Factors Influencing the Sustainment of Professional Learning Communities: a Multi-Study

Research Synthesis

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Abstract

Research has shown that participation in PLCs can facilitate teachers' professional development, school reform, and students' academic achievements. However, before schools can experience these benefits, PLCs need to be implemented well and sustained successfully. Different factors have been found to affect the development and sustainment of PLCs. The main objective of this review is to provide an overview of factors influencing PLC sustainment, as perceived by educational professionals in primary and secondary education. This review is a mixed-methods research synthesis including 22 qualitative, quantitative, and mixed-methods studies. Data was collected by extracting key sentences summarizing each study's main findings. Through a thematic analysis of the dataset, three overarching themes and eleven subthemes were found: leadership (supportive leadership, shared leadership, and teacher leaders), collaborative culture (trust, collective responsibility, collective inquiry, and motivators), and structural conditions (time, space, monetary resources, and external support). In the discussion, the role of context in sustaining PLCs and possible interrelatedness between influencing factors are discussed, after which several limitations and implications of this review are described.

Factors Influencing the Sustainment of Professional Learning Communities: a Multi-Study Research Synthesis

Teachers play a crucial role in providing high-quality education and preparing students to thrive in a society with a continuous technological and digital revolution (Gomendio, 2017). It is therefore vital for teachers to keep their knowledge base and professional skills up to date through professional development (Gomendio, 2017; Johnson & Templeton, 2010). Professional development for teachers is any activity or process developed to improve or advance their knowledge, attitude, and behavior (Hunzicker, 2011; van Veen et al., 2010). One effective way for teachers' professional development to be addressed is the Professional Learning Community (PLC) (Lomos et al., 2011; Vescio et al., 2008). The PLC is a complex, multidimensional phenomenon (Lomos et al., 2011; Toole & Louis, 2002). The concept originated in the business sector as 'learning organizations', which arose with the realization that working and learning can be complementing aspects in an organization (Walker, 2002; Watson, 2014). With the belief that schools and educational institutions can also be designed and run as learning organizations (Senge et al., 2012), the concept of learning organizations was modified to fit the educational context and became what is now referred to as PLCs (Thompson et al., 2004; Watson, 2014). PLCs strive to develop collaborative work cultures (Vescio et al., 2008), and stem from the belief that when teachers work together, the quality of learning and teaching practices improves (Bolam et al., 2005). Through critical examination of teaching practice, the main goal of a PLC is to meet the educational needs of students and to improve their learning (Toole & Louis, 2002)

There are differing perspectives on the fundamental characteristics and elements of a PLC (Lomos et al., 2011; Stoll et al., 2006). However, there appears to be a consensus that the concept of PLC is comprised of at least five interrelated characteristics, namely: shared values and vision, a focus on student learning, collaboration, deprivatized practice, and reflective dialogue (Lomos et al., 2011; Kruse et al., 1995; Toole & Louis, 2002). *Shared values and visions* are an essential part of the foundation of a PLC (Kruse et al., 1995; Watson, 2014). To sustain an effective PLC, participants need to agree on what good outcomes of education are, and what values to uphold in the process of getting there (Strike, 1999). Without a core of shared beliefs, participants adhere to their own visions and values, and collaboration might lead to misunderstanding, conflict, and interpersonal mistrust

(Kruse et al., 1995). One element the shared vision in a PLC must contain, which is also a PLC characteristic, is a *focus on student learning* (Kruse et al., 1995; Watson, 2014). The purpose of a PLC is to meet students' educational needs and to improve their learning, a shared focus on this ensures commitment from participants to work toward students' success (Watson, 2014). The next characteristic, *collaboration,* is a crucial part of effective PLCs (Kruse et al., 1995; Poekert, 2012). PLCs need to be communities where teachers not only cooperate, which focuses on mutual aid in order to work more efficiently, but also actively co-develop skills, knowledge, and practices relevant to their teaching practices (Ning et al., 2015; Kruse et al., 1995; Poekert, 2012). Furthermore, participants of a PLC need to define and develop their practice in public, also called *deprivatization of practice* (Kruse et al., 1995). Being open about one's teaching practice, through conversation and observation, opens up the opportunity for richer and more meaningful collaboration and the possibility to improve with the help of others (Kruse et al., 1995). The last characteristic is *reflective dialogue,* which is a type of conversation needed in PLCs. Reflective dialogue forms the bridge between shared values and visions, and actually improving teaching practices (Kruse et al., 1995; Vescio et al., 2008). This type of dialogue concerns reflective and in-depth conversations about educational issues (e.g., curriculum, instruction, and student development) and other day-to-day issues, and plays a significant role in identifying and solving concerns that come up (Kruse et al., 1995; Stoll et al., 2006).

Research has shown that participation in a PLC can facilitate teachers' professional development, school reform, and student's academic achievements (Lomos et al., 2011; Stoll et al., 2006; Vescio et al., 2008). However, before the benefits of a PLC can be reaped, it needs to be implemented well and then sustained successfully. A PLC moves through four developmental stages to become fully sustainable, namely, non-initiated, initiation, implementation, and sustainability (Hipp et al., 2008). The process starts with mere awareness of the concept of PLCs with the school organization and staff, then the choice is made to adopt the innovation in the initiation stage, after which the PLC is operationalized and put into practice in the implementation stage (Hipp et al., 2008). A PLC generally moves from the implementation stage to the sustainability stage when it is an established part of the school system and culture, while striving for continuous growth (Hipp et al., 2008). Further it can be stated that for a PLC to be sustained, and effective, it needs to be developed in

all five interrelated characteristics (Bolam et al., 2005; Kruse et al., 1995). However, it is suggested that several factors influence the development of PLCs (e.g., Hipp et al., 2008; Hord, 1997; Kruse et al., 1995). Earlier reviews have already discussed several factors found to hinder and promote successful PLCs, like leadership, school culture, and organizational structures (Ismail et al., 2020; Sai & Siraj, 2021; Stoll et al., 2006). These reviews, however, focused on PLCs in the implementation stage (Stoll et al., 2006), or PLCs in general (Ismail et al., 2020; Sai & Siraj, 2021). A review summarizing studies solely focused on the sustainment of PLCs is yet available. This study is therefore able to fill in a gap in the literature, by providing an overview of factors influencing PLC sustainment, while also providing insights into the process of sustaining PLCs to schools and educational professionals. It is essential to adequately support educational professionals in the process of developing PLCs toward sustainment, since it is found to be complex, thus taking time and effort to succeed (Fullan, 1983; Hipp et al., 2008).

To ensure a complete and thorough overview of factors influencing PLC sustainment, this review includes both qualitative, quantitative, and mixed-method research. The overarching research question that guided this mixed-methods research synthesis was: *What factors do educational professionals perceive to influence the sustainment of PLCs?*

Method

This study is a *mixed-methods research synthesis* (MMRS) (Heyvaert et al., 2013; Heyvaert et al., 2017), taking into account qualitative, quantitative, and mixed-method primary research. The basis of mixed method research is to "combine the strengths of qualitative and quantitative methods by integrating the in-depth descriptions of complex phenomena obtained by qualitative methods and the statistical generalizability of quantitative methods" (Pace et al., 2012, p. 2). By combining qualitative and quantitative research, this review tries to preserve PLCs' complex and dynamic nature as much as possible while presenting findings that can be generalized.

Research Protocol

Inclusion criteria

Multiple inclusion criteria were formulated to determine which studies are eligible for this review. For a study to be included, it needed to research (1) formal, within-school, collaborative

teacher teams in (2) primary and secondary education, (3) which have existed for at least one year. Further, a study needed to focus on researching (4) factors that hinder or promote the process of (5) maturing toward or abiding in the sustainability stage of PLC development.

To ensure included studies discuss a similar construct, each study needed to provide (4) a definition of PLC, and explicitly or implicitly discuss the five interrelated characteristics that PLCs share (Shared values and vision, focus on student learning, collaboration, deprivatization of practice, reflective dialogue) (Kruse et al., 1995). Articles were not excluded when they encompass additional characteristics.

Lastly, included studies are (5) empirical, (6) peer-reviewed, and (7) published in the period between 2010 and 2021. This margin was chosen to limit the scope of this review, and to ensure outcomes are relevant to the context of present-day education.

Search procedure

Search terms were defined to cover the three main topics of interest (Table 1): (1) professional learning communities, (2) factors influencing PLCs, and (3) educational setting. Relevant search terms were determined through an analysis of the literature used in the theoretical framework of this study, after which related synonyms were inquired in online synonym databases.

Since research, regarding the organization of professional learning in schools, varies in terms used to describe PLCs (Stoll et al., 2006; Toole & Louis, 2002), a broad variety of synonyms are included in this category. First, the constructs related to PLCs discussed by Toole & Louis (2002) were gathered (collegiality, collaboration, professional community, discourse communities, teacher networks, democratic communities, and schools that learn), after which additional synonyms were identified in the research presented in the theoretical framework of this review, and research referenced in those studies.

Table 1

Search Terms Used in Search Procedure

Category	Search Terms
Professional learning community	Professional learning communit*, PLC*, Learning Communit*, Collegial*, Collabora*, Professional Communit*, Discourse communit*, teacher network*, democratic communit*, Schools That Learn, Communit* of Practice, Learn* Organization*, Continuing Professional Development.
Factors influencing PLC	Factor*, element*, variable*
	Hinder*, Hamper*, Imped*, Inhibit*, Interfere*, Prohibit*, Disrupt*, Challeng*, Problem*, Issue*
	Promot*, Benefit*, Encourag*, Stimulat*, Support*, Advanc*, Improv*, Facilitat*
School setting	Primary education, primary school*, elementary school*,
	Secondary education, secondary school*, high school*

The identified search terms were applied in the databases of Web of Science and EBSCOhost (Table 2). This search resulted in 3087 unique articles. After deriving the studies, titles and abstracts were screened, leading to the exclusion of 2909 articles. 178 articles were deemed relevant to this research's purpose or needed further analysis to determine their relevance. Full texts for 169 articles were retrieved, for 9 articles the full text was not available and therefore were excluded. The remaining 169 articles were scanned and checked for the inclusion criteria, in a standard order: empirical, target group, duration of PLC, focus on sustainment and influencing factors, definition of PLC, and the five characteristics of a PLC (Kruse et al., 1995). When the article did not meet an inclusion criterium, the screening was stopped, and the article was excluded. This screening resulted in the exclusion of 146 articles (not empirical $n = 18$; review $n = 1$, target group $n = 13$; duration of PLC $n = 27$; focus on sustainment $n = 51$, focus on factors $n = 25$; definition PLC $n = 4$, characteristics of a PLC $n = 7$). During the coding, no additional articles were excluded; therefore the final sample

consists of 22 articles (table 3). An overview of the search process and results are shown in Figure 1.

Table 2

Databases Included in Search Procedure

Search engine	Databases / Disciplines
Web of Science	Education Educational Research, Education Scientific Disciplines, Education Special, Social Sciences Interdisciplinary, Sociology, Psychology Educational
EBSCO*host*	Academic Search Premier, APA PsycArticles, ERIC, Primary Search, Psychology and Behavioural Sciences Collection, SocINDEX

Quality assessment

      To ensure the quality of research included in this review, a quality assessment was performed. Depending on the type and design of research, varying methods of quality assessment are available (Heyvaert et al., 2013; Heyvaert et al., 2017). Since this review comprises qualitative, quantitative, and mixed-methods research, it is important to be able to compare quality assessment scores. Therefore, a more general assessment tool was selected: the Mixed Methods Appraisal Tool (MMAT) (Pluye et al., 2009). The MMAT allows reviewers to assess the methodological quality of studies with diverse designs through one tool. The MMAT has been content-validated (Pluye et al., 2009; Souto et al., 2015), piloted (Pace et al., 2012), and shows sufficient reliability (Pace et al., 2012; Pluye et al., 2009; Souto et al., 2015).

      The MMAT supports the appraisal of five types of studies: qualitative research, randomized controlled trials, non-randomized studies, quantitative descriptive studies, and mixed-method studies (Pluye et al., 2009). The tool consists of two screening questions and five quality criteria per type of study (Appendix A) (Hong et al., 2018). For all included studies the two screening questions were answered positively. On the basis of the five quality criteria, quality scores were calculated [((number of 'yes' responses divided by the number of criteria) X 100)], a higher percentage meaning that a study meets more criteria (Pluye et al., 2009). When a study lacked on a quality criteria, notes were

kept as to why. A summary of the quality scores and additional notes can be found in appendix B. No study scored below a quality score of 60, so no further studies were excluded.
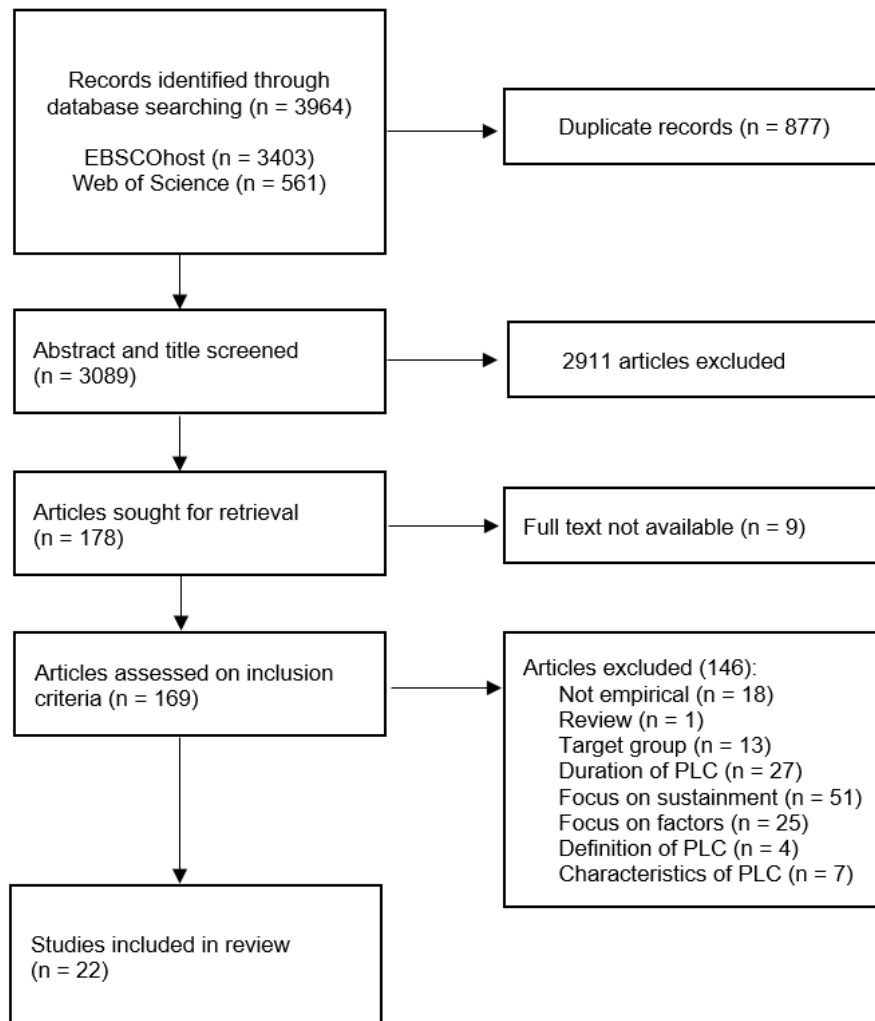
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│ database searching (n=3964) │───────▶│ Duplicate records (n = 877) │
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│ EBSCOhost (n = 3403)        │        └─────────────────────────────┘
│ Web of Science (n = 561)    │
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│ Abstract and title screened │───────▶│ 2911 articles excluded      │
│ (n = 3089)                  │        │                             │
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│ Articles sought for retrieval│──────▶│ Full text not available (n=9)│
│ (n = 178)                   │        │                             │
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│ Articles assessed on inclusion│─────▶│ Articles excluded (146):        │
│ criteria (n = 169)          │        │    Not empirical (n = 18)       │
└─────────────────────────────┘        │    Review (n = 1)               │
              │                        │    Target group (n = 13)        │
              │                        │    Duration of PLC (n = 27)     │
              │                        │    Focus on sustainment (n = 51)│
              │                        │    Focus on factors (n = 25)    │
              │                        │    Definition of PLC (n = 4)    │
              │                        │    Characteristics of PLC (n = 7)│
              ▼                        └─────────────────────────────────┘
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│ Studies included in review  │
│ (n = 22)                    │
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Figure 1. Flowchart of the search procedure.

Data extraction and key sentences

All included articles in this review were coded based on three aspects: (1) general characteristics of the study (author, title, and year of publication), (2) research design (method, instruments, and data collected), and (3) research setting (characteristics of participants and PLCs, and educational setting).

To be able to analyze and compare data from quantitative, qualitative, and mixed-method research, the data collected needs to be converted into either all qualitative or all quantitative data (Heyvaert et al., 2017; Sandelowski et al., 2009). Because the PLC is a complex and multidimensional phenomenon (Kruse et al., 1995; Stoll et al., 2006), it is important to persevere the nuances and

Table 3

Overview of articles included in this review, and themes.

Article	Design	Data collection measures	Educational context	Participants	Country	MMTS Score	Themes		
							Leadership	Collaborative culture	Structural conditions
Ahn, 2017	Qual	Interviews, qualitative survey, observation	Secondary school	1 school: 16 teachers, 3 administrators	South-Korea	100	x	x	
Antinluoma, Ilomäki, Lahti-Nuuttila, & Toom, 2018	Quan	Questionnaire	Primary, lower secondary and comprehensive schools	13 schools: 200 teachers, 11 assistant principals (7 also teachers) 8 principals Total: 212	Finland	100	x	x	x
Bouchamma, April, & Basque, 2019	Qual	Semi-structured interviews	Primary school	6 school principals	Canada	100	x	x	x
Chen & Wang, 2015	Qual	Interviews Secondary: Focus groups, observations, meeting notes, lesson plans, project documents	Senior secondary school	1 team: Principal, director, chief of equipment, 8 teachers	Taiwan	80	x	x	x
Chen, Lee, & Lin, 2016	Quan	Questionnaire	Secondary school	34 schools: 444 teachers	Taiwan	100	x	x	
De Neve & Devos, 2017	Qual	Semi-interviews	Primary school	3 schools: Per school: principal, special needs coordinator, 2/3 teachers	Belgium: Flanders	100	x	x	x

Table 3 (continued)

Article	Design	Data collection measures	Educational context	Participants	Country	MMTS Score	Leadership	Collaborative culture	Structural conditions
								Themes	
De Neve & Devos, 2017	Qual	Semi-interviews	Primary school	3 schools: Per school: principal, special needs coordinator, 2/3 teachers	Belgium: Flanders	100	x	x	x
DeMatthews, 2014	Qual	Interviews	Primary school	6 schools: Principals, assistant principals, instructional coaches, teachers	USA	100	x		
Haiyan & Walker, 2021	Qual	Interviews	Primary school	101 principals	China	100	x	x	x
Jones & Thessin, 2017	Qual	Interviews, document analysis, survey	Secondary school	1 school: 1 principal, 7 PLC leaders and teachers	USA	100	x		x
Leclerc, Moreau, & Dumounchel., 2012	Qual	Interviews, group interviews, observations	Primary school	6 schools: 6 principals, 39 teachers	Canada	100	x		x
Olivier & Huffman, 2016	Qual	Interviews, focus groups	Primary, middle and secondary school	27 schools: 12 principals, 6 central office staff, 3 groups of teachers	USA	100	x		
Owen, 2014	Qual	Interviews, focus groups, school documentation	Primary and secondary school	3 schools: 15 principals and teachers	Australia	80	x	x	x
Owen, 2016	Qual	Interviews, surveys, focus group	Primary and secondary school	3 schools: 3 principals, 15 teachers	Australia	100	x	x	

(continued)

Table 3 (continued)

Article	Design	Data collection measures	Educational context	Participants	Country	MMTS Score	Themes		
							Leadership	Collaborative culture	Structural conditions
Pang, Wang, & Leung, 2016	Quan	Questionnaire	Primary school	10 schools: 387 teachers	China (Hong Kong)	100	x	x	x
Schaap & de Bruijn, 2018	Mixed-method	Questionnaire, observation	Pre - vocational education	3 schools: 3 PLCs, 3-6 teachers per PLC	The Netherlands	100		x	
Wong, 2010a	Qual	Interviews, observation	Secondary school	1 school: 2 PLC, 11 teachers	China	80	x	x	x
Wong, 2010 b	Qual	Interviews, observation	Junior secondary school	1 school: 6 teachers	China	100	x		x
Yin & Zheng, 2018	Quan	Questionnaire	Primary school	1095 teachers	China	80	x	x	
Yuan, Zhang, & Yu, 2018	Qual	Interviews	Secondary school	1 school: 1 principal, 10 teachers	China	100	x	x	x
Zhang, Yuan, & Yu, 2017	Qual	Interviews	Senior secondary school	3 schools: 6 school leaders, 12 teachers	China	100	x	x	x
Zheng, Yin, Liu, & Ke, 2016	Quan	Questionnaire	Primary school	35 schools: 215 teachers	China	80	x		
Zheng, Yin, & Li, 2019	Quan	Questionnaire	Primary school	1082 teachers	China	100	x	x	x

Note. MMTS scores (quality assessment) are further elaborated on in appendix B.

context of the results in each research. Results from quantitative studies were therefore derived as qualitative findings. The method for data extraction was the same for qualitative, quantitative, and mixed-method studies, and was done by acquiring key sentences from each study (as described in Langeloo et al., 2019). The key sentences answered the research question of this review while reflecting the study's primary outcomes. Preferably key sentences were direct quotes from the article; otherwise they were formulated based on information from the results or discussion section. In total, 78 key sentences were extracted, with an average of 3.5 per article.

Thematic analysis

After the data was extracted, the key sentences were put into Atlas.ti (version 9, Windows) for a thematic analysis. This analysis was conducted based on Braun and Clarke's (2012) procedure for thematic analysis. Thematic analysis is a method for systematically identifying, organizing, and offering insight into patterns of meaning (themes) across a dataset (Braun & Clarke, 2012). This method of analysis provides the means to summarize the findings from the studies included in this review into a coherent overview. The process consisted of six steps (Braun & Clarke, 2012); firstly, the data was read through multiple times to become familiar with all the content. Secondly, all information in the key sentences was coded inductively with initial codes. This step resulted in 47 unique codes. Step three consisted of searching for overarching themes by grouping and regrouping codes topically related to each other. In step four, the potential themes were reviewed by checking the themes against the data, to see whether the themes matched the topics in the related studies. Step five consisted of finalizing the borders of each theme by defining their content and producing fitting names. The last step consisted of writing up the themes, found in the results section of this review.

Results

The purpose of the current review was to provide an overview of factors that have been found to play a role in the sustainment of PLCs. Multiple overarching themes and related subthemes were inducted through a thematic analysis of 22 qualitative, quantitative, and mixed-methods studies. These themes are discussed in the following order: Leadership, collaborative culture, and organizational resources.

It is important to note that additional themes were inducted in the analysis but are not included

in this result section. This review is based on the assumption that the five interrelated characteristics by Kruse et al. (1995) (Shared vision and values, a focus on student learning, collaboration, deprivatized practice, and reflective dialogue) are a required foundation to any effective and sustained PLC. Therefore, these characteristics are not considered to be factors influencing the sustainment of PLCs. Accordingly, inducted themes that were found to have substantial overlap with the definitions of the five interrelated characteristics, like shared vision and values (Chen et al., 2016; De Neve & Devos, 2017; Owen, 2014; Pang et al., 2016), are not discussed in this result section.

Leadership

For years research has discussed the importance and influence of school leadership on school organization, culture, and student achievement (Hord & Sommers, 2008; Thompson et al., 2004). Therefore, it was not surprising that leadership was also perceived to be an important factor influencing the sustainment of PLCs in this review. Firstly, three quantitative studies found that leadership practices in general have a significant positive influence on all five interrelated PLC characteristics (Kruse et al., 1995): reflective dialogue, deprivatization of practice, collaboration (Chen et al., 2016), focus on student learning, and shared visions and values (Yin & Zheng, 2018; Zheng et al., 2016). However, other studies were more specific in the type of leadership activities that were perceived to facilitate the sustainment of PLCs. Through further thematic analysis, these activities were divided into two types: supportive and shared leadership. In addition, the role of teacher leadership is discussed as a subtheme to shared leadership.

Supportive leadership

Supportive leadership was perceived, by both school leaders and teachers, to be pivotal to sustaining PLCs, in six qualitative (Chen & Wang, 2015; Haiyan & Walker, 2021; Olivier & Huffman, 2016; Owen, 2014; Owen, 2016; Zhang et al., 2017) and two quantitative studies (Pang et al., 2016; Zheng et al., 2019). The main objective of supportive leadership is to provide PLCs with the conditions to flourish as an effective collaborative team and achieve their goals (Banai & Reisel, 2007; Harris & Jones, 2010; Owen, 2016). With a general focus on the learning and development of both staff and students, supportive leaders try to provide the right amount and type of support needed by a PLC. Through a needs-based differentiation, supportive leaders can aid PLCs in the way most vital

(Bouchamma et al., 2019; Haiyan & Walker, 2021; Jones & Thessin, 2017), continuously providing the measures needed for a PLC to sustain.

There are many ways in which a school leader can support PLCs and their members' needs. However, most can be differentiated into three areas of effect, namely leadership actions that positively influence the cultural, structural, and relational conditions within PLCs (Haiyan & Walker, 2021; Walker, 2012). By supporting these conditions, a school leader can provide an environment in which a PLC can thrive (Haiyan & Walker, 2021; Hord & Sommers, 2008; Stoll et al., 2006). *Cultural conditions* surround the elements of vision, values, and goals; an essential part, and one of the fundamental characteristics of a PLC (Stoll et al., 2006; Kruse et al., 1995). To support these conditions, firstly, teacher participation in the creation of a school vision and shared goals can be promoted. Supporting cultural conditions ensures that there is a shared awareness of the purpose of the PLC, while creating a sense of ownership and reducing conflict and miscommunications during collaboration (Bouchamma et al., 2019; De Neve & Devos, 2017; Haiyan & Walker, 2021; Kruse et al., 1995). Further, a school leader can establish clear expectations for achievements, vision, and values (Bouchamma et al., 2019; DeMatthews, 2019; Leclerc et al., 2012; Olivier & Huffman, 2016; Owen, 2014; Owen, 2016) and reinforce those expectations with modeling (Haiyan & Allan, 2021). For example, Haiyan & Walker (2021) explored school leaders' role in building and sustaining PLCs in Chinese Schools. Throughout 101 interviews with school leaders, the perceived importance of modeling was highlighted. As one school leader stated, "If you are a role model, teachers will follow you" (p. 592). When school leaders want certain beliefs to be mirrored by the PLC, they must visually and concretely demonstrate how important it is to them personally (Hayian & Walker, 2021). For instance, a school leader's willingness to invest, and provide general support toward professional development, can promote the commitment from PLC-members toward this cause.

Structural conditions can be promoted by school leaders by ensuring sufficient resources are provided within PLCs for collaboration practices, teaching practices, and professional development (Haiyan & Allan, 2021; Walker, 2012). Examples of needed resources are time and space to collaborate (Bouchamma et al., 2019; De Neve & Devos, 2017; Haiyan & Allan, 2021; Jones & Thessin, 2017; Leclerc et al., 2012; Owen, 2014; Yuan et al., 2018), financial resources (Bouchamma

et al., 2019; Zhang, 2017), and external support (Leclerc et al., 2012; Pang et al., 2016; Wong, 2010b; Yuan et al., 2018; Zhang et al., 2017). The influence of structural conditions on PLC sustainment, however, was also perceived independently from supportive leadership actions. These findings are discussed in more detail in the theme 'structural conditions' later in this result section.

Lastly, the school leader can implement supportive leadership for *relational conditions* by facilitating collaborative relationships between members of a PLC (Haiyan & Allan, 2021; Walker, 2012). Through managing teamwork (Bouchamma et al., 2019), participating and guiding collaboration processes (Haiyan & Allan, 2021; Owen, 2014), and fostering a positive collaborative culture (Chen et al., 2016; Owen, 2016; Yin & Zheng, 2018; Zheng et al., 2016; Zheng et al., 2019), a school leader can provide a PLC with the relational conditions needed to sustain a PLC. For example, Haiyan and Walker (2021) asked school leaders what they did to facilitate the relational conditions that foster the key characteristics of PLCs. By creating feelings of trust through informal interactions, and expressions of care and understanding, school leaders worked toward harmonious relationships and team spirit. These purposeful actions to cultivate personal relationships, helped the school leaders to strengthen the positive collaborative culture within their PLCs successfully.

Shared leadership

Several studies found that school leaders and teachers perceived distributed or shared leadership to be essential to sustaining PLCs (Antinluoma et al., 2018; Bouchamma et al., 2019; DeMatthews, 2014; Leclerc et al., 2012; Olivier & Huffman, 2016; Owen, 2014). This type of leadership stems from the notion that school leaders do not single-handedly lead their schools to success (Spillane, 2005). In school organizations with shared leadership, it is acknowledged that expertise is dispersed over many people, that collaboration brings about greater change than the sum of individual efforts, and that teacher leadership is an important resource to leadership capacity (DeMatthews, 2019; Harris, 2003). Shared leadership can therefore be seen as a set of practices that can and should be enacted by people at all levels within the school organization, instead of viewing leadership as a set of personal characteristics and attributes of the people at the top (Kouzes & Posner, 2007; Pearce et al., 2009). The school leader plays a crucial role in the promotion of shared leadership in PLCs. Mainly by actively sharing power, authority, and decision making, while promoting and

nurturing leadership in others (Antinluoma et al., 2018; Bouchamma et al., 2019; Olivier & Huffman, 2016).

Shared leadership was perceived to foster the sustainment of PLCs in different manners. Firstly by supporting the development of PLCs as a bottom-up initiative (Chen et al., 2016), since teachers are actively included in leadership and decision-making processes. Actively engaging members of a PLC also allows the school leader to become aware of and better serve teachers' professional needs (Chen et al., 2016), and tap into skills and expertise within the team (Bouchamma et al., 2019; Leclerc et al., 2012). Lastly, sharing leadership can foster feelings of autonomy within PLC-members (Bouchamma et al., 2019; Olivier & Huffman, 2016; Yuan et al., 2018). Through shared leadership PLC-members can be given the opportunities to act upon interests, rather than that their behavior and choices are imposed by higherups, positively influencing their feelings of ownership and engagement (Owen, 2016; Ryan & Deci, 2002).

Teacher leaders.

As school leaders share more of their leadership functions through shared leadership, leadership capacity needs to be developed throughout the school organization (DeMatthews, 2014; Hord & Sommers, 2008). One type of leader that can then come forward is the *teacher leader*. Teacher leaders can be seen as the right hand of the school leader and have been found to help foster the sustainment of PLCs by four studies (De Neve & Devos, 2017; DeMatthews, 2014; Jones & Thessin, 2017; Wong, 2010b). Teacher leadership has three main facets: leadership of students and other teachers, leadership of operational tasks, and leadership in decision making or partnerships (Katzenmeyer & Moller, 2001). In addition to these activities, teacher leaders can support school leaders in enacting school visions and goals, by encouraging other PLC members to focus on the goals at hand, improve teaching practices, and foster a positive collaborative culture (DeMatthews, 2014; Wong, 2010b).

However, before teacher leadership can have a positive influence on the sustainment of PLCs, there are a few considerations. For instance, not every teacher can automatically become an effective teacher leader. Before a leader can be successful, their talents and skills need to be fostered, and professional development encouraged (De Neve & Devos, 2017; Jones & Thessin, 2017). The main

instigators of the development of successful teacher leaders are the school leaders (DeMatthews, 2014; Lee & Ip, 2021). The school leader, therefore, plays a crucial role in promoting the leader's capacity in a school. Through resources for teachers to develop leadership skills, as well as opportunities to exercise those skills, teacher leaders are given the ability to facilitate the sustainment of a PLC (DeMatthews, 2014; Jones & Thessin, 2017; Lee & Ip, 2021).

Collaborative Culture

The collaborative culture in a PLC is an important feature for effective and authentic collaboration between members (Toole & Louis, 2002; Kruse et al., 1995; Yuan et al., 2018). A PLC therefore needs a culture where collaboration is expected, inclusive, genuine, ongoing, and focused on critically examining practices to improve student development (Toole & Louis, 2002). To sustain a PLC this positive, open culture is essential (Yuan et al., 2018; Zheng et al., 2016), however, preserving one is not always an easy feat. Studies included in this review discuss four factors essential to the culture of collaboration within a PLC: trust, collective responsibility, collective inquiry, and motivators.

Trust

A total of nine studies, three quantitative (Chen et al., 2016; Yin & Zheng, 2018; Zheng et al., 2016) and six qualitative (Ahn, 2017; Bouchamma et al., 2019, Chen & Wang, 2015; De Neve & Devos, 2017; Haiyan & Allan, 2021; Owen, 2016), identified the value of trust in fostering the sustainment of PLCs. Trust can be seen as the backbone of sustainable PLCs (Bryk & Schneider, 2003) and reflects "a person's willingness to be vulnerable to another based on the confidence that the latter is benevolent, reliable, competent, honest and open" (Tschannen-Moran & Hoy, 2000, p. 556). When this type of trust is realized, collaborative spaces become safe to work, share and learn together (Ahn, 2017; Cranston, 2011). Without trust in colleagues, members will try to protect themselves from betrayal and harm, diverting energy to self-protection (Tschannen-Moran, 2014). However, when members in a PLC are able to trust, this energy can be put toward fostering authentic and effective collaboration and communication (Cranston, 2011; Zheng et al., 2016), achieving goals, and solving complex educational issues (Tschannen-Moran, 2014). Trust is, therefore, essential when preserving the endeavors needed to sustain PLCs.

The three quantitative studies (Chen et al., 2016; Yin & Zheng, 2018; Zheng et al., 2016) all researched the direct and mediating effect of trust on the five characteristics of PLCs (Shared vision and values, a focus on student learning, collaboration, deprivatized practice, and reflective dialogue; Kruse et al., 1995). Chen et al. (2016), Yin and Zheng (2018), and Zheng et al. (2016) found that teachers' trust in colleagues has significant positive effects on all five PLC characteristics. However, Yin and Zheng (2018) surprisingly also found that teachers' trust in school leaders was significantly but negatively related to these characteristics. Although this was an unexpected finding, it is reflected in earlier research that identified an inconsistent positive, negative or nonsignificant effect of the role of trust in school leaders on the facilitation of PLCs (Yin & Zheng, 2018).

In addition to the significant effects of trust on the sustainment of PLCs, it is important to highlight that these studies found that both trust in colleagues and school leaders also mediate the effects of leadership practices on PLCs (Chen et al., 2016; Yin & Zheng, 2018; Zheng et al., 2016). In this case, too, trust in colleagues positively mediated leadership practices (Chen et al., 2016; Yin & Zheng, 2018; Zheng et al., 2016), while trust in school leaders negatively mediated leadership practices (Yin & Zheng, 2018). This finding indicates that in a school organization with higher collegial trust, and lower trust in school leaders, leadership practices can have a larger impact on PLC sustainment (Chen et al., 2016; Yin & Zheng, 2018; Zheng et al., 2016).

The findings from qualitative research also found that, both school leaders and teachers, perceived trust to be crucial when sustaining PLCs, especially trust in colleagues (Ahn, 2017; Bouchamma et al., 2019, Chen & Wang, 2015; De Neve & Devos, 2017; Haiyan & Allan, 2021; Owen, 2016). In addition, different factors were found to positively influence collegial trust, such as shared norms and identity (Owen, 2016), casual conversations outside of the PLC (Ahn, 2017), and physical proximity between members at their workplace (Ahn, 2017). Whereas selfish and irresponsible behavior negatively influenced the trust experiences between members of a PLC (Owen, 2016).

Collective responsibility

Eight qualitative studies found that, both teachers and school leaders perceived collective responsibility to be an important factor influencing the sustainment of PLCs (Bouchamma et al., 2019;

Chen & Wang, 2015; De Neve & Devos, 2017; Owen, 2014; Schaap & de Bruijn, 2018; Wong, 2010a; Yuan et al., 2018; Zhang et al., 2017). Collective responsibility can be seen as the willingness of teachers to be proactive when working towards the vision and goals of the PLC, especially regarding student learning (LoGerfo & Goddard, 2008; De Neve & Devos, 2017). By accepting collective responsibility, members of a PLC attribute control over the outcomes of their efforts to themselves, and will continue to put effort in sustaining successful practices, and transforming any failures (LeGerfo & Goddard, 2008).

Collective responsibility is perceived to foster sustainment of PLCs through, facilitating effective collaboration (Chen & Wang, 2015; Schaap & de Bruijn, 2018; Wong, 2010a; Yuan et al., 2018), greater involvement of members in PLC activities (Bouchamma et al., 2019), more commitment to project goals and tasks, greater individual responsibility (Schaap & de Bruijn, 2018; LoGerfo & Goddard, 2008), and professional development activities to integrate individual efforts in a collective endeavor (Chen & Wang, 2015).

To foster collective responsibility in PLCs, one element was perceived to be essential: the creation and maintaining of a shared vision and shared goals (Bouchamma et al., 2019; Chen & Wang, 2015; De Neve & Devos, 2017). This ensures the direction of collaborative efforts is clear, and unity can be created within the team. For example, in the study by Wong (2010a), students' examination results were used as a measure for shared goals. Members of this PLC agreed to meet a certain threshold for students' standardized exam scores, this goal helped members to feel collectively accountable for their efforts, and to keep a strong focus on students' academic development.

Collective inquiry

Four studies noted the importance of collective inquiry and shared practices in sustained PLCs (Antinluoma et al., 2018; Chen & Wang, 2015; Owen, 2014; Pang et al., 2016). To improve educational practices, teachers need opportunities to articulate and make explicit, knowledge that is implicit to good practice. Collective inquiry gives them these opportunities through thorough examination and reflection of daily practices (Cochran-Smith & Lytle, 1999). Implicit knowledge is developed through experiences in the classroom, sharing those practices, and critical reflection on those experiences (Cochran-Smith & Lytle, 1999; Owen, 2014). Activities that promote collective

inquiries and the sharing of practices, like debate (Owen, 2014), help acknowledge implicit expertise in a way that helps PLCs to improve their collective teaching practices and work towards achieving their shared goals.

Motivators

Lastly, a few studies found that certain factors help sustain PLCs by making the endeavor worthwhile to the members (Ahn, 2017; Leclerc et al., 2012; Owen, 2016). Through promoting positive features and effects of the PLC, resilience can be built to overcome challenges and flourish as a community (Owen, 2016). These positive features can be promoted by sharing positive emotions and positive accomplishments while also celebrating, being rewarded, and being proud of PLC-members (Leclerc et al., 2012; Owen, 2016). Many situations can be seen as worthy of celebrating. However, one motivating accomplishment that was explicitly pointed out, was the visible improvement of students' behavior and development, through the enhancement of teacher practices (Ahn, 2017; Owen, 2016).

Structural Conditions

To facilitate and sustain a PLC, a flexible and effective organizational structure, and a certain threshold of resources is needed (McLaughlin & Talbert, 2007; Pang et al., 2016). Teachers and school leaders perceived two types of resources that influenced the sustainment of PLCs, namely those in support of primary PLC activities: time (Antinluoma et al., 2018; Bouchamma et al., 2019; De Neve & Devos, 2017; Haiyan & Walker, 2021; Jones & Thessin, 2017; Leclerc et al., 2021; Zhang et al., 2017), space (Antinluoma et al., 2018; Jones & Thessin, 2017; Owen, 2016), and monetary resources (Bouchamma et al., 2019; Owen, 2014; Owen, 2016; Zhang et al., 2017), and those in support of the development of and learning within a PLC: external support (Chen & Wang, 2015; Wong, 2010b; Yuan et al., 2018; Zhang et al., 2017).

The factors of time, space and money, are generally known as scarce resources in educational contexts (Senge, 2012). In this review, these factors were also mainly found to be discussed in light of impediments to the sustainment of a PLC. Developing and sustaining a PLC takes a lot of time and effort, therefore sufficient resources are essential to keep up an effective PLC (Hord & Sommers, 2008; Kruse et al., 1995; Talbert, 2010). One resource that is often perceived to be insufficient is time

(Antinluoma et al., 2018; Bouchamma et al., 2019; De Neve & Devos, 2017; Haiyan & Walker, 2021; Jones & Thessin, 2017; Leclerc et al., 2021; Zhang et al., 2017). To maintain a PLC, every member needs time to execute PLC-activities, while members also need to come together as a team structurally. Considering the already high workload of educational professionals (Senge et al., 2012), ensuring time for PLC-activities can be difficult (e.g. Leclerc et al., 2012; Zhang et al., 2017). There are, however, many strategies through which time can be allocated as efficiently as possible (Hord & Sommers, 2008, p. 56-57). However, the primary solution suggested by the studies in this review is to structurally and explicitly schedule time to collaborate (De Neve & Devos, 2017; Leclerc et al., 2012; Owen, 2014). Depending on the needs and possibilities, PLCs were found to have collaboration time every other day, every week, or every two weeks, with the possible addition of semi-regular supplementary hours (De Neve & Devos, 2017; Haiyan & Walker, 2021; Jones & Thessin, 2017; Leclerc et al., 2012). Although there are various strategies in which sufficient collaboration time can be ensured, the high demands of education (Senge, 2012) will probably always cause difficulties in allocating sufficient time toward PLC-activities.

In line with sufficient time to perform PLC-activities, some studies found that educational professionals perceive an absence of places to work (together) to hinder the sustainment of PLCs (Antinluoma et al., 2018; Jones & Thessin, 2017; Owen, 2016). Not every school has the capacity to provide consistent space for every PLC. In addition, it is stated that a smaller proximity between collaborating members can positively influence their collaboration practices (Ahn, 2017; Chen et al., 2016; Owen, 2014). Sometimes creative measures are needed to solve the issue of space (Hord & Sommers, 2008), for example, working in the music room after school hours, or using teachers' classrooms in rotation.

Lastly, a factor was highlighted that could have both a large positive and negative effect on the sustainment of PLCs, namely monetary resources (Bouchamma et al., 2019; Olivier & Huffman, 2016; Owen, 2014; Zhang et al., 2017). Every school has a budget, which can be used in many ways to promote PLCs and support any needs. For example, a lack of sufficient time for collaboration, due to a large workload, can be helped by hiring additional staff and a shortage of space can be solved by looking for external locations that fit collaborative needs (Zhang et al., 2017). However, as stated by a

school leader in Zhang et al. (2017): "We don't have financial power, so we have no choice". Often school budgets are small, and there are many educational needs, it is therefore not always possible to allocate sufficient funding to PLCs (Zheng et al., 2017; Owen, 2014). Instead of helping to solve problems, monetary resources then might be a disruptor to continuous sustainment.

In addition to the resources that support a PLCs general functioning, some studies also discussed the importance of a structural resource that helps PLCs to develop and grow, namely external professional resources (Chen & Wang, 2015; Wong, 2010b; Yuan et al., 2018; Zhang et al., 2017). The perceived influence of external support like PLC-experts (Wong, 2010b; Zhang et al., 2017), national or international professional partnerships (Wong, 2010b; Zhang et al., 2017), or professional development courses (Yuan et al., 2018) came about in two ways. Firstly, external professional sources can be used to obtain expert advice and guidance in the process of sustaining PLCs (Wong, 2010b; Yuan et al., 2018). When issues came forward that were perceived to be outside of the capabilities in a school organization, external support was able to provide PLCs with the means to overcome them. Secondly, regular exchanges with external professional sources were found to positively influence the collaboration within PLCs (Chen & Wang, 2015; Wong, 2010b; Yuan et al., 2018; Zhang et al., 2017). By stimulating educational professionals' thinking, and bringing in new ideas, external professional resources were able to make PLC members feel more motivated and empowered to be innovative, and further develop their practices.

Discussion

Participation in PLCs can facilitate teachers' professional development, school reform, and students' academic achievements (Hord & Sommers, 2008; Lomos et al., 2011; Stoll et al., 2006; Vescio et al., 2008). However, before those benefits can be reaped PLCs first need to be effective, and then sustained throughout the years. There are five interrelated characteristics essential to any effective PLC (Shared vision and values, a focus on student learning, collaboration, deprivatized practice, and reflective dialogue; Kruse et al., 1995), but an overview of factors influencing the sustainment of a PLC was yet absent. In this review, a mixed-methods research synthesis in combination with a thematic analysis was used to answer the following research question: What factors are perceived by educational professionals to hinder or promote the sustainment of PLCs?

A variety of factors have been found and discussed through three overarching themes: leadership (supportive and shared leadership, and teacher leaders), collaborative culture (trust, collective responsibility, collective inquiry, and motivators), and structural conditions (time, space, monetary resources, and external support). As the results show, these factors were perceived, by both teachers and school leaders, to promote the sustainment of PLCs by enabling their practices. Whether this was through guidance and support through leadership, an open and positive culture where collaboration is facilitated, or through foundational resources needed to sustain PLC practices and development.

However, certain considerations need to be taken into account when interpreting these findings. Firstly, there is not yet a universal definition of a PLC (Hairon et al., 2017; Watson, 2014). For this review, the framework from Kruse et al. (1995) was used, which is based on the belief that PLCs are comprised of five interrelated characteristics: shared values and vision, a focus on student learning, collaboration, deprivatized practice, and reflective dialogue. These characteristics are fundamental, meaning their presence is essential for any PLC to be effective (Kruse et al., 1995). Most conceptual frameworks of PLCs include these five characteristics, however, some studies discuss additional fundamental characteristics (Lomos et al., 2011; Stoll et al., 2006). In some instances, these additional characteristics overlap with the influencing factors discussed in this review. Hord (1997), for example, views supportive leadership, shared leadership, and supportive conditions as essential attributes to a PLC, instead of just influencing factors. Whereas Bolam et al. (2005) also views 'promotion of collective, as well as individual learning' to be one of the key characteristics. Since there is yet conceptual clarity on PLCs, it can be difficult to differentiate between the elements which are the fundamental characteristics of a PLC, and which only influence the sustainment of PLCs. It is therefore possible that when further research determines a universally agreed-upon definition of PLCs, a different variety of factors may be found to influence the sustainment of PLCs. However, both the foundational characteristics by Kruse et al. (1995) and all factors found in this review, are discussed in various studies regarding PLCs (e.g., Stoll et al., 2006; Hord, 1997; Ismail et al., 2020). This demonstrates the relevance of all these elements to the sustainment of PLCs, whether they are considered to be an explicit part of the PLC's definition or not.

Secondly, when analyzing the collected data in this review, the contextual information about the researched PLCs was only considered to a limited extent. By limiting the contextual information of each PLC, like participants, type of education, or geographical location, a generalizable overarching list of perceived factors could be created. However, the PLC is a complex, multidimensional concept, embedded in the context in which it comes about (Kruse et al., 1995; Lomos et al., 2011; Wong, 2010a). This suggests that, depending on the context, the way a PLC is sustained, and how factors foster or hinder that process may differ. However, based on the findings in this review alone, there can be no further elaboration on how context influences the sustainment of PLCs. Nonetheless, when interpreting and generalizing the findings of this review, it is important to keep the potential role of context in mind.

In addition to the relevance of context, it should be highlighted that the discussed influential factors and foundational characteristics by Kruse et al. (1995) are also influenced by this context. No elements related to PLCs are self-contained (Hord & Sommers, 2008; Kruse et al., 1995; Wong, 2010a). Both PLC characteristics and the influencing factors can therefore not be seen as independent from each other. In this review, factors were searched that influence the sustainment of PLCs; however, this relation is not as straightforward as it appears. It is plausible that foundational characteristics, contextual elements, and other influential factors affect the role a particular factor plays in the sustainment of PLCs. Several possible interrelations between factors already came forward in this review. Supportive leadership, for example, is found to have the ability to foster two other influencing factors: trust (Bouchamma et al., 2019; Haiyan & Walker, 2021; Yin & Zheng, 2018; Zheng et al., 2016), and structural conditions (De Neve & Devos, 2017; Haiyan & Walker, 2021; Zhang et al., 2017). This suggests school leaders can not only directly, but also indirectly foster PLC sustainment by encouraging trusting relations between PLC-members and providing sufficient resources. In addition, evidence was found that PLC-members collegial trust mediates the effect of leadership practices on PLC sustainment (Chen et al., 2016; Yin & Zheng, 2018; Zheng et al., 2016). This indicates that in PLCs with higher collegial trust, leadership practices can have a larger impact on PLC sustainment. These findings give insight into some interrelatedness of influencing factors. However, further research is needed to seek out if additional factors are interrelated, and how these

interrelations might influence the effects factors have on the sustainment of PLCs.

Thirdly, in this review, qualitative, quantitative, and mixed-method research was included. Combining these types of research gives the ability to utilize their methodological strengths (Pace et al., 2012), making it possible to preserve the complex nature of PLCs through qualitative results, while also presenting findings that could be generalized through quantitative results. However, there was no complete overlap between the topics that the included qualitative and quantitative studies researched. Four out of the six quantitative studies (Chen et al., 2016; Yin & Zheng, 2018; Zheng et al., 2016; Zheng et al., 2019) included in this review researched the influence of leadership on PLC sustainment, and three through the mediation of trust (Chen et al., 2016; Yin & Zheng, 2018; Zheng et al., 2016). All other discussed factors, excluding leadership and trust, could therefore not be substantiated by any quantitative findings, limiting the generalizability of the findings in this review. However, every factor could be substantiated by at least three qualitative studies, based in different contextual situations. For example, three studies found a perceived influence of teachers' motivation on the sustainment of PLCs (Ahn, 2017; Leclerc et al., 2012; Owen, 2016). As shown in table 3 these studies took place in different geographical locations, in different educational settings, taking into account the views of school leaders, teachers, and administrators. This indicates that the results can at least be generalized to a certain extent.

Lastly, it can not be ignored that the scale of this review, including 22 studies, is relatively small. This issue has two main causes. To ensure the validity of results, studies were only included in this review when there was explicit or implicit overlap with the conceptual framework by Kruse et al. (1995). Several studies only discussed three to four characteristics, and were thus not included in this review. In addition, there is yet a small collection of research focusing on PLCs, specifically in the sustainment phase of development. As such, it can be stated that more research is needed. Based on the limitations of this review, a few suggestions for further research can be made. Firstly, the findings in this review imply that the way factors influence the sustainment of PLCs may depend on the context of that PLC. Further research, however is needed to elaborate on which and how contextual elements possibly influence PLC sustainment, or the way discussed factors hinder or foster that process. Secondly, the findings of this review imply possible interrelatedness between the factors perceived to

influence the sustainment of PLCs. This indicates that the factors might hinder or nurture each other's influences on the sustainment of PLCs. To fully understand the implications of this discovery, however, further research is vital. Lastly, the findings in this review are based on limited quantitative evidence. By not being able to provide quantitative substantiation of the factors, both reliability and generalizability are affected. It is therefore vital for future research to further analyze the influence of factors on the sustainment of PLCs, and to verify the findings in this review.

Implications

There are a few theoretical and practical implications that result from the findings in this review. The first implication concerns research regarding the conceptualization and operationalization of PLCs in different developmental stages. This review specifically focused on factors that influence PLC sustainment, however earlier reviews also looked at these topics for PLCs in the implementation stage (Stoll et al., 2006) or PLC in general (Ismail et al., 2020; Sai & Siraj, 2021). As it turns out, there is a substantial overlap between the factors found to influence the sustainment of PLCs, and those that influence the implementation of or PLCs in general. All reviews explicitly discussed the overarching themes (leadership, culture, and structural conditions), although the subthemes were also sometimes discussed implicitly. Sai and Siraj (2021), for example discuss several features of school leadership that match the supportive leadership discussed in this review, yet this specific term is not used. Stoll et al. (2006), does explicitly discuss several of the subthemes found in this review: shared leadership, trust, and structural conditions. This finding might suggest that there is conformity in the way factors play a hindering or promoting role for PLCs in the process of implementing, sustaining, or PLCs in general. However, other findings indicate differently. For example, the developmental stages of PLCs are said to have distinctly different characteristics. As a PLC moves through these stages, it evolves and changes (Hipp et al., 2008; Owen, 2016). It is therefore expected that the influence of factors on PLCs is not stagnant throughout the developmental stages. The findings from Leclerc et al. (2012) are in line with this hypothesis. In their research, influencing factors are differentiated between those that influence the progression of PLCs, regardless of stage, and ones that are more influential in a specific developmental stage. For example, teacher leaders are perceived to play a bigger role in supporting a PLC's sustainment than supporting a PLC's implementation. Based on these accounts alone however,

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no clear conclusions can be inferences. Further research is needed to see whether and how the findings from this review, and reviews discussing PLCs in other developmental stages are substantially different.

As for practical implications, the findings in this review can provide educational professionals with further understanding of PLCs, and elements that influence them. Through awareness, the overview of factors that are perceived to influence the sustainment of PLCs can be used as a guide to both support PLCs in the general progress toward sustainment and troubleshoot specific sustainment issues. However, a clear blueprint for building a sustainable PLC, is this review not able to provide. PLCs are greatly dependent on the context in which they take place (De Neve & Devos, 2017; Stoll et al., 2006; Wong, 2010a), depending on this context, not only the role a specific factors plays in the sustainment might change, but also the actions and strategies to establish and foster that factor. When using the findings provided in this review, it is therefore important that educational professionals keep the context in which the PLC occurs in mind.

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Appendix A

Quality criteria per category of study design (MMAT; Hong et al., 2018)

Category of study designs	Methodological quality criteria
Screening questions (for all types)	S1. Are there clear research questions?
	S2. Do the collected data allow to address the research questions?
1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question? 1.2.
	1.2. Are the qualitative data collection methods adequate to address the research question?
	1.3. Are the findings adequately derived from the data?
	1.4. Is the interpretation of results sufficiently substantiated by data?
	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?
2. Quantitative randomized controlled trials	2.1. Is randomization appropriately performed?
	2.2. Are the groups comparable at baseline?
	2.3. Are there complete outcome data?
	2.4. Are outcome assessors blinded to the intervention provided?
	2.5. Did the participants adhere to the assigned intervention?
3. Quantitative non-randomized	3.1. Are the participants representative of the target population?
	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?
	3.3. Are there complete outcome data?
	3.4. Are the confounders accounted for in the design and analysis?
	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?
4. Quantitative descriptive	4.1. Is the sampling strategy relevant to address the research question?
	4.2. Is the sample representative of the target population?
	4.3. Are the measurements appropriate?
	4.4. Is the risk of nonresponse bias low?
	4.5. Is the statistical analysis appropriate to answer the research question?
5. Mixed methods	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?
	5.2. Are the different components of the study effectively integrated to answer the research question?
	5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?
	5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?
	5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?

Appendix B

Overview of the Quality Assessment (MMAT) for Studies Included in Review Sample.

	Screening questions		Questions category	Quality score	Notes
Articles	S1	S2			
Ahn, 2017	1	1	1	100	
Antinluoma et al, 2018	1	1a	4	100	
Bouchamma et al., 2019	0*	1	1	100	
Chen & Wang, 2015	0*	1	1	80	Little information and justification is provided for the methodological choices made. For example, a use of surveys, but no indication of their specific content or role in the data analysis.
Chen et al., 2016	0*	1	4	100	
De Neve & Devos, 2017	1	1	1	100	
DeMatthews, 2014	0*	1	1	100	
Haiyan & Walker, 2021	0*	1	1	100	
Jones & Thessin, 2017	1	1	1	100	
Leclerc et al., 2012	0*	1	1	100	
Olivier & Huffman, 2016	1	1	1	100	
Owen, 2014	1	1	1	80	A clear description of the data collection methods is provided, however it is unclear how that data is analysed and integrated.
Owen, 2016	0*	1	1	100	
Pang et al., 2016	1	1	1	100	
Schaap & de Bruijn, 2018	1	1	5	100	
Wong, 2010a	1	1	1	80	No information on the analysis of the data is provided, except "Analysis of the data was an ongoing procedure throughout the data collection phase of the research". How findings are derived is therefore unclear.
Wong, 2010b	1	1	1	100	
Yin & Zheng, 2018	1	1	4	80	It is not clearly stated whether the sample is representative of the target population. However, participants were contacted through nationally obligated PD-activities, and there was a response rate of 73%. This can imply that there is a relatively small chance of a significant mismatch between the sample and target population.
Yuan et al., 2018	1	1	1	100	

(continued)

Appendix B (continued)

Articles	Screening questions S1	S2	Questions category	Quality score	Notes
Zhang et al., 2017	1	1	1	100	
Zheng et al., 2016	0*	1	4	80	No information is provided about the response rate on the survey, or about the extent to which the sample represents the target population.
Zheng et al., 2019	0*	1	4	100	

Note. Screening questions: S1: "Are there clear research questions?", S2: "Do the collected data allow to address the research questions?"; * = No explicit research questions, but a clear purpose for the is study present; Category of questions: 1= Qualitative studies, 2 = Quantitative randomized controlled trials, 3 = Quantitative non-randomized, 4 = Quantitative descriptive, 5 = Mixed methods; Quality score: amount of questions answered positively / total amount of questions.