroom practice enhances the effectiveness of professional development approaches (Van Driel et al., 2012). The core components of lesson study are therefore going through all phases of the lesson study cycle and taking a question or issue from daily teaching practice as the starting point (Wolthuis et al., 2020).

5.2.2 School leaders' interpretations

How school leaders implement and act upon interventions, such as PLCs, is greatly affected by their interpretation of the intervention, as they adapt them according to their interpretation (Burch & Spillane, 2003; Coburn, 2005; Spillane & Callahan, 2000). For PLCs, leaders' interpretations of the PLC and its core components seem crucial.

Interpretation involves the development or application of ways of comprehending the meaning of information: it entails the fitting of information to some structure for understanding and action (Taylor & Crocker, 1981). Interpretation is found to be important in developing and sustaining the adaptive cognitive frameworks necessary for strategic action and change (Bartunek, 1984; Gioia & Chittipeddi, 1991; Schneider, 1997). Interpretations are made by providing labels for information, situations or issues (Dutton & Jackson, 1987). These labels are related to aspects of strategic relevance (Jackson & Dutton, 1988), which we evaluate in terms of perceived usefulness. Usefulness is here defined as the appropriateness of the design for the organization (Wolthuis et al., 2020). For this study, usefulness then refers to the suitability of the PLC and its core components for the school, according to school leaders. This is associated with, among other things, the willingness to facilitate use of resources and the flow of information concerned with the situation or issue (Maitlis & Christianson, 2014; Rudolph et al., 2009), in this case the PLC.

Based on previous research (e.g., Wolthuis et al., 2020), we assume that it is important for sustainability that school leaders interpret the PLC and its core components as useful, for

the PLC to be organized and implemented as intended and thereby to be able to become an organizational routine.

5.2.3 School leaders' educational beliefs

Underlying educational beliefs are assumed to play a role in how PLCs are perceived. A belief is "a proposition which may be consciously or unconsciously held, is evaluative in that it is accepted as true by the individual, and is therefore imbued with emotive commitment; further, it serves as a guide to thought and behavior" (Borg, 2001, p. 186). Previous research has shown that educational beliefs shape how school leaders interpret their daily work (Slegers et al., 2009), of which PLCs are a part. As PLCs are a tool for trying to improve *teaching and student learning through professional development and educational research by teachers*, we assume that beliefs about these (italicized) concepts are crucial for school leaders' interpretation of the PLC.

5.2.3.1 Beliefs about teaching and student learning

For beliefs about teaching and learning, scholars often make a distinction between teacher-oriented and student-oriented beliefs, although in different terms (Chan & Elliott, 2004; De Vries et al., 2013; Luft & Roehrig, 2007; Meirink et al., 2009). *Teacher-oriented* beliefs are focused on teaching as the transmission of knowledge and learning as the ability to reproduce this knowledge (Luft & Roehrig, 2007). Teachers are largely held responsible for the regulation of student learning processes (Meirink et al., 2009). The teacher is the one who has all the knowledge and they need to transfer this to the student.

Student-oriented beliefs are focused on teaching as providing knowledge in such a way that it fits the student's prior knowledge, background, and educational level, so that the student can construct knowledge, through which learning occurs (Luft & Roehrig, 2007; Meirink et al., 2009). Students are stimulated to take responsibility for their own learning processes and for regulating them, and are also stimulated to work and learn together (Meirink et al., 2009). The teacher has to determine where the student stands, so they can fit the content to be taught to the student's prior knowledge. Teaching is a collaboration between the student and the teacher (Chan & Elliott, 2004).

Previous research has shown that staff members demonstrate aspects of both teacher- and student-oriented beliefs when discussing teaching and student learning (e.g., Belo et al., 2014). In line with previous studies (De Vries et al., 2013; Meirink et al., 2009), we therefore consider student-oriented and teacher-oriented beliefs as two distinct dimensions of beliefs about teaching and student learning.

As a collective focus on and responsibility for student learning is important for PLCs (Doğan & Adams, 2018; Little, 2012), we assume that for leaders to be devoted to and thereby sustaining working on school improvement with PLCs in their school, they must tend to focus on the student-centered dimension of beliefs about teaching and learning.

5.2.3.2 Beliefs about professional development

Professional development in this study is discussed in terms of teacher learning. Acquisition and construction/participation are often used to describe teacher learning (e.g., Belo et al., 2014; Hodkinson & Hodkinson, 2005; Meirink et al., 2009). Teacher learning through *acquisition* focuses on passive reception of knowledge, which can happen, for example, by listening. Teacher learning through *construction/participation* focuses on actively constructing knowledge by interpreting events. Learning then takes place “by participating in authentic and meaningful learning activities” (Belo et al., 2014, p. 92). Acquisition and construction/participation should not be considered separately. Sfard (1998) argued, for example, that “the act of acquisition is often tantamount to the act of becoming a participant” (p. 6). Both thus contribute in some part to professional development.

In addition, professional development can happen individually or in collaboration. Individual learning includes, for example, learning through one’s own individual teaching activities and through imposed external change, such as new curricula (Hodkinson & Hodkinson, 2005). According to Little (1990), collaborative learning can happen in four ways: by telling stories, providing aid and assistance, sharing, and engaging in joint work. The latter two are especially important for professional development, as here the “ground is laid for productive discussion and debate” (Little, 1990, p. 518).

Considering beliefs about professional development and sustainable school improvement with PLCs, Akiba et al. (2019) showed that staff members of schools that sustained PLCs by making the PLC’s activities part of organizational routines believed that professional development occurs as teachers engage in their daily practice and in various situations, which is closely related to construction/participation and collaborative learning.

Professional development in PLCs happens through collaboration, discussing teaching and learning, and constructing knowledge (e.g., Little, 2012; Stoll et al., 2006). Combining this with the findings of Akiba et al. (2019), we assume that for leaders to be devoted to and thereby sustaining working on school improvement with PLCs in their school, their beliefs about professional development must be focused on construction/participation and collaborative learning.

5.2.3.3 Beliefs about educational research

Educational research refers to the systematic collection and analysis of data related to the field of education. Educational research can be carried out by university researchers or by practitioners themselves (Anderson & Herr, 1999; Joram, 2007), and beliefs about educational research can demonstrate aspects of both researcher-oriented and practitioner-oriented beliefs. Researcher-oriented beliefs focus on the value of researchers conducting research, for example, because of the valid and reliable results researchers bring forward (Joram, 2007). Practitioner-oriented beliefs focus on the value of practitioners conducting research. This type of educational research, even possibly together with researchers, is found to contribute to reducing the research-practice gap (Kempe, 2019). This multi-functional role helps practitioner-researchers to “approach learners and issues from different viewpoints, enhancing the scope of their actions as well as the quality and appropriateness of the changes and solutions they propose” (Vasquez, 2017, p. 5). It does, however, ask different skills of teachers (Cai et al., 2018), such as the ability to access and fathom research. It also asks for teachers' time, which is already scarce (Vasquez, 2017).

In PLCs such as data teams and lesson study teams, practitioners (i.e., teachers and school leaders) carry out practice-based educational research (e.g., Schildkamp et al., 2016; Stepanek et al., 2007). Therefore, we assume that for leaders to be devoted to and thereby sustaining working on school improvement with PLCs in their school, leaders must tend to focus on the practitioner-oriented dimension of educational research.

5.3 METHOD

To explore leaders' interpretations of the PLC and the PLCs' core components and their educational beliefs in schools working on sustainable school improvement with PLCs, we conducted a small-scale explanatory study using a semi-structured interview approach. This allows participants to thoroughly discuss their interpretation and beliefs, which is necessary for complex and internal constructs (Luft & Roehrig, 2007).

5.3.1 Participants

Six leaders from two secondary schools participated in this study (see Table 5.1). Both schools were located in the Netherlands. The school system in the Netherlands is decentralized and there is no national curriculum. Teachers teach towards core curriculum standards, but these objectives are general (OECD, 2008, 2010). Schools thus have the freedom to decide what and how they want to teach, and to implement innovations such as a PLC.

These two schools were part of two projects. In these projects, schools were trained to work with data teams or lesson study. Because they a) finished the initial implementation phase and b) were working already working with the PLC for seven years, they were asked to participate

in this study. School A (approximately 1,000 students and 75-100 staff members) worked with data teams; school E (approximately 900 students and 50-75 staff members) worked with lesson study teams.

Table 5.1 Description of the Study's Participants

| School | Name ¹ | Gender | Age | Experience in education | Role |
|--------|-------------------|--------|-----|-------------------------|---------------------|
| A | Anne | Female | 57 | 29 years | Principal |
| | Amber | Female | 48 | 19 years | Assistant principal |
| | Andrew | Male | 39 | 15 years | Teacher |
| E | Evelyn | Female | 57 | 32 years | Principal |
| | Emily | Female | 35 | 13 years | Teacher |
| | Esther | Female | 64 | 20 years | Teacher |

¹The names are pseudonyms

5.3.2 Procedure

Schools A and E were selected based on purposive sampling (Creswell & Clark, 2007). These schools were part of a larger study into the role of school leadership for sustainable school improvement with PLCs (e.g., Van den Boom-Muilenburg et al., 2020a, 2020b). Five schools were observed over an extended observation period of approximately 168 hours, divided over 6-8 successive weeks per school. The current study focused on schools A and E because they a) were working the longest with the PLC and thus were furthest along in the process of realizing sustainability and b) used the most PLC core components. As this study is part of the larger study, the participants were expecting the invitation to participate in this study. This study was approved by the ethical committee of the researcher's university (#200391).

Three leaders were identified and invited for an interview based upon a social network questionnaire that was administered earlier (Van den Boom-Muilenburg et al., 2020b). We invited one formal leader (i.e., the school principal), and two leaders who were central actors in the social network that focused on conversations considering the PLC were also selected. These could be either formal or informal leaders.

We invited the leaders by e-mail for the interview. The digital video-interviews had an average duration of one hour, were audio-recorded and transcribed verbatim. The transcripts were sent back to leaders for a member check. Adjustments were not necessary.

5.3.3 Instrument

We used a semi-structured interview protocol with four interview topics: the leader's interpretations of (core components of) the PLC, beliefs regarding teaching and learning, beliefs regarding professional development, and beliefs regarding educational research (see Appendix). The

protocol was pre-tested with a researcher colleague who was also a teacher. No adjustments had to be made.

5.3.4 Analysis

We used systematic text condensation (STC) to analyze our data (Malterud, 2012). It helped us to establish an adequate and information-rich sample providing coherent stories, firmly grounded in empirical data. This small-scale exploratory study has its limitations regarding generalizability and trustworthiness, but we have tried to diminish these as much as possible by the following (cf. Lincoln & Guba, 1989). We worked on transferability (validity) by elaborating on the choice for these specific schools and their sustainably working on school improvement with PLCs in the procedure-section and explaining the context in depth. Additionally, we worked on dependability (reliability) by explaining the steps we used to perform the STC. Finally, we corroborated (objectivity) our findings by using quotes from the interviews to illustrate our findings and discuss them amongst each other (as described below). This helped us to stay sharp on not deviating from what was said.

The analysis consisted of four steps. First, the transcripts were intensively read and annotated by the first three authors to get a total impression of the whole. For example, "Education should be tailored, which means that students can make their own choices from that what we offer" was annotated as "belief". Second, to identify and organize data elements that might elucidate the answer to the research question, relevant meaning units were selected, in this case quotes related to the leaders' interpretations of the PLC and their educational beliefs. These were coded based on sensitizing concepts related to interpretation (i.e., useful), beliefs about teaching and student learning (i.e., teacher-oriented, student-oriented), beliefs about professional development (i.e., acquisition, participation, construction, individual learning, collaborative learning) and beliefs about educational research (i.e., researcher-oriented, practitioner-oriented). For example, the following unit illustrated the interpretation of lesson study: "It is a way to get a lot more insight into what the student is doing in class, because normally I have little insight into what a student is doing in class." Participants also mentioned aspects of the context that seemed to relate to sustainability. An example of such as unit was "We minimized it because we are afraid to scare people". Although these were not the primary focus of the research, but emerged through our thick data collection, they were taken into consideration and coded. Third, to abstract meaning from the meaning units, these codes and quotes were discussed thoroughly among the researchers to reach agreement on a) how they perceived the codes and quotes and b) how educational beliefs could explain the interpretation of the PLC and, in turn, the form of sustainability at the school, for example by relating the abovementioned context-example to leader's interpretation of the usefulness of lesson study's steps. Fourth, the data were synthesized into narrative cases for each leader (cf. Davis et al., 2012). These consisted of a summary of leaders' interpretations of the PLC and its core components, leaders' educational

beliefs, and the connection between these aspects, all of this in their context. We compared the narrative cases of the leaders for each school to get an overview and connect the leaders to the school's sustainable working on school improvement with PLC at the school. Quotes from the interviews were translated from Dutch into English to illustrate the narrative cases.

5.4 RESULTS

In this section, the results will be discussed for schools A and E consecutively. First, a brief overview of the school's context is provided. Then, each leader's interpretation of the PLC and educational beliefs are summarized (for an overview, see Table 5.2 for school A and Table 5.3 for school E). Finally, overall findings per school are provided.

5.4.1 School A

5.4.1.1 PLCs at School A

The PLCs school A worked with were data teams. They started working with the data teams seven years ago due to dissatisfaction with the average grade for English language. After the first data team, four more data teams followed. They worked on various problems, such as disappointing math results in third grade. At first the data teams worked only on department-specific problems, but then they started working on a schoolwide problem. Each data team differed in its composition, depending on who was facing a problem. In total, five data teams worked at the school. The data team meetings were planned in the yearly calendar in all years but one. Four out of the five data teams were guided by an external data team coach.

School A was led by Anna, the principal. She was responsible for the organization of the data teams, but never participated in a data team. The two other leaders of school A, who were identified based upon the social network questionnaire, were Amber and Andrew. Amber was an assistant principal. She participated in three data teams. Andrew was a science teacher. He participated in one data team.

Table 2. Summary of Leaders' Interpretations of Data Teams and their Educational Beliefs for School A

| | | Interpretation | | | | Educational beliefs | | |
|-----------------------|--|----------------------------|--|--------|------------------|--|--------------------------|----------------------|
| | | Usefulness core components | | | Regular meetings | Teaching and learning | Professional development | Educational research |
| Usefulness data teams | Manual | All steps | | | | | | |
| Anna | Useful for improvement; educational quality | Useful | Useful – but fewer steps can yield results too | Useful | Student-oriented | Collaborative learning | Not expressed | |
| Amber | Useful for improvement; professional development | Useful | Useful | Useful | Student-oriented | Construction/ participation Collaborative learning | Practitioner-oriented | |
| Andrew | Useful for improvement; educational research | Useful | Useful | Useful | Student-oriented | Construction/ participation Collaborative learning | Practitioner-oriented | |

Table 3 Summary of Leaders' Interpretations of Lesson Study and their Educational Beliefs for School E

| | | Interpretation | | | |
|---|---|---------------------------------------|-----------------------|--|---------------------------------------|
| | | Usefulness core components | | Educational beliefs | |
| Usefulness lesson study | Using issue from daily practice | All steps | Teaching and learning | Professional development | Educational research |
| Evelyn Useful for improvement through working together, lesson planning, researching student learning, PD | Useful | Useful, but second step not necessary | Student-oriented | Construction/participation Collaborative learning | Researcher-oriented |
| Emily Useful for improvement through lesson planning, working together | Useful, but time-consuming and overwhelming | Useful, but second step not necessary | Student-oriented | Collaborative learning | Researcher-oriented |
| Esther Useful for researching student learning, PD | Useful | Useful, but second step not necessary | Student-oriented | Construction/participation Collaborative learning | Researcher- and practitioner-oriented |

5.4.1.2 Anna

Anna considered data teams as useful “small clubs of professionals who try to improve educational quality by systematically trying to sharpen the questions we encounter”. In other words, she saw data teams as an instrument to continually improve educational quality. Therefore, she thought that it was important to use the manual, especially for “practicing the method”. If the method was well known, Anna found it sufficient to check the manual once in a while to make sure that “[you’re] not skipping something essential.” She also saw value when not all steps were completed. This was because “a lot of profit came into existence” with fewer steps, and that might already impact school A’s educational quality. For example, Anna thought that when a hypothesis was rejected and the data team then had to go back from step 5 to step 2, they had already learned something about their problem. Regular meetings were very important. For Anna, people had to know “that they are in it, that they have the space for it, and that they are supported in working systematically. (...) To maintain this, you have to facilitate it.”

Anna found that “education should be tailored, which means that students can make their own choices from that what we offer” and that “the teacher’s core business is to focus, together with the student, on [the student’s] development”. Her beliefs about teaching and learning were thus student-oriented. According to her, professional development should also be “tailored to the professional’s needs, (...) in line with his or her development (...) but also serving the organization”. Each professional might benefit from another type of professional development, such as “a master’s education at the university” or “assignment related to policy and team plans”. According to Anna, anyone could benefit from “sitting down together”, having a dialogue about “where someone stands and needs to go” and “work[ing] together with a group of colleagues”. Her beliefs about professional development were thus not strictly focused on acquisition or construction/participation, but tended to focus on collaborative learning. Anna found that educational research was “a premise from theory that needs to be tested in practice”, which she considered useful. Data teams and “apply[ing] research for, for example, formative assessment” were examples of practice-based educational research within the school. However, this was not something Anna talked about extensively. She did not perform practice-based research herself.

In sum, educational quality was a central aspect in Anna’s interpretation and educational beliefs. Some tension between Anna’s beliefs was present, however: although she found all steps of the data team intervention to be useful, she also thought that performing fewer steps could still yield results. In her view, educational quality could be (somewhat) improved even when some steps were skipped. She saw data teams as a tool to improve educational quality. Her interpretation and beliefs were aligned.

5.4.1.3 Amber

Amber thought of data teams as “groups of people (...) who are learning together” and who were useful because they “also provide answers to questions that the school faces.” She considered the manual to be “very helpful to [check] the sequence of the steps and discipline” but thought that “[you don’t need to] work continuously and rigidly with the manual. It gets, so to speak, inside your head”. Amber found all steps of the data team intervention to be important, but found that “the one [step] provides you with more energy than the other.” According to Amber, the regular meetings were important to “keep the process going”, “do it as disciplined as possible” and to show your appreciation by “organizing it for those people, and to facilitate it.”

Amber found it to be important that in education “both teacher and student are owner of the [learning] process (...) and you have to [track] this process, both as teacher and student, to check where you stand.” According to her, this could help to “adjust education to the questions and needs” of the student. Amber thus thought of teaching and learning as student-oriented. She found that professional development “should be tailored to [colleagues’] needs” too. She mentioned that, in general, professional development “together with others in a one to one-and-a-half year (...) more intensive trajectory” is beneficial for everyone, thereby also focusing on professional development as construction/participation and collaborative learning. Educational research “is a form of professional development” and useful to Amber. She held practitioner-oriented beliefs. However, she felt that educational research was not for everyone: “I see colleagues struggling with [research] (...) and you do not need to tire them with it. It has to be part of your nature”.

Amber’s beliefs and interpretation and beliefs were thus aligned. According to her, professional development happened through construction/participation and practice-based research could be seen as professional development. As data teams focus on collaboratively creating knowledge and have a research cycle in them, it made perfect sense that Amber considered data teams to be important for professional development.

5.4.1.4 Andrew

According to Andrew, data teams were “small research teams within the school, who, based on data (...), research something and draw conclusions”. He considered them to be useful. “Implementing improvement or something new” was an important part of data teams for Andrew as well. Using the manual made him “aware of specific steps and how to execute them”. Those steps provided him with structure, “that makes you aware of why you’re executing certain steps and whether [that what you’re doing] is valid and reliable.” Regular meetings did the same, because they “(...) create space and time, so that you can really work on it.”

For Andrew, arranging education so that it is adapted to student's needs was important. He had a student-oriented way of thinking about teaching and learning. He found that working from "learning goals and translating these goals to student activities" and "creating a learning conversation" between the student and teacher helped in that respect. Knowledge was thus constructed in interplay between student and teacher. For professional development, Andrew focused on construction/participation and also collaborative learning. Both "collaboration with colleagues" and "the discussion with each other" helped professionals learn. Educational research was "necessary to come further" in education, according to Andrew, particularly practice-based educational research, because he thought that "when you (...) just perform literature research (...) you do not get the complete picture. You need the context." His beliefs about educational research were practitioner-oriented,

Andrew's interpretation of data teams and his educational beliefs were aligned with how data teams are intended to work. For example, for him, practice-based research was crucial for improving the learning of students. The research cycle in data teams could thus help improve student learning. This made data teams seem useful to him.

5.4.1.5 Overall Findings

A summary of the outcomes based on our research model for school A is provided in Figure 5.2. For all seven years, the data teams at school A worked with the core components. Although the manual was not used during every meeting, it was used as a check for details about a specific step, or when the external coach directed them to it. The steps were all taken. Data teams were thus used as intended.

The interpretation of data teams and most educational beliefs (i.e., teaching and learning should be student-oriented, professional development as construction/participation and collaborative learning, practitioner-oriented beliefs about educational research) of school A's leaders seem to be in line with how data teams are intended to work. Although all three leaders saw improvement as the ultimate goal of data teams, all three placed different emphases (i.e., educational quality, professional development, educational research) within this goal. These emphases could be traced back to their educational beliefs.

For the first core component, using all steps of the data team intervention, slight differences between the three leaders became apparent. Although all stated that the steps were useful, Anna added that it might not be necessary to carry out all steps. Considering her emphasis with regard to the goal of data teams (i.e., a tool to improve educational quality), this makes sense: according to her, fewer steps can already enhance the quality.

The second core component, using the manual, was considered equally useful by all three leaders. They were convinced that it helps to keep the structure of data teams in line.

The third core component, meeting at least once a month, was considered equally useful by the three leaders also. All stated that it was important for continuing the process. That seems logical, especially considering that they all had a clear goal in mind for the data teams.

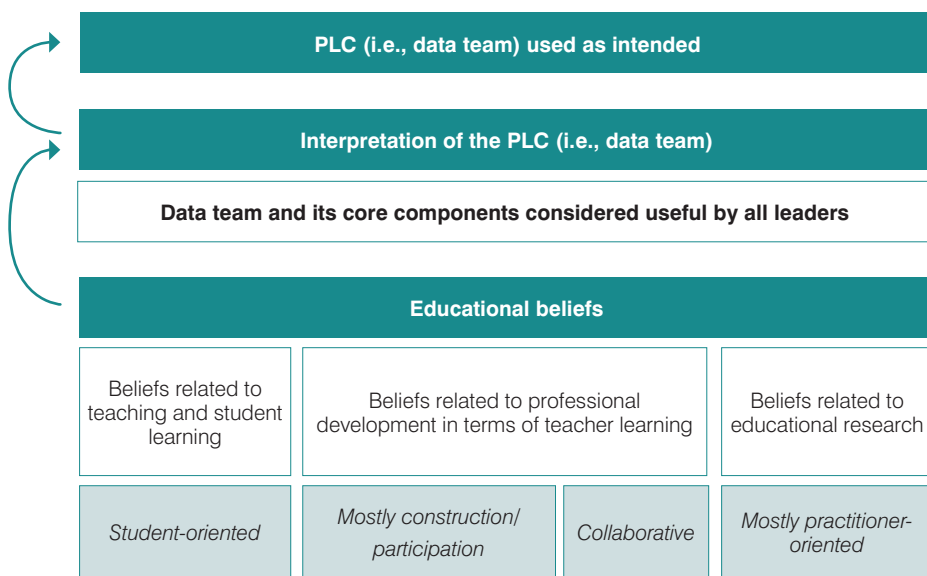


Figure 2. Summary of the Outcomes for School A Based on Our Research Model.

5.4.2 School E

5.4.2.1 PLCs at School E

The PLCs school E worked with were lesson study teams. They started working with lesson study seven years ago. Several teachers had participated in a cross-school lesson study network for four years. Their enthusiasm about the approach made them want to continue with lesson study at their own school. The school leadership supported this. Multiple lesson study teams worked on various problems, such as the quality of mathematics lessons and the grouping of students for collaboration assignments. While at first only one department worked with lesson study, later all departments in the school worked with lesson study. Although all staff members were asked to work with lesson study, exemptions were made. Because lesson study meetings were planned on a specific day, staff members who were not teaching on that day (i.e., because of part-time work) did not have to participate. Additionally, several people had exemptions because of personal reasons (e.g., not wanting to participate). Approximately 75% of the colleagues participated.

The lesson study teams at school E worked autonomously on Tuesday afternoons. A lesson study coordinator was appointed, and one teacher assisted. They started and closed these afternoons in a plenary way, supporting the different lesson study teams by answering questions and thinking along with them during the process.

School E was led by Evelyn, one of the two principals. She participated in one lesson study team. The two other leaders of school E, who were identified based upon the social network questionnaire, were Emily and Esther, who had participated in the four-year cross-school lesson study network. Emily taught Dutch language arts and was appointed as lesson study coordinator. Esther also taught Dutch language arts, and she assisted Emily with coordinating lesson study at the school.

5.4.2.2 Evelyn

For Evelyn, lesson study was useful for “developing lessons together, to get insight into the learning of students and to (...) improve that.” Additionally, “the discussions with each other about how you can improve education and how you can do better for the students” were important to her. Although Evelyn found that performing all steps of the lesson study cycle would be best, the second step (i.e., studying data, publications and lesson material) made it “extra complicated”. She found that “the goal is not to perform lesson study perfectly, but to (...) improve the quality of your lessons”. According to Evelyn, lesson study without that step could already yield results, “namely, together developing lessons and improving them for students”. She also thought that searching for publications that complement the lesson study was “hard (...), you have to take extra actions for that and research it”. That took up “time, but maybe sometimes it is also willingness”. Time to spend on this “is not something everyone has, or not worth the sacrifice”. She thought that demanding that second step from teachers meant that you “move past what it can yield [without the step], namely together developing lessons and improve them for students”. This step could therefore be omitted, according to Evelyn. Using a question or issue from daily teaching practice as the starting point was important for Evelyn. According to her, it was “a source of inspiration for everyone” and it helped to show that “it is not just your problem, but more people are facing it.”

Evelyn saw teachers as “the ones that (...) need to know where students need to go” and who need to “act on individual differences between students”. In that way, students could “have a choice in what they find challenging” and be “able to collaborate with each other”, which she found important. She had student-oriented beliefs about teaching and learning. For professional development, she thought collaborating was important, too. She found it important “that it is not only about listening, but that you are really processing something”. For example, “talking with each other about education and what you are doing”, and thereby seeing professional development as construction/participation, was a “beautiful way of learning”. Evelyn found

educational research important and saw it as something you have to read, thereby holding researcher-oriented beliefs. She admitted that she did not use it, because of “time, at least, that is the feeling I have. (...) You are distracted by the daily things that happen”.

In sum, Evelyn’s interpretation of lesson study was to a large extent aligned with the way it is intended to work. This also went for her educational beliefs, except for her beliefs related to educational research. Tension seemed to be present between her beliefs and her actual practice. For example, contextual aspects such as time constraints and a lack of conviction about the purpose of the complete lesson study cycle seemed to hinder her from prioritizing educational research in her own practice, and also in lesson study.

5.4.2.3 Emily

Emily found lesson study useful for “[gaining] more insight into what the students are doing in the lessons”, and, more importantly, as “a way to collaboratively work (...) on your lesson planning.” According to her, this was eventually “where you spend the most time on”. Although Emily thought that everyone should be familiar with all steps of the lesson study cycle “to have the complete picture”, she found that “lesson study also works without executing all steps”. In particular, she often omitted the second step, or “the research part” as Emily called it. She was convinced that this step “scares colleagues”. Emily found using a question or issue from daily teaching practice as the starting point important. However, thinking of a problem you want to tackle together with colleagues might take up a lot of time and could feel overwhelming. She thought that choosing a fixed topic (such as differentiation) for lesson study across the school “might work pretty well too”.

For Emily, teaching and learning should be student-oriented, as teachers need to “connect to the student’s curiosity” and “guide students in that process”. According to her, it was important to “not per se explain everything [to students, because] we can learn a lot from students too”. She thought that professional development should be also “tailor[ed] to the needs of colleagues”. In general, “most people want to do something practical”, according to her, and all could benefit from “learning together”. However, Emily was convinced that “sometimes you have to just impose what we are going to do with each other.” But she felt that “it is complicated to organize something standard”, because each colleague had his/her own preferences for learning. Her beliefs about professional development were thus focused on collaborative learning. She found practice-based educational research to be important. For her, it was “research into teaching and classroom practice”. Additionally, she thought that educational research was not crucial, as “your lessons can be quite good without reading professional literature”, thereby showing her researcher-oriented beliefs. The lessons might “grow old”, but by “attending conferences and talking with colleagues” you could also “stay informed”.

Emily's interpretation of lesson study was to a large extent aligned with the way it is intended to work. For her, educational research was not crucial in order to improve education, therewith not acknowledging the value of educational research carried out by researchers or practitioners for practice. That she omitted the step in the lesson study cycle related to research then seems logical. Contextual aspects such as possible resistance of colleagues, a lack of conviction about the purpose of the complete lesson study and time constraints also seemed to hinder her from performing educational research in lesson study. Although she found using a question from daily practice to be useful, and it fit her beliefs about professional development, contextual aspects such as time constraints made her consider alternatives.

5.4.2.4 Esther

Lesson study was useful for "working on your professionalism, and [studying] what students do with your materials or didactics", according to Esther. To do so, teachers worked "together with colleagues (...) on some sort of research". For her, all steps of the lesson study cycle were useful. However, she found that it had to be "practicable" and "pragmatic". Esther found it to be important to focus on "the fun you are experiencing together when you are developing lessons, (...) and observing students". By adding the second step of the lesson study cycle (i.e., studying data, publications and lesson material) it got "too theoretical" and "artificial" for colleagues. This step needed to be omitted to "persuade colleagues". This might be traced back to an experience that Emily and Esther had with one teacher who was very critical about the data that were collected. The teacher whom Esther referred to "asked whether we passed on the [results of the observations] to the school leaders". This teacher "did not trust" them and "did not participate in lesson study". The use of a question or issue from daily teaching practice as the starting point made lesson study "meaningful" for Esther, because "that is where your needs are, as a teacher".

The interaction between teacher and student was "very important" for Esther. According to her, the teacher's core business was "additional to transferring knowledge, also to teach students how to learn from and with each other". Professional development took place best through "discussing the lesson's content, and continuously focus on (...) what do we find important? Not the books but your vision should be the starting point", according to Esther. For her, the "substantive discussion is (...) core of your professionalism". Esther's beliefs of professional development thus focused on construction/participation and collaborative learning. Educational research was important for Esther, which she described as "practicing in practice" and "reading articles about education". This helped her to get "a broad perspective and new ideas". She thus held a combination of researcher- and practitioner-oriented beliefs about educational research. However, she added that, compared to educational research, "exchanging ideas with colleagues" was "at least as important".

Esther's interpretation of lesson study was to a large extent aligned with the way it is intended, and her educational beliefs too. However, tension between her beliefs and actual practice seemed to be present. For example, possible resistance of colleagues and a lack of conviction of the complete lesson study cycle's purpose seemed to hinder her from prioritizing educational research in her own practice but also in lesson study.

5.4.2.5 Overall Findings

A summary of the outcomes based on our research model for school E is provided in Figure 3. The lesson study teams at school E used a question or issue from daily teaching practice as starting point. Lesson study was to a large extent performed according to the lesson study cycle, except for the second step, that is, the study of data, publications and lesson material. They thus did not use lesson study entirely as intended.

All leaders' interpretations of lesson study and educational beliefs were in line with the assumptions behind PLCs. The omission of the second step of lesson study could be traced back to leaders' educational beliefs and contextual aspects leading to tensions between their educational beliefs and actual practice.

All leaders at school E considered the first core component, using all steps of the lesson study cycle, to be useful, except the second step about incorporating data or publications. This was congruent with their focus on collaboration of staff members and on conversations with each other, in other words the creation of a collaborative culture, without the research part. This omission of the research part was congruent with researcher-oriented beliefs. Additionally, and perhaps more importantly, tensions between the beliefs and their actual practices seemed to be present. These tensions could be related back to two themes. First, the leaders seemed to have a lack of conviction about the purpose of the complete lesson study cycle. Second, the leaders seemed to fear colleagues' resistance, associating research with a time-consuming and daunting activity for colleagues.

The second core component, using a question or issue from daily teaching practice as the starting point, was considered useful by two leaders; the third felt that it took up too much time. This aspect of the organizational context might also affect the extent to which lesson study's core components were used.

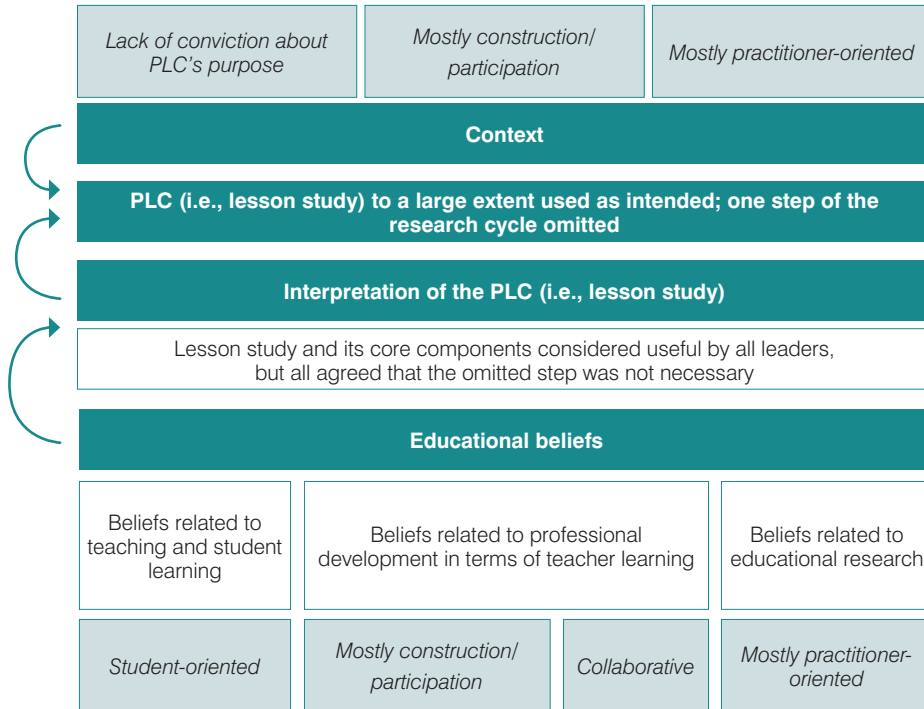


Figure 3. Summary of the Outcomes for School E Based on Our Research Model.

5.5 CONCLUSION AND DISCUSSION

In this study, we explored in depth how school leaders' interpretations of the PLC and their underlying educational beliefs could explain the sustainability of the PLCs in their schools. A semi-structured interview approach helped us obtain insight therein. From this small-scale exploratory study, we can conclude that, although both schools worked for seven years with the PLC, the realized degree of sustainability differed. This could be traced back to the leaders' interpretations of the PLC, and, in turn, to their educational beliefs and the organizational context of their school. Our overall results suggest three broad themes: student- and collaboration-oriented beliefs are critical for continuing the work of PLCs, different degrees of sustainability result from leaders' interpretations and educational beliefs, and the organizational context mediates leaders' acting on their beliefs.

5.5.1 Student- and collaboration-oriented beliefs are critical for continuing the work of PLCs

All six leaders in this study, independent of their schools and the form of sustainability that was realized, considered collaborative learning important for professional development and held strong student-oriented beliefs towards teaching and student learning. As collaborative learning is an important part of PLCs (Little, 2012; Stoll et al., 2006) and student learning is the focus of PLCs (Doğan & Adams, 2018; Little, 2012), it makes sense that all of these schools were still working with PLCs. PLCs thus fit well in these schools. Namely, the relevant and functional dialogue about their own school and teaching practices that is held in the PLC helps in achieving these goals. We argue that believing in the value of this dialogue is the core of continuing the work of the PLC in the schools.

5.5.2 Degrees of sustainability result from leaders' interpretation and educational beliefs

Although the two schools in this study had worked with their PLC for seven years, they differed in the degree to which they worked sustainably on school improvement with the PLC. Our in-depth design helped bring this to the surface. At school A, the PLC was used as originally intended. At school E, the PLC was not quite used as originally intended. One core component of the lesson study PLC was using all six steps of the lesson study cycle. The second step of this cycle, studying data, publications and lesson material, was omitted. This particular step is critical in lesson study, and is assumed to be crucial for in-depth reflective professional inquiry. Reflective professional inquiry is defined as (*italics added for emphasis*): “a collaborative, dialogic process in which educators both consider and aim to address pressing educational issues or problems. Such a process involves the collective generation and testing of ideas linked to enhancing their own practice; with these ideas *based on evidence in the form of literature and/or data* and displaying internal attribution.” (Brown et al., 2020, p. 9)

This is an important aspect for PLCs leading to school improvement (Doğan & Adams, 2018). Although school E sustainably worked with a form of the PLC and adapted the PLC to the needs of their teachers, leaving out this step of in-depth reflective professional inquiry can lead to a less rich learning outcome. One might even argue that the fidelity of the model was lacking, as the intervention is no longer delivered as intended (Carroll et al., 2007). However, as the leaders of school E explained, their main focus was on collaboration and discussion, which might suggest that the form of the PLC they used and preferred was still sustainable. It is better not to ask whether schools did or did not achieve sustainability; rather, we should ask what aspects of sustainability are achieved and in what manner, which is in line with previous research (McNaughton, 2021; Van den Boom-Muilenburg et al., 2020a). Sustainability in this respect is then conceptualized not so much from a fidelity approach, but rather from a local adaptation approach: adjustments can be made to the practice, adhering to the core components, but also

fitting it to the school's organizational context (Quinn & Kim, 2017). Variability can be considered to be a source of effective local design (McNaughton, 2021), although omitting one of the core components leaves us questioning whether to speak of 'effective' local design.

These degrees of sustainability could be explained by the type of PLC. Although both have a research cycle, differences are apparent as well: data teams focus on school-, team-, or classroom-level problems, lesson study teams focus solely on classroom problems; data teams use different types of data – ranging from test results to student interviews, lesson study uses student observation data. Additionally, for lesson study the entire school is ideally included (Saito, 2012; Stepanek et al., 2007), which is not an explicit goal for data teams. The more people need to be involved, the more wishes need to be granted, which possibly results in more (practice-oriented) adjustments. However, as this study did not aim to compare the two approaches, we cannot support these statements with data.

What we can support with data, is the statement that the degrees of sustainability could be explained by leaders' interpretations of the PLC and their underlying educational beliefs. Leaders' interpretations of the PLC affected how they used the PLC. For example, when core components were considered useful, they were used as intended, and the other way around. Leaders' underlying educational beliefs at the school that used the PLC as intended were, as we expected, in line with the key aspects of the PLC (e.g., Little, 2012; Stoll et al., 2006). We found that the leaders at each school had similar interpretations. These shared purposes make the community a community, which is important for collaboration (Little, 2012; Stoll et al., 2006).

Leaders' beliefs related to educational research at the school that did not quite use the PLC as originally intended differed: although they considered it to be useful, it was not crucial for the quality of the education offered at their school, and they were mostly researcher-oriented, which can explain why they omitted the second step of the lesson study cycle, which incorporated research. Additional to holding practitioner-oriented beliefs for educational research, seeing value in educational research for practice seems vital too. The beforementioned research-practice gap can play a role in this (Kempe, 2019): researchers not asking questions of practical relevance is often mentioned by practitioners as a reason for not valuing and using educational research (Vanderlinde & Van Braak, 2010). When practitioners feel like this, it seems logical that they are not prone to study materials as needed for the second core component in lesson study.

This shows that it is important for leaders to consider their beliefs and those of their colleagues in the school before aiming for sustainable school improvement with a PLC. Modifying beliefs is very difficult, as new information is often used to confirm and strengthen current beliefs (e.g., Pajares, 1992). We argue, therefore, that in order to accomplish meaningful learning and

reflective inquiry for staff members, it is important to take pre-existing beliefs as a starting point for further extending their knowledge base.

5.5.3 The organizational context mediates whether leaders can act on their beliefs

An explanation as to how working for a number of years with a PLC does not automatically lead to sustainability might be the organizational context in which the PLC is embedded (e.g., Kennedy, 2010; McNaughton, 2021; Van Driel et al., 2012; Wolthuis et al., 2020). The organizational context mediates the extent to which someone can act in accordance with their beliefs. In accordance with Phipps and Borg (2009), this study showed that tensions can arise between the organizational context and beliefs. However, we added specific and detailed parts of the organizational context that could be considered. Lack of conviction about the PLC's purpose, time constraints, and fear of colleagues' resistance were identified themes in tensions between leaders' beliefs and actual practice that caused leaders to no longer carry out all of the PLC's core components. Additionally, our study showed how the organizational context interfered with leaders' beliefs. In some cases, even though leaders found something important, a "but" appeared in their reasoning because of these tensions. These tensions apparently play a crucial role in their choice to carry out the core components.

Additionally, these tensions caused by the organizational context also affected leaders' other behavior. An important core activity of school leaders that is important for sustainability relates to understanding people and supporting their development (Hendriks & Scheerens, 2013; Leithwood et al., 2008; Robinson et al., 2008). The identified tensions influenced how leaders perform this core activity. For example, at school A, where no tensions were apparent, external support was facilitated and implemented by leaders. This helped the leaders to use the PLC as intended. Leaders at school E did not do this. Additionally, at school A, leaders seemed to be a role model related to the PLC: two out of three leaders were involved in the PLC and made sure that it was implemented as intended. At school E, this seemed less the case: while all leaders were involved in the PLC, they could have made a point of carrying out the second step; they did not, and instead omitted it.

5.5.4 Practical implications

Checking whether the organizational context stimulates the use of the PLC and making both formal and informal leaders' interpretations of the PLC and their educational beliefs explicit is an important step in moving towards sustainability. The core components of the PLC could be discussed with(in) the school, so that everyone knows why it is (or is not) important and useful for the school (Wood, 2017). Together, staff members can decide whether or not to invest in the PLC. As this study found that student- and collaboration-oriented beliefs are critical for continuing the work of the PLC, the school leadership could check whether these beliefs are held. Additionally, when a research cycle is part of the PLC, it is also important that the school leadership believes

in the value of research carried out by practitioners and using educational research in general. Checking whether leader's beliefs are a good match for the PLC that is implemented will be crucial for the chances of the school's sustainable working on school improvement with the PLC as intended, and obtaining the best educational results. A good fit is not only important for suitable behavior by leaders (Burch & Spillane, 2003; Fishbein & Ajzen, 2010), but it also helps to impact other staff members' perceptions of the PLC (Tuytens & Devos, 2018). Leaders are an important part of staff members' social context, and staff members draw on their social context when developing their perceptions of interventions such as a PLC (Maitlis, 2005).

5.5.5 Limitations and future research

We acknowledge several limitations of our study. First, leaders were only interviewed once. As interpretation could change over time and sustainability is a process rather than a state (Van den Boom-Muilenburg et al., 2020a), it might be that interpretation of the PLC changes during the process of sustainability. A longitudinal study looking into leaders' interpretation of the PLC and their underlying educational beliefs could yield interesting results.

Second, our study showed the importance of the context for sustainability, more specifically, for how those leaders interpreted and used the PLC. Although the context was addressed in the interviews, we did not systematically ask about its aspects. The organizational context is rarely considered when researching professional development (Imants & Van Veen, 2012). Often the focus is only on the characteristics of staff members as an explanation for the effectiveness of teacher learning. This leads to blaming teachers, while the organizational context seems to be more relevant in explaining this (Kennedy, 2010). We therefore recommend that future studies incorporate aspects of the organizational context more in their research design.

Third, our research focused on one context: the Dutch context. In this context, a school's staff members have the freedom to decide what and how they want to teach, and to implement curriculum innovations (OECD, 2008, 2010), which might affect their involvement in the PLC. Studies in other contexts are necessary to develop a more comprehensive understanding of leaders' interpretations and underlying educational beliefs in relation to sustainable school improvement.

Fourth, we wanted to stress again that this is a small-scale explanatory study. This comes with its limitations. For example, the results cannot be generalized. However, the small-scale exploratory qualitative design provided us with in-depth insights into leaders' interpretations of the PLC and educational beliefs and helped us find interesting leads for future studies. To strengthen the findings resulting from this study, we suggest that future studies verify whether these factors played a role in other schools that have realized sustainable school improvement and check

whether these factors played a role for leaders who decided not to continue working with the PLCs.

Both types of PLCs have shown to lead to improved student (Dudley et al., 2019; Poortman & Schildkamp, 2016). This study focused on the process of making the PLC's core components a self-evident and functional part of the work at the school. Future studies might collect student achievement data in addition to data focused on the process of realizing sustainability, so that a complete picture of both sustainability's process and outcome can be provided.

In sum, our study highlights the influence of the interplay between leaders' interpretation of the PLC, their underlying educational beliefs, and schools' contextual factors on the degree of sustainability that is realized. These findings gave more insight into the conditions that support schools in sustaining PLCs' core components.



6

Conclusion and discussion



6.1 INTRODUCTION

Continuing professional development approaches such as professional learning communities (PLCs) could help schools to sustainably work on school improvement. Achieving sustainability has been found to be a challenge for a lot of schools, however (Askill-Williams & Koh, 2020; Cohen & Mehta, 2017; Hubers, 2016). Leadership seems to be crucial for sustainability (e.g., Fullan, 2004; Harris & Jones, 2010; Hollingworth et al., 2018; King, 2016; Prenger et al., 2020; Santangelo, 2009; Spillane, 2006), but research into sustainability of professional development and leadership is scarce (e.g., Hubers, 2020; Maitlis & Christianson, 2014; Prenger et al., 2020). This dissertation therefore focused on the overarching question: *What is the role of school leadership in schools that work sustainably on school improvement with professional learning communities?*

This final chapter addresses and answers the overarching question by means of the results of the four studies. Therefore, the four studies will be summarized (6.2), followed by general conclusions (6.3). Then more in general leadership, sustainability and the methods used are discussed (6.4). To conclude, final considerations address the practical implications of the research presented in this dissertation (6.5).

6.2 SUMMARY OF THE FINDINGS

6.2.1 Leadership practices and sustained data use with data teams

The first research questions (Chapter 2) that were addressed were: *What does working on sustainable data use look like in secondary schools that work with data teams?* and *What does leadership look like in these schools?*. To answer the research question, a total of over 500 hours of observations were conducted, a social network questionnaire was administered, and policy and other documents were collected in three secondary schools that had sustained data use with data teams. The findings show how the schools put sustained data use in practice and how they matched and differed from each other in the form of sustainable data use they achieved. All schools organised regular meetings, shared results of the data team with others in the school and established data use and data teams within school policy, and shared results of the data team with others in the school. Two schools did not use all steps or used the data team manual as a reference book and not as a guide. Additionally, concrete leadership practices carried out by formal leaders, informal leaders, or both were identified. Finally, the findings showed in detail how an interplay of leadership practices was carried out in the schools that worked on sustainable data use with data teams. Leaders in these schools all focused on: clear vision and goals, resourcing and facilitation, planning, monitoring, providing support, being available, connecting, modelling, being knowledgeable, and knowledge sharing. The various leadership practices will be discussed in depth in 6.3.1.

6.2.2 Leadership practices and sustained lesson study

Chapter 3 focused on leadership for sustaining lesson study. The questions addressed in this chapter were: *What does sustained lesson study in secondary schools look like?* and *What does leadership look like in these schools?* To answer the research question, a total of 300 hours of observations were conducted, school policy and other documents were collected, and the school leaders were interviewed in two secondary schools that had sustained lesson study. The findings show how the schools put sustained lesson study into policy and practice, and that leaders carried out an interplay of practices for sustained lesson study including: being available and knowledgeable, clear vision and goals, planning, providing support, modelling, monitoring, motivating, and resourcing and facilitation. Crafting coherence between lesson study and the school's goals was found to be important for one of the schools, too. The various leadership practices will be discussed in depth in 6.3.1. Whether and how leadership practices were carried out in these schools seemed to depend on the school context. For example, the policy reasons for working with lesson study, such as an urgency to improve due to a negative school evaluation by the inspectorate of education, could perhaps explain why leaders used a top-down approach to implement lesson study or implemented lesson study in interplay with teachers, and in turn, this could perhaps explain how leaders could focus on crafting coherence between lesson study and the school goals. This, however, needs further investigation.

6.2.3 Leading PLC-related knowledge brokerage

The focus of Chapter 4 was leadership and knowledge brokerage. Therefore, the question addressed was: *Who are the key actors in knowledge brokerage in schools that work sustainably on school improvement with PLCs, what knowledge do they broker and how do they broker knowledge?* Therefore, a social network questionnaire was administered in five schools that worked sustainably on school improvement with PLCs (i.e., data teams or lesson study teams). By means of the questionnaire, the key actors per school were identified. The observational data from Chapters 2 and 3 were analysed to identify what knowledge they brokered and how they brokered knowledge. Additionally, key actors were interviewed about their knowledge brokerage. The results identified that experience in education was an important factor in these schools, but formal position was not as critical for being a key actor. In addition to brokering knowledge about the PLC's focus (the problem or question the PLC is focusing on), process and outcomes (the results of the different steps taken during the PLC process), and approach (the method used in the PLC process), key actors also brokered knowledge related to the advantages of working with the PLC and the PLC's organizational matters. Key actors used mostly activities related to linkage and exchange (e.g., linking the school organization and the PLC, providing assistance and support), followed by knowledge management (e.g., oral and written dissemination); they used capacity building the least (e.g., arranging for all staff members to experience a miniature version of the PLC). Key actors not only reached more staff members compared to their colleagues, but the quality of their relationships was also higher. Combining

these results showed how key actors fit different profiles: super-trader, transceiver, or transmitter. Super-traders had the strongest relations with staff members, used the most different types of activities and brokered different types of knowledge. Transceivers were interlocutors about PLC-related knowledge. Transmitters mainly broadcasted different types of PLC-related knowledge. All schools had all types of key actors.

6.2.4 Leaders' interpretation of the PLC and their educational beliefs

In the fourth and last study (Chapter 5), the following question was addressed: *How do school leaders' interpretations of the PLC and their educational beliefs explain their sustainable work on school improvement with PLCs?* To study this, six leaders from two secondary schools that worked sustainably on school improvement with PLCs were interviewed. The leaders were selected by means of the social network questionnaire administered in Chapter 4. The results identified that all leaders had student- and collaboration-oriented educational beliefs: they considered teaching as providing knowledge in such a way that it fits the student's prior knowledge, in collaboration between the student and the teacher, and they considered collaborative learning important for teachers' professional development. These beliefs therefore seemed critical for continuing the work of PLCs in these schools. Additionally, sustainability in these schools might be explained by leaders' interpretation of the PLC and their educational beliefs: when leaders saw the PLC's core components as useful for the student learning or teacher learning, those core components were used as intended; when they found the PLC's core components less useful, the core components were not used as intended. Moreover, some leaders considered educational research to be useful, but not crucial for the quality of the education offered at their school, and their beliefs were mostly researcher-oriented: they did not stress the importance of research carried out by practitioners. This might explain why the leaders omitted part of one of the PLC's core components, which incorporated research. Finally, the study showed that the school context mediates whether leaders can act on their beliefs. For example, lack of time and fear of colleagues' resistance showed why some leaders in our study omitted a part of a specific core component of the sustained PLC.

6.3 GENERAL CONCLUSION

In the following sections, the overarching question that guided this dissertation will be answered and general findings that were addressed across multiple chapters are combined and further explained. The first general finding concerns the triple role of leadership for working sustainably on school improvement with PLCs. The second general finding concerns factors affecting the triple role of leadership.

6.3.1 The triple role of leadership

When combining the findings of the four previously described studies, the role of the leadership in the five schools that worked sustainably on school improvement with PLCs appears to be threefold: 1) they adequately designed the organization for working with the PLC, 2) they managed the teaching and learning program while considering the PLC, and 3) they helped and supported the staff members' development for working with the PLC. The triple role corresponds to the three core functions of leadership that contribute to student outcomes (Leithwood et al., 2008; Hendriks and Scheerens, 2013; Robinson et al., 2008). As working sustainably on school improvement should lead to continually improving or maintaining improved student results (e.g., Alanis & Rodriguez, 2008; Bambara et al., 2012; Prenger et al., 2020), the resemblances follow logically: the goal is the same. The PLCs that were studied differed. For example, data teams focus on school-, team-, or classroom-level problems, and use different types of data—ranging from test results to student interviews (Schildkamp et al., 2016); lesson study teams focus on classroom problems and use mainly student observation data (De Vries et al., 2017; Lewis et al., 2006). These differences did not seem determinative for how leadership was carried out in the schools in our study.

The first part of the role, organizing and (re-)designing the organization for working with the PLC, was enacted in those schools through different leadership practices: crafting coherence, facilitating availability of resources, and vision and goals. *Coherence* was crafted in three out of the five schools by connecting the PLC to current affairs within the school and school goals. *Vision and goals* related to the PLC were clearly articulated and added to policy plans, although they were not always communicated. *Facilitating the availability of resources* was done, for example, by clearing schedules for staff members to participate in PLC meetings, providing task-hours, and subsidizing an external coach.

The second part of the role, understanding people and supporting their development, was enacted in the five schools by being available, being knowledgeable, connecting, modeling, providing support, motivating, and engaging in knowledge brokerage. *Being available* was observed by leaders' presence in the teachers' room, their open office doors and their willingness to listen to problems. *Knowledgeability* was, for example, observed by knowing the PLC's content and procedures and recognizing problems that could be solved with the PLC. The leaders created *connections* with universities, for example, and asked them for literature or to speak during a study day. *Modeling* was observed, for example, by active participation in PLC meetings. *Providing support* was done, for example, by answering questions related to the PLC, assisting with developing materials that could be used in the PLC and organizing meetings to discuss challenges related to the PLC with each other. The leaders *motivated* others by talking enthusiastically about the results and the added value of the PLC. *Engaging in knowledge brokerage* is an important aspect of this part of the role, as it seems to be important

for supporting staff members' development related to the PLC. The leaders therefore *linked and exchanged* (e.g., linking the school organization and the PLC, providing assistance and support), *managed knowledge* (e.g., oral and written dissemination) and *built capacity* (e.g., arranging for all staff members to experience a miniature version of the PLC).

Previous research emphasized leadership practices related to understanding people and supporting their development (e.g., Andreou et al., 2015; Benz et al., 2004; Zehetmeijer, 2012) or the combination of leadership practices related to understanding people and supporting their development and organizing and (re-)designing the organization (e.g., Bambara et al., 2012; Bellei et al, 2020; King, 2016) as important for sustainability. The schools that participated in this dissertation also carried out leadership practices related to managing the teaching and learning program while considering the PLC, which is therefore considered the third part of the role, enacted through planning and monitoring. *Planning* contributed to working sustainably on school improvement with PLCs by putting PLC meetings in the yearly calendar and making it a topic of discussion on yearly department meeting agendas. *Monitoring* was done by adding the PLC as a topic of conversation to the performance reviews. Additionally, by monitoring the teaching and learning program, the leaders identified areas of improvement (e.g., classroom instruction) that could be worked on with the PLC.

In sum, this study shows not only that the schools that worked on sustainable school improvement with PLC's continued to put the leadership practices that make up the triple role of leadership into practice, but also provides insights into *how* they paid attention to these practices. For example, literature makes very clear that having a vision is important, but this study shows what this looks like in schools: how it is incorporated in policy documents and how the PLC work is connected to the wider vision of the school. The complexity of the school system, as it is constantly subject to change and continual interaction takes place (Davis et al., 2012), is demanding for leaders, who focus on and react to the connection between the PLC and the organization, its staff members, and the curriculum. However, the manner in which the triple leadership role was carried out differed between schools. This will be discussed below (6.3.2).

6.3.2 Factors related to the triple role of leadership

In the five secondary schools that were subject of the studies in this dissertation, the leadership practices described above were enacted in various manners. The way in which they carried out the triple role of leadership seemed to be related to different factors. These factors are situated at the personal, interpersonal, and school contextual levels. It must be stressed here that no causal relations were studied. All the possible relations discussed below are based on the observations in the five schools in this dissertation, and all need further investigation.

6.3.2.1 Personal level

At the personal level, four factors seemed to relate to how the triple role of leadership was carried out by the leaders in these five schools. First, this concerned leaders' *understanding of the PLC* and their *educational beliefs*. Leaders' understanding and beliefs influence their actions (e.g., Burch & Spillane, 2003; Fishbein & Ajzen, 2010; Slegers et al., 2009), as also seems to be the case for the leaders in our study (see Chapter 5). When the leaders considered the PLC's core components as useful, they kept stressing the importance of carrying out those parts of the PLC to the staff members. When the leaders considered a core component as less useful, they supported the omission of a part of one of the core components. Whether the leaders thought of core components as useful depended on their beliefs about teaching and student learning, professional development, and educational research. For example, some leaders did not stress the importance of research carried out by practitioners. The same leaders allowed that part of one of the PLC's core components, which incorporated research, was omitted.

All leaders in knowledge brokerage had *experience in education* (Chapter 4). As proficient understanding of the educational system (e.g., budgets, resources, myriad other issues) is necessary for brokerage (Sinnema et al., 2020), novices might lack the expertise to become efficient brokers.

The leaders established reciprocated and intense relationships with other staff members (Chapters 2 and 4), for which leaders' *trustworthiness* seemed to be important (Daly et al., 2014). Such relationships are vital for carrying out leadership practices related to understanding people and supporting their development (Cole & Weibaum, 2010; Daly, 2012), such as knowledge brokerage through interactive discussions about PLC-related knowledge in which both interlocutors contribute to the conversation. Staff members who participate in the PLC can explain lessons learned related to the PLC, and staff members who do not participate in the PLC can, for example, describe challenges they face (Malin et al., 2018). These discussions in turn contribute to changing practice (Daly & Stoll, 2018). Leaders' trustworthiness helped establish reciprocated and intense relationships between the leaders and staff members in these five schools, through which leaders could perform PLC-related knowledge brokerage easily and in greater depth (Daly, 2010).

Although it did not matter for knowledge brokerage, *the function someone fulfills in the school* was found to be important for the leaders in the schools that were studied in this dissertation for carrying out leadership practices related to organizing and (re-)designing the organization for working with the PLC (Chapter 2). Those were namely found to be enacted only by leaders with a formal position, such as principals or assistant principals. The coordination and facilitation carried out by formal leaders is thus important, too (Azorín et al., 2019).

6.3.2.2 Interpersonal level

Two factors at the interpersonal level seemed to relate to how the triple role of leadership was carried out by the leaders in these five schools. First, the leadership practices, independent of the part of the threefold role of leadership to which they are related, were never enacted by one person, but *enacted in interplay* (Chapters 2, 3 and 4). Because of the complexity of the school system (Davis et al., 2012), this makes sense: one leader alone cannot meet all demands of the school, making distributed leadership practices necessary (Angelle, 2010). The studies in this dissertation thus confirm how not one leader, but distributed leadership contributes to sustainability (e.g., Fullan, 2004; King, 2016; Ng & Nicholas, 2013; Spillane, 2006).

Second, the studies showed that *dense social networks*, which are characterized by a large number of relationships between different staff members (Daly, 2010) and are also seen as teams with greater cohesion, were present in all school teams (Chapters 2 and 4). In dense networks, deeper levels of social and professional exchange are perceived more frequently (Reagans & McEvily, 2003).

6.3.2.3 School contextual level

The schools that were studied in this dissertation also showed how three factors at the school contextual level seemed to relate to how the triple role of leadership was carried out. The school context refers to both structural and cultural characteristics of the school (Hendriks & Scheerens, 2013; Imants & Van Veen, 2010).

Time, or the lack of it, and *fear of colleagues' resistance* (Chapter 5) were found to limit leaders' willingness to support carrying out the core components of a PLC, which is considered important for sustainability (e.g., Quinn & Kim, 2017).

The *policy reasons for implementing the PLC* differed between the schools and may account for differences in the enacted leadership (Chapter 3). One school implemented a PLC because of the urgency of improving the quality of the school's education, and therefore a top-down approach was used to implement the PLC. Other schools implemented the PLC because of the experienced added value of the PLC, and therefore the PLC could be implemented in interplay with the teachers. Although the way leadership was enacted differed, it worked for each of the specific school contexts.

The importance of the school context has been stressed for professional development approaches in general (Kennedy, 2010; McNaughton, 2021). The studies in this dissertation show how the school context also affects the way in which leadership is enacted and how this sometimes influences working sustainably on school improvement with PLCs in general. Therefore, the school context should be considered when researching leadership for professional development

so “(...) future processes of change and reform will have a far greater chance of succeeding” (Harris, 2020, p. 145).

6.4 GENERAL DISCUSSION

6.4.1 Leadership: An eye for different aspects

The studies in this dissertation showed how leadership for working sustainably on school improvement with PLCs may need to focus on multiple aspects. Leaders in this study had an eye for the PLC, the staff members and the school context while carrying out an interplay of leadership practices. The studies in this dissertation thus support the statement of Bryk et al. (2015), who stressed that we need to look not only at “What works?”, but at “What works, for whom, and under what set of conditions?”.

The small-scale, in-depth approach helped highlight concrete aspects *in situ* related to the role of leadership. Although this approach hindered providing broadly generalizable results, the studies in this dissertation do provide hypotheses for further research. An example of such a hypothesis is that clearing staff members' schedules contributes to meeting regularly, one of the PLC's core components, and thus to sustainability (Chapter 2). Chapters 2, 3, and 4 showed that an interplay of leadership practices was carried out by the leaders of the five schools. This brings up the question how these interact and how these influence sustainability. A larger study with more schools and with a stronger quantitative component (e.g., questionnaires) is therefore necessary. By means of structure equation modeling (SEM) possible paths between the phenomena sustainability and leadership could be more firmly established.

Additionally, it could be tested whether these practices and aspects of the school context played a role in schools that have realized sustainable school improvement in other contexts. In the Dutch context, the school's staff members have the freedom to decide what and how they want to teach, and to implement curriculum innovations (OECD, 2008, 2010), which might affect their involvement in the PLC in this study. Studies in other contexts in which teachers and schools do not have this kind of autonomy (see, for instance, Cohen et al., 2018) are necessary to develop a more comprehensive understanding of leadership practices and school contextual characteristics that support sustainability (cf. local proof route, Lewis et al., 2006).

The leaders of all schools that participated in the studies in this dissertation showed how they found the PLC valuable and useful for their schools. For example, one of the assistant principals of School A found data teams useful because “data teams provide answers to questions that the school faces” and School E's lesson study coordinator mentioned how lesson study contributed to “[gaining] more insight into what the students are doing in the lessons”. By sustaining these approaches, those leaders can let as many staff members as possible benefit from the PLC

(King, 2016). Value and effectiveness seem to be important preconditions for sustainability (e.g., Levinthal & March, 1993; Pietsch et al., 2020): when the value is missing, and the PLC does not seem to help achieve the school's goals, sustainability cannot be strived for. It should be acknowledged that the studies in this dissertation assumed the effectiveness of the PLCs based on previous research (e.g., for data teams, see Lai & McNaughton, 2016; Poortman & Schildkamp, 2016; for lesson study, see Dudley et al., 2019; Vermunt et al., 2019), but did not measure the effect of the PLCs on the schools' educational quality. To get an even more comprehensive look at the role of leadership for sustainability, future studies might study schools that did *not* sustain the PLCs and, for example, focus on how leaders monitored the value of the professional development approach for the school and how they made the decision to stop working with it. Effectiveness can be taken into account then as well.

6.4.2 Sustainability: A complex concept

Sustainability is and remains a complex concept. In general, sustainability is analyzed in two ways. In the fidelity perspective, sustainability could mean that the professional development approach is understood and performed exactly as is prescribed (Anderson, 2007). In the local adaptation perspective, adjustments to practice are allowed, as long as teachers adhere to the core components of the professional development approach (Quinn & Kim, 2017). The studies in this dissertation used the local adaptation perspective on sustainability. This approach left more room for considering the school context, which in our study seemed to have impact on the role of leadership. Yet, the question remains when sustainability is achieved. For example, one of the schools that sustained lesson study did not use publications, which is part of one of lesson study's core components. All other core components, from live observations of student learning to re-teaching the research lesson, were carried out. Does this mean the school did not achieve sustainability?

It could be argued that instead of determining *whether or not* sustainability is achieved, we could look at *the extent to which* sustainability is achieved. This can, for example, be done by indicating which core components are being carried out and to what extent. Variability in enactment is inevitable and can be considered a source of effective local design (McNaughton, 2021; McKenney & Reeves, 2012), although (partly) omitting one of the core components leaves us questioning whether to speak of "effective" local design. How precisely core components must be enacted for the professional development approach to be true to its goals, in other words, the approach's tolerance (McKenney & Reeves, 2012), is something that could be considered as well. Professional development approaches with high tolerance, indicating that even with adaptations their goals can still be met, are thus desirable in education. After all, the ultimate aim is not to "properly" implement the methods developed, but to help school staff members learn and develop professionally to improve student learning.

6.4.3 Methods: A reflection

For this dissertation, a case study design was used. The schools were selected based on the 'dependent variable', being that they worked on sustainable school improvement with a PLC – either data teams or lesson study teams. This design was chosen to explore and describe in-depth what the phenomena looked like. This design is suitable for such aims (Yin, 2014). What needs to be emphasized, however, is that the results and conclusions need to be treated with caution: they provide a picture of the situation at five schools and cannot be statistically generalized to other settings or populations (Miles et al., 2018; Yin, 2014). The detailed illustrations do allow others to assess to what extent the results apply to other situations, in other words analytical generalization (Krathwohl, 1998; Poortman & Schildkamp, 2012).

For the case studies in Chapters 2, 3 and 4 a mixed methods approach was applied. Different sources of data (i.e., observations, documents, interviews, and a questionnaire) were used in two different manners. Firstly, a mixed methods approach to corroborate the findings across different approaches was employed, so that greater confidence could be held in the conclusions. This was used for triangulation purposes, by showing that independent measures were in agreement, or, at least, did not contradict each other (Burke Johnson & Onwuegbuzie, 2004; Miles et al., 2014). A mixed methods approach was also applied for complementarity reasons, for seeking elaboration, enhancement, illustration and clarification of the results of one method with results of the other method (Meijer et al., 2002). The data from the observations and documents combined with the interviews and social network questionnaire formed a more comprehensive view of the phenomenon studied, the role of leadership in schools that work sustainably on school improvement with professional learning communities. The four specific data collection methods used in this study are collection of (policy) documents, an intensive observation period, a social network questionnaire and interviews. The latter three will be discussed separately.

When discussing the intensive observation period (cf. Louws, 2016), the observer bias and the observer effect have to be mentioned. The observer bias is defined as the tendency to see what someone wants to see. The way someone looks at situations is shaped by their previous experiences or pre-conceptions. The observer effect is defined as the disturbance of an observed system because of the observation, for example, when the leaders act differently when the observer is present. Several studies have shown that the risk of this is low as staff members get used to being observed and shadowed (e.g., Tulowitzki, 2019). None of the studies was based solely on observational data, however. Additionally, after the observation period ended, a report was written for each school. In this report, a descriptive overview of the observation period was provided. This report was discussed in a meeting with the school leaders. Therefore, the report served as member check. Only few minor comments were made, for example, regarding formulation. This data collection method helped to "offer a level of detail no other method seems to be able to provide" (Tulowitzki, 2019, p. 105). By emerging in practice, concrete and real-life

examples of leadership could be identified. It increased the degree to which the results are representative of conditions in the real world, also known as ecological validity (Yin, 2014), for the studies in this dissertation.

Second, the social network questionnaire helped to provide insight into the social interactions in schools that work sustainably on school improvement with PLCs, information that contains chief determinants of how well and quickly efforts hold, diffuse and sustain (Daly, 2010). We did not measure staff members' attitude towards the PLC, however. Especially in dense networks, this is important to consider: densely connected staff members who are resistant towards a professional development approach, such as PLCs, can limit working with the approach (Moolenaar et al., 2012). Although extreme negativity was not identified during the extended observation period, collecting this type of data in the questionnaire would have made our conclusion about the network density stronger. This data collection method did help identify the leadership of knowledge brokerage related to working sustainably on school improvement with PLCs in a unique way. By considering prominence in the social network instead of function in the school, insights into the social interactions of both formal and informal leaders could be provided in a new way. Additionally, both direct (i.e., degree centrality) and indirect (i.e., betweenness centrality) influence were considered. Relationships should not be treated in isolation (Borgatti & Ofem, 2010): when teacher Y is linked to teacher X and teacher Z, teachers X and Z could influence each other indirectly through teacher Y. Measuring the indirect influence is important to take the full picture of activity in schools into account and to fully understand how knowledge travels within the school (Rodway et al., 2021).

Third, the interviews helped to provide information on sustainability at a later point in time (i.e., one year after the observation period). In addition, interviews helped to provide insight into the complex and internal constructs of leaders' educational beliefs and understanding of the PLC (Luft & Roehrig, 2007). Interviews thus helped supplement the findings in two ways: by gathering additional information and by grasping information that could not be retrieved otherwise.

6.5 PRACTICAL IMPLICATIONS

The studies in this dissertation provide practical implications on two levels: three for school leaders (6.5.1-6.5.3) and one for those educating school leaders (6.5.4).

6.5.1 Look before you leap

Chapter 5 showed that not all leaders thought of all core components as useful. Whether this was the case seemed to be dependent on their beliefs about teaching and student learning, professional development, and educational research. Some leaders did not stress the importance of research carried out by practitioners. The same leaders allowed that part of one of the PLC's

core components, which incorporated research, was omitted. For schools and their leaders, it seems, therefore, important to consider whether a professional development approach suits them, the school and the school context. The core components of the approach need to be discussed with(in) the school well before actual implementation of the approach, so that everyone understands the approach (Wolthuis et al., 2020) and knows why it is (or is not) important and useful for the school (Wood, 2017). This is challenging, as questions of appropriateness and usefulness cannot always be answered beforehand. An interesting strategy might therefore be to start small by letting a select group experience the professional development approach (Bryk et al., 2015). Discussions about what the approach adds and how it fits the school context could follow after this try-out, and can then be accompanied by evidence. Together, staff members can decide whether or not to invest in the approach. Others put it even stronger: when the outcomes are negative, leaders should have the courage to stop working with the approach (e.g., Pietsch et al., 2020).

6.5.2 Delve into the PLC approach

All leaders in the schools in this dissertation were knowledgeable about the PLC (Chapters 2 and 3). Teachers are often trained or coached to work with professional development approaches before or during their implementation (e.g., Van Driel et al., 2012). This external source of information affects professional development (Clarke & Hollingworth, 2002). Other leaders that are starting to work with a professional development approach might therefore engage in such training as well. Following such training, together with (other) teachers, could trigger the school leaders to invest early on in increasing their knowledge about the professional development approach.

6.5.3 Tailor the PLC approach and your leadership to the school context

The leaders in the studies in this dissertation tailored the PLC approach to their school contexts (Chapters 2, 3, and 5). Additionally, they carried out an interplay of leadership practices (Chapters 2, 3 and 4), which they tailored to their school contexts (Chapter 3 and 5).

It might therefore be important for leaders to know their school context, so they can adapt both the PLC approach and their leadership to it. One single success formula might not exist. Or, as Bryk (2015, p. 25), stated: “Improving schools entails coherent, orchestrated action (...). Put simply, there is no one silver bullet.” The detailed illustrations in this dissertation can help leaders assess what contexts are more or less similar to theirs and, in turn, how they might carry out different leadership practices.

6.5.4 Continue to put the triple role of leadership into practice

The schools in this study, independent of how long they were working on sustainable school improvement with PLCs, continued to put the triple role of leadership into practice. This has implications for those educating school leaders, especially since previous research showed that the complex nature of implementing and sustaining professional development approaches demands professional development for leaders (Acton, 2021; Fullan, 2016). The studies in this dissertation provide ample insight into what could be addressed in professional development focused on school leadership for sustainability. Those leadership practices in combination with the differences in the school context that the leadership could be tailored to, call for an approach that offers space for both aspects. Two approaches that might help in this regard, are professional learning networks and the reflection tool that was developed based upon the studies in this dissertation.

A professional learning network that consists of school leader teams from fellow schools can offer space for both content (identified leadership practices) and the school contexts (e.g., Acton, 2021; Bryk et al., 2015). Activities such as discussing vignettes (Angelides & Gibbs, 2006) or working with immersive simulations (Johnson & Voelkel, 2021) could be helpful for that. In addition, school leader teams can reach out to each other, for example, to discuss the meaning of the content for their schools, as well as issues that come up during their daily practice.

Another helpful approach might be working with the reflection tool that was developed based on the studies in this dissertation. It aims to help leaders become aware of and focus on this triple role. With this tool, the leaders and staff members at a school can determine whether the leaders are adequately equipped to achieve sustainability. This is done by indicating for multiple statements if and to what extent leadership practices are being carried out. Additionally, concrete next steps that can be taken on short notice need to be formulated. The tool thus provides success criteria and helps schools determine where they stand in relation to those criteria and helps them come up with practices that support work towards those success criteria. It can be used before implementing and during working with a PLC approach. The tool has been piloted with 51 school leaders and was received enthusiastically.

Leadership practices related to organizing and (re-)designing the organization for working with the PLC, managing the teaching and learning program while considering the PLC, and understanding people and supporting their development for working with the PLC were carried out and focused on by the leaders at the five schools that sustainably work on school improvement with PLCs. Leaders of other schools can assess, based upon the detailed descriptions, to what extent the results apply to their context. In that way, other schools can work sustainably on school improvement with PLCs too.

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SAMENVATTING (DUTCH SUMMARY)

Scholen willen het leren van hun leerlingen zo goed mogelijk ondersteunen. Tegelijkertijd wordt van scholen verwacht dat ze zich continu ontwikkelen om tegemoet te komen aan de snel veranderende omgeving, veranderend beleid en toenemende diversiteit in hun (leerling) populatie. Professionele ontwikkeling van leraren is daarbij onontbeerlijk.

Een veelbelovende professionele ontwikkelingsaanpak is de zogenaamde professionele leergemeenschap (PLG). In PLG's werken leraren van een school, eventueel met schoolleiders, samen aan een specifiek ontwikkelthema dat van belang is in hun dagelijkse schoolpraktijk ten behoeve van professionele ontwikkeling en schoolontwikkeling. In regelmatige bijeenkomsten bespreken ze theorie en onderzoeken ze hun ervaringen. PLG's blijken een positief effect te hebben op zowel het leren van leraren als het leren van leerlingen.

Door kerncomponenten van de PLG onderdeel te maken van de dagelijkse schoolroutines en te verankeren in het beleid en de praktijk van de school, oftewel te verduurzamen, kan er in de school duurzaam aan schoolontwikkeling gewerkt worden. Duurzaamheid is belangrijk om uiteindelijk alle leerlingen te laten profiteren van de resultaten van de PLG.

Leiderschap is een belangrijke factor die duurzaamheid beïnvloedt. Niet alleen formele leiders, zoals (con)rectoren, leveren een belangrijke bijdrage aan duurzaamheid; ook leraren dragen hieraan bij. In deze dissertatie wordt leiderschap dan ook door een bril van gedeeld leiderschap beschouwd. Leiderschap draait dan om alle praktijken die worden uitgevoerd om de kennis, motivatie of handelingen van anderen te beïnvloeden.

Het verduurzamen van professionele ontwikkelingsaanpakken, zoals PLG's, is echter een uitdaging voor veel scholen. Verder is het onderzoek naar duurzaamheid en leiderschap schaars. Dit proefschrift richt zich daarom op leiderschap voor duurzaamheid met de volgende centrale onderzoeksvraag: *Wat is de rol van leiderschap bij het duurzaam werken aan onderwijsontwikkeling met professionele leergemeenschappen (PLG's)?*

In **Hoofdstuk 2** wordt ingegaan op leiderschap en de duurzaamheid van een specifiek type PLG, namelijk datateams. Een datateam werkt op de eigen school aan een onderwijsprobleem. Dit kunnen bijvoorbeeld de tegenvallende resultaten voor een bepaald vak zijn. Ze zoeken daarvoor een oplossing door het gebruik van data en volgen een cyclische procedure. Leiderschapspraktijken, zoals het communiceren van een duidelijke visie, zouden bijdragen aan het verduurzamen van een dergelijke aanpak. Het onderzoek naar deze leiderschapspraktijken en hoe ze precies uitgevoerd worden, was echter schaars. De studie beschreven in dit

hoofdstuk, gaat daarom in op de vragen: hoe zien a) duurzaam datagebruik met datateams en b) leiderschap eruit op scholen die werken aan duurzaam datagebruik met datateams?

Om deze vraag te beantwoorden, werden drie middelbare scholen die duurzaam data gebruiken door middel van datateams onderzocht. Daarvoor werd elke school zes tot acht weken intensief geobserveerd, er werd een vragenlijst over sociale netwerken uitgezet en er werden beleidsdocumenten verzameld.

De resultaten laten zien hoe de scholen verschillen in de vorm van duurzaam datagebruik. Alle scholen organiseerden regelmatig bijeenkomsten, verankerden datagebruik- en datateams binnen het schoolbeleid en deelden de resultaten van het datateam met anderen in de school. Twee scholen pasten niet alle stappen toe of gebruikten het datateamhandboek als naslagwerk en niet als leidraad. Daarnaast werden concrete leiderschapspraktijken geïdentificeerd die uitgevoerd werden door zowel formele als informele leiders. Ten slotte laten de resultaten zien hoe verschillende leiderschapspraktijken in samenspel werden uitgevoerd. De leiders in alle scholen focusten op: een duidelijke visie en doelen, faciliteren, plannen, monitoren, ondersteunen, beschikbaar zijn, verbinden, modelleren, goed geïnformeerd zijn en kennisdeling. Deze leiderschapspraktijken worden verderop in detail besproken.

Hoofdstuk 3 richt zich op leiderschap en de duurzaamheid van een ander type PLG, namelijk lesson study teams. Een lesson study-team onderzoekt het leren van de eigen leerlingen in de eigen lespraktijk. Hiervoor wordt een cyclische procedure gebruikt, waarvan het *live* observeren van een les een belangrijk element is. Leiderschapspraktijken, zoals het bieden van ondersteuning, zouden bijdragen aan het verduurzamen van een dergelijke aanpak. Het onderzoek naar deze leiderschapspraktijken en hoe ze precies uitgevoerd worden, was echter schaars. De studie beschreven in dit hoofdstuk, gaat daarom in op de vragen: hoe zien a) duurzaam lesson study en b) leiderschap eruit op scholen die duurzaam met lesson study werken?

Om deze vraag te beantwoorden, werden twee middelbare scholen die duurzaam lesson study gebruiken, onderzocht. Daarvoor werd elk van de scholen zes tot acht weken intensief geobserveerd en drie leiders van de school werden geïnterviewd.

De resultaten tonen hoe de scholen lesson study duurzaam in beleid en praktijk verankeren. Ook laten ze zien dat verschillende leiderschapspraktijken in samenspel werden uitgevoerd door leiders, namelijk: beschikbaar en deskundig zijn, duidelijke visie en doelen, facilitering, het zijn van een rolmodel, monitoring, motivering, ondersteuning bieden en planning. Het creëren van samenhang tussen lesson study en de doelen van de school was op een van de scholen ook belangrijk. Deze leiderschapspraktijken worden verderop in detail besproken. Of en hoe bepaalde leiderschapspraktijken werden uitgevoerd, leek af te hangen van de context van

de school. De beleidsredenen om met lesson study te werken, bijvoorbeeld een waardering Onvoldoende van de Onderwijsinspectie, zouden bijvoorbeeld kunnen verklaren waarom het leiderschap een top-downbenadering gebruikte of juist een samenspel met leraren organiseerde om lesson study te implementeren. Ook zouden deze beleidsredenen mogelijk kunnen bepalen in hoeverre het leiderschap zich concentreerde op het creëren van samenhang tussen lesson study en de doelen van de school. Dit moet echter verder onderzocht worden.

De focus van **Hoofdstuk 4** is kennisdeling. Om de kerncomponenten van de PLG onderdeel te maken van de dagelijkse schoolroutines, ofwel te verduurzamen, dienen ook de overige collega's betrokken te worden bij de PLG. Daarvoor is kennisdeling belangrijk. Kennisdeling is een dynamisch en complex geheel van actoren, activiteiten en drijfveren waarbinnen de PLG-kennis wordt uitgewisseld, getransformeerd en anderszins gecommuniceerd met collega's die niet hebben deelgenomen aan de PLG. Leiderschap speelt een grote rol bij kennisdeling, maar het onderzoek naar de combinatie van leiderschap, kennisdeling en duurzaamheid is schaars. De studie in dit hoofdstuk richt zich daarom op de volgende vraag: Wie zijn de sleutelfiguren van kennisdeling op scholen die duurzaam werken aan schoolontwikkeling met PLG's, welke kennis delen zij en hoe delen zij deze kennis?

Vijf middelbare scholen die duurzaam aan onderwijsontwikkeling werkten met een PLG (datateams of lesson study teams) werden in dat kader onderzocht. Er werd een vragenlijst afgenomen om de sociale netwerken in kaart te brengen. Op basis van de uitkomsten van de vragenlijst, werden per school drie sleutelfiguren geïdentificeerd. Aan de hand van de intensieve observatiedata uit eerder onderzoek en interviews met de sleutelfiguren, werd de onderzoeksvraag beantwoord.

De resultaten lieten zien dat voor het vervullen van de rol van sleutelfiguur ervaring in het onderwijs wel belangrijk is, maar de formaliteit van de rol in de school niet zo belangrijk is op deze scholen. Sleutelfiguren deelden niet alleen kennis over de focus, het proces en de resultaten en de aanpak van de PLG, maar ook over de voordelen van het werken met en organisatorische zaken gerelateerd aan de PLG. Sleutelfiguren gebruikten voornamelijk activiteiten die verband hielden met koppeling en uitwisseling, zoals het verbinden van de schoolorganisatie en de PLG en het bieden van hulp en ondersteuning, om kennis te delen. Ook gebruikten ze activiteiten gericht op kennismanagement (bijvoorbeeld mondelinge en schriftelijke communicatie) en gericht op capaciteitsopbouw (bijvoorbeeld door al het personeel een miniatuurversie van de PLG te laten ervaren). Sleutelfiguren bereikten met hun kennisdeling niet alleen meer personeelsleden in vergelijking met hun collega's, maar ook de kwaliteit van hun relaties was hoger. De resultaten lieten ten slotte zien dat er een onderscheid gemaakt kan worden in drie typen sleutelfiguren. De zogenaamde superdelers hadden de sterkste relaties met collega's, deelden verschillende soorten kennis en gebruikten de meest verschillende soorten activiteiten om dit te doen. De tweede groep, de zogenaamde interactievelingen, waren gesprekspartners voor PLG-

gerelateerde kennis en deelden PLG-gerelateerde kennis. Ze focusten zich ook op uitwisseling: in interactie met collega's verkregen ze informatie die gebruikt kan worden in de PLG. De derde groep, de zenders, focusten in hun kennisdeling op het zenden van verschillende soorten PLG-gerelateerde kennis. Alle typen sleutelfiguren waren op elk van de scholen aanwezig.

In **Hoofdstuk 5** wordt ingegaan op de interpretatie van de PLG en de onderwijsopvattingen van het leiderschap. De aanname is namelijk dat leiders handelen op basis van hun interpretatie van de PLG, welke gebaseerd is op de onderliggende onderwijsopvattingen. Aangezien PLG's een hulpmiddel zijn om *het lesgeven* en *het leren van leerlingen* te verbeteren door middel van *professionele ontwikkeling* en *onderwijsonderzoek door leraren*, werden de opvattingen over deze (cursief gedrukte) concepten onderzocht in relatie tot hun interpretatie en de duurzaamheid. De laatste studie beantwoordt daarom de volgende vraag: Hoe verklaren de manier waarop schoolleiders de PLG interpreteren en hun onderwijsopvattingen het duurzaam werken aan schoolontwikkeling met PLG's?

Twee middelbare scholen, één die duurzaam werkte aan onderwijsontwikkeling met datateams en één die duurzaam werkte aan onderwijsontwikkeling met lesson study, werden onderzocht. Op basis van de sociale netwerk vragenlijst uit eerdere studies, werden per school drie sleutelfiguren geïdentificeerd. Zij werden geïnterviewd om de onderzoeksvraag te beantwoorden.

De resultaten lieten zien dat alle leiders zowel leerlinggerichte als samenwerkingsgerichte opvattingen hadden: zij vonden het belangrijk dat het onderwijs en lesgeven zich focust op de leerling en dat professionele ontwikkeling plaatsvindt door samenwerkend leren. Deze worden daarom cruciaal geacht om het werk van PLG's voort te zetten. Daarnaast kon duurzaamheid verklaard worden door de manier waarop schoolleiders de PLG interpreteren en hun onderwijsopvattingen. Wanneer het leiderschap de kernelementen van de PLG nuttig vond voor het leren van leerlingen of leraren, werden die kernelementen gebruikt zoals bedoeld; wanneer het leiderschap de kernelementen minder nuttig vonden, gebeurde dat niet. Ook beschouwden enkele leiders onderwijsonderzoek als nuttig maar niet als cruciaal voor de kwaliteit van onderwijs op hun school. Dit zou kunnen verklaren waarom het leiderschap toestond dat een onderdeel van een van de kernelementen van de PLG, waarin onderzoek een belangrijke rol speelde, niet werd uitgevoerd. Ten slotte laat dit onderzoek zien dat de schoolcontext een belangrijke factor is voor leiderschap om wel of niet te kunnen handelen in lijn met hun opvattingen. Door tijdgebrek en angst voor weerstand van collega's lieten sommige leiders toe dat een deel van een kernelement van de PLG niet werd uitgevoerd.

Samenvattend laten de resultaten van de scholen in deze dissertatie zien dat de rol van leiderschap bij het duurzaam werken aan onderwijsontwikkeling met PLG's, onafhankelijk van het type PLG, drievoudig is.

Het eerste deel van de rol bestaat uit het gereedmaken van de schoolorganisatie voor het werken met de PLG. Daarvoor werd *samenhang gecreëerd* door de PLG te verbinden met de doelen van en lopende zaken binnen de school. Ook werden *visie en doelstellingen* duidelijk verwoord en toegevoegd aan beleidsplannen. Tenslotte *faciliteerde* het leiderschap deelname, door bijvoorbeeld roosters vrij te maken zodat medewerkers deel konden nemen aan PLG-vergaderingen, taakuren te faciliteren en een externe coach in te huren.

Het tweede deel van de rol heeft betrekking op het managen van het onderwijsprogramma terwijl er rekening gehouden wordt met de PLG. Het leiderschap *plande* de PLG door de PLG toe te voegen aan jaarlijkse (sectie)gesprekken en PLG-vergaderingen aan de jaarkalender. In het kader van *monitoring* werd deelname aan de PLG besproken tijdens de functioneringsgesprekken. Bovendien kon het leiderschap door monitoring van het onderwijsprogramma verbeterpunten identificeren waar de PLG aan zou kunnen werken.

Het derde deel van de rol heeft betrekking op het ondersteunen en ontwikkelen van collega's gericht op de PLG. Het leiderschap was bijvoorbeeld *beschikbaar* door hun aanwezigheid in de lerarenkamer, open kantoordeuren en bereidheid om naar problemen te luisteren. Hun *deskundigheid* werd getoond door de inhoud en procedures van de PLG te kennen en problemen die met de PLG konden worden opgelost te herkennen. Het leiderschap *legde contacten* met bijvoorbeeld universiteiten en vroeg hen om literatuur te delen of om te spreken tijdens een studiedag. Ook diende ze als *rolmodel* door actief deel te nemen aan PLG-vergaderingen. Het *bieden van ondersteuning* werd bijvoorbeeld gedaan door het beantwoorden van vragen over de PLG, het helpen met het ontwikkelen van materialen die in de PLG gebruikt konden worden en het organiseren van bijeenkomsten om uitdagingen met betrekking tot de PLG met elkaar te bespreken. Ook *motiveerde* het leiderschap collega's door over de resultaten te praten en enthousiast te zijn. Door hun *betrokkenheid bij kennisdeling* wisten zij de ontwikkeling van hun collega's op het gebied van de PLG te stimuleren. Ze deden dit door activiteiten gericht op koppeling en uitwisseling, kennismanagement en capaciteitsopbouw.

Hoe deze drievoudige leiderschapsrol wordt uitgevoerd, hing binnen de onderzochte vijf scholen af van verschillende factoren. De manier waarop de PLG begrepen wordt, de functie die iemand binnen de school vervuld, onderwijsopvattingen en betrouwbaarheid zijn *persoonlijke factoren* die de rol leken te beïnvloeden. *Interpersoonlijke factoren*, zoals het samenspel van leiderschap en hechte sociale netwerken, leken dat eveneens te doen. Als laatste wordt het uitvoeren van de drievoudige leiderschapsrol beïnvloed door *contextuele factoren van de school*, namelijk door tijd, beleidsredenen voor het werken met de PLG, het academisch klimaat en de angst voor weerstand van collega's.

Deze dissertatie leidde tot vier praktische implicaties. De eerste implicatie is *klein starten en met elkaar overleggen* om te bepalen of de professionele ontwikkelingsaanpak past bij de school en zijn context. Het bespreken van de kernelementen van de aanpak kan daarbij helpen, zodat iedereen de aanpak begrijpt en ziet waarom het belangrijk en bruikbaar is (of niet) voor de school. Samen kunnen de medewerkers beslissen om wel of niet te investeren in het werken met de aanpak.

Ten tweede zou het leiderschap ook kunnen *deelnemen aan training of coaching gericht op het programma*. Leraren worden vaak voor of tijdens de implementatie van de professionele ontwikkelingsaanpak getraind of gecoacht om ermee te werken. Omdat de deskundigheid van het leiderschap een belangrijke bijdrage bleek te leveren aan duurzaamheid, wordt geadviseerd dat het leiderschap de training(en) ook volgt. Het samen met (andere) leraren volgen van een dergelijke training zou het schoolleiderschap ertoe kunnen aanzetten om al vroeg te investeren in het vergroten van hun kennis over de professionele ontwikkelingsaanpak.

Ten derde lijkt het belangrijk dat *de PLG en het leiderschap worden aangepast aan de schoolcontext*. Een eenduidige succesformule voor leiderschap lijkt niet te bestaan; de scholen in deze dissertatie maakten allen aanpassingen op basis van hun context – bijvoorbeeld in de manier waarop zij ondersteuning boden. De gedetailleerde beschrijvingen in deze dissertatie kunnen scholen helpen te bepalen welke voorbeelden bij hun context passen.

Ten vierde lijkt *het blijven toepassen van de drievoudige rol van leiderschap* wanneer naar duurzaamheid gestreefd wordt belangrijk. Daar is ook een rol weggelegd voor opleiders van schoolleiders. Een mogelijke vorm zou een professioneel leernetwerk met collega-schoolleiders kunnen zijn. Dit biedt mogelijkheden voor de ontwikkeling van de gevonden leiderschapspraktijken en biedt ruimte voor het bespreken van de schoolcontext. Ook de op basis van deze dissertatie ontwikkelde reflectietool kan bijdragen. Met deze tool kan een school bepalen of het leiderschap voldoende toegerust is om duurzaamheid te realiseren. De tool is inmiddels getest met 51 schoolleiders en werd enthousiast ontvangen. Leiderschapspraktijken met betrekking tot het gereedmaken van de schoolorganisatie voor het werken met de PLG, het managen van het onderwijsprogramma terwijl er rekening gehouden wordt met de PLG en het ondersteunen en ontwikkelen van collega's gericht op de PLG, moeten dus blijvend worden uitgevoerd. Op die manier kunnen alle scholen duurzaam werken aan onderwijsontwikkeling met PLG's.

APPENDIX: INTERVIEW QUESTIONS

Semi-structured Interview Protocol, Translated from Dutch into English

State of affairs concerning the PLC¹

How is [the PLC] working out at your school now? What is the state of affairs?

What changed since the observation period?

What is your role in lesson study now?

Is [the PLC] part of the school's policy? In what manner?

Can you tell me in what way [PLC members] at your school are still working with [each of the PLC's core components]?

Leaders' interpretation of (core components of) the PLC

What is [the PLC], according to you?

What is the core of [the PLC] for you?

What does [the PLC] mean for your daily practice?

Do you think [the PLC] is useful? Why (not)?

An important part of [the PLC] is [core component]. What do you think about [core component]?

Beliefs about teaching and student learning

What should education look like, according to you?

How would you describe the role of the teacher?

What is the core of being a teacher for you? Why is that important to you?

How would you describe student learning?

What is the core of student learning for you? Why is that important to you?

What does the education offered at your school look like?

Beliefs about professional development

What should professional development look like, according to you?

What is the core of teacher professional development for you? Why is that important to you? How do you prefer to develop yourself as a teacher/school leader?

Beliefs about educational research

What is educational research, according to you?

What is the core of educational research for you? Why is that important to you?

Do you carry out research yourself?

How useful is practice-based educational research for you?

Questions related to the observation period were added per school

¹Questions adjusted per school: leaders at school A, C, and D were asked about the data team approach and its core components; leaders at school B and E were asked about lesson study and its core components.

PUBLICATIONS AND PRESENTATIONS

Scientific Publications

Accepted manuscripts

Van den Boom-Muilenburg, S. N., De Vries, S., Van Veen, K., Poortman, C. L., & Schildkamp, K., (2021). Understanding sustainable professional learning communities by considering leaders' interpretations and educational beliefs. *International Journal of Leadership in Education*. Advance online publication. doi:10.1080/13603124.2021.1937705

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