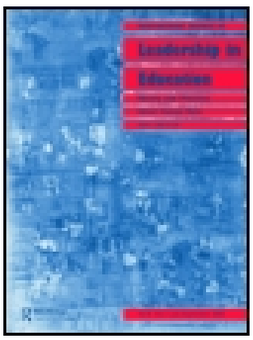

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Understanding sustainable professional learning communities by considering school leaders' interpretations and educational beliefs

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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 sustainability of 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 PLC. 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 sustainable school improvement with PLCs.

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

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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 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., 2020).

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

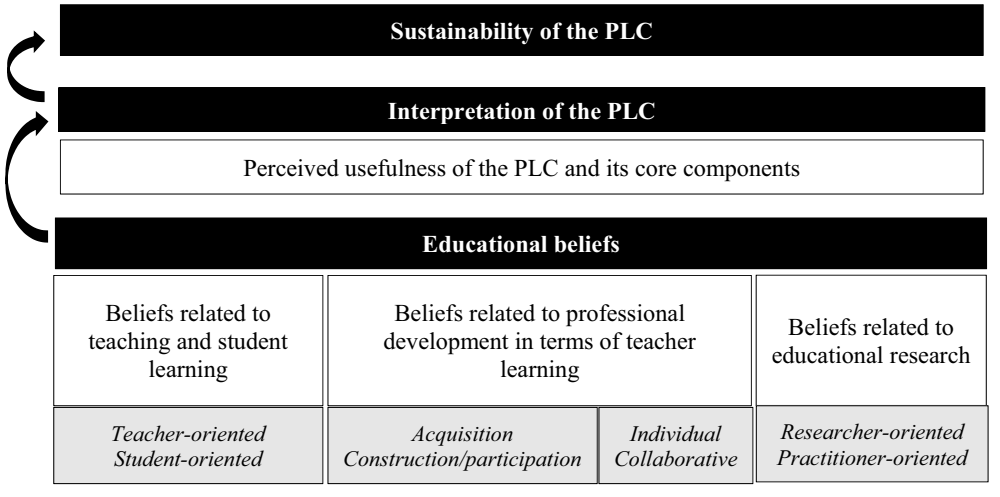

Figure 1. Research model.

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?

Theoretical framework

In this section we will clarify our research model (see Figure 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.

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.

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., 2020).

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).

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.

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 (Sleegers 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.

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; Luft & Roehrig, 2007; Meirink et al., 2009; De Vries et al., 2013). *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 (Meirink et al., 2009; De Vries et al., 2013), 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 sustain the work of PLCs in their school, they must tend to focus on the student-centered dimension of beliefs about teaching and learning.

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 the work of PLCs in their school, their beliefs about professional development must be focused on construction/participation and collaborative learning.

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' (Vásquez, 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 (Vásquez, 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 the work of PLCs in their school, leaders must tend to focus on the practitioner-oriented dimension of educational research.

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).

Participants

Six leaders from two secondary schools participated in this study (see Table 1). Both schools were located in the Netherlands. The school system in the Netherlands is decentralized and there is no national curriculum. Teachers teach toward 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 considered to work sustainably on school improvement, because they started working with the PLC seven years ago. 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.

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

Table 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

[1]The names are pseudonyms

school improvement with PLCs (e.g. Van den Boom-Muilenburg et al., 2020, 2021). 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 (#200,391).

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., 2021). 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.

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.

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 explanatory 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 sustained 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 minimalized 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 sustainability of the PLC at the school. Quotes from the interviews were translated from Dutch into English to illustrate the narrative cases.

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 2 for school A and Table 3 for school E). Finally, overall findings per school are provided.

School A

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

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.

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.

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.

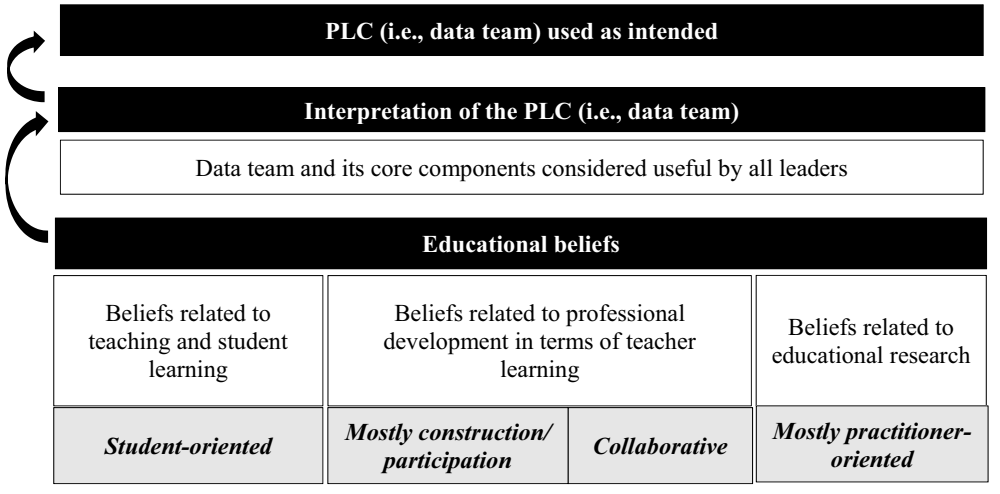

Figure 2. Summary of the outcomes for School A based on our research model.

Overall findings

A summary of the outcomes based on our research model for school A is provided in Figure 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.

School E

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.

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.

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.

Esther. Lesson study was useful for 'working on your professionality, 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 professionality'. 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.

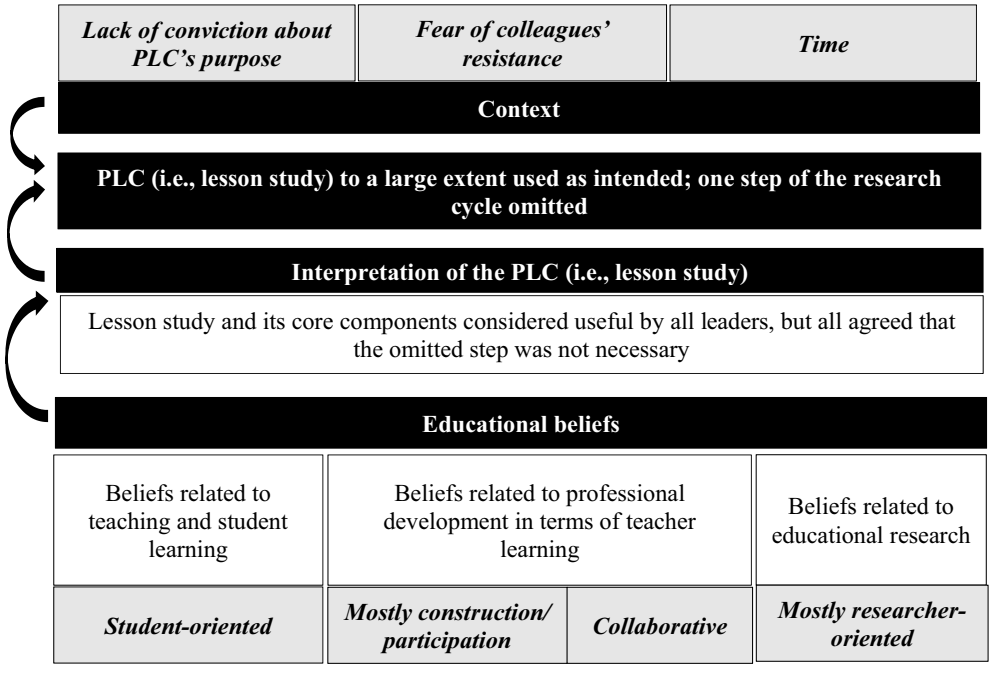

Figure 3. Summary of the outcomes for School E based on our research model.

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.

Conclusion and discussion

In this study, we investigated 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.

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 toward 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.

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 collectivegeneration 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 internalattribution. (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, 2019; Van den Boom-Muilenburg et al., 2020). 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, 2019), 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 preexisting beliefs as a starting point for further extending their knowledge base.

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, 2019; 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; Van den Boom-Muilenburg et al., 2020). 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.

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 toward 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 sustaining 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).

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., 2020), 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 leaders interpreted and used the PLC. Although the context was addressed in the interviews, we did not systematically ask about its aspects. When researching professional development. The focus is often 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.

Note

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

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Appendix

Semi-structured Interview Protocol, Translated from Dutch into English

Leaders' interpretation of (core components of) the PLC[1]
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?