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ARTICLE



Schools as professional learning communities: what can schools do to support professional development of their teachers?

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ABSTRACT

In order to support professional development of their teachers 14 Dutch secondary schools developed and implemented a series of interventions. The concept of School as Professional Learning Community was used to frame these school interventions. Data were collected through project documents, interviews with school principals and project leaders, group interviews with teachers and focus groups with project leaders. Interventions can be grouped into five clusters: 1) Shared school vision on learning; 2) Professional learning opportunities for all staff; 3) Collaborative work and learning; 4) Change of school organisation, and 5) Learning leadership. Interventions aimed at teacher-leaders, team leaders and school principals were relatively rare. Interventions belonging to the clusters Professional learning opportunities and Collaborative work and learning were the ones most frequently mentioned including formal and informal teacher groups working and learning together. In general, we conclude that the more embedded an intervention was in the organisation and culture of a school, the more sustainable it appeared to be.

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School as learning community; school as learning organisation; school interventions; teacher professional development; secondary education

Introduction

Research on teachers' professional development has generally yielded disappointing results with teacher professional learning activities often being characterised as ineffective (cf., Borko 2004, Timperley and Alton-Lee 2008, Desimone 2009). One of the reasons is that most research on teacher professional development fails to consider how learning is embedded in professional lives and working conditions, acknowledging the context and the situatedness of teacher learning (Opfer and Pedder 2011, Cordingley 2015). A majority of the literature on teacher professional learning focuses on specific activities, processes, or programmes in isolation, leading to lists of findings and recommendations which cannot be replicated by others, are in conflict with findings from other studies or are formulated on a very general level (e.g. Bubb and Earley 2006, 2009, Timperley and Alton-Lee 2008, Cordingley 2015). In their literature review, Opfer and Pedder (2011) propose to reconceptualise research on teacher professional learning to better understand under what condition, why and how teachers learn. These authors argue that current literature on teacher learning focuses too much on individual teachers and individual activities or programs, without inclusion of influences from the institutional or school system context.

The current study aims at providing insights into what interventions secondary schools organise to facilitate, support and enhance professional learning of their teachers.

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School as a learning organisation and teachers' professional learning

In literature on teacher professional learning, many conditions of the school context are described, such as time scheduled for professional learning (Lohman 2006, Bubb and Earley 2009), proximity to colleagues' workspaces and collegial availability and support (Lohman 2006, Bubb and Earley 2009, Cordingley 2015), quality of support, guidance and supervision of learning processes (Louis *et al.* 1996), accessibility of resources and support (Louis *et al.* 1996, Evans *et al.* 2006), monitoring and evaluation of teacher professional learning at a school level (Louis *et al.* 1996, Bubb and Earley 2009) and management support and educational leadership (Giles and Hargreaves 2006; Kwakman 2003). A large body of research exists on the relationship between teacher professional learning and educational leadership indicating that practices of distributed leadership (or one of the related terms as shared leadership, collective leadership, collaborative leadership, co-leadership, professional leadership or teacher leadership) seems to be most favourable for teacher professional learning (Poeckert 2012, Grenda and Hackman 2014).

In their literature review on conceptualising teacher professional learning, Opfer and Pedder (2011) argue that schools need to develop the processes and practices of learning organisations if they are to offer the conditions that optimise and sustain teacher learning. These authors provide a list of very general characteristics of learning organisations, such as a nurturing learning environment across all levels of school, creating systems of knowledge management and examining values, assumptions and beliefs underpinning institutional practices. The concept of learning organisation originates from the work of Senge (1990), who defined the learning organisation as a place 'where people continually expand their capacity to create results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free and where people are continually learning how to learn together' (p.3). In his work, Senge distinguished individual, collaborative and collective aspects of the concept of learning organisation. As learning schools have structures that enable their staff to learn and grow as a professional, operating genuine communities that draw on a shared vision and the collective capacity of their staff in their pursuit of continuous improvement. In the concept of School as Learning Organisation connections between staff's personal and interpersonal learning, and how the school learns collectively, are understood as the key to change and success (Mulford 1998, Giles and Hargreaves 2006).

In a recent literature review on schools as learning organisations, Stoll and Kools (Kools and Stoll 2016, Stoll and Kools 2017) conclude that the perspective of community is the heart of the concept of School as Learning Organisation. After reviewing various perspectives on the concept of learning organisation, they propose an integrative perspective on schools as learning organisations distinguishing seven elements the collective endeavour of a school can be focused on:

- (1) developing and sharing a vision centred on the learning of all students;
- (1) creating and supporting continuous learning opportunities for all staff;
- (2) promoting team learning and collaboration among staff;
- (3) establishing a culture of inquiry, innovation and exploration;
- (4) embedding systems for collecting and exchanging knowledge and learning;
- (5) learning with and from the external environment, and
- (6) modelling and growing learning leadership.

The development of a shared vision (element 1) is the outcome of a process involving all staff and teaching and learning practices are oriented towards realising the vision. Moreover, students, parents, the external community and other partners are invited to contribute to the schools' vision. *Creating and supporting continuous learning opportunities for all staff* (element 2) means

that the schools provide time and other resources to support learning, all new staff receive induction and mentoring support, and professional learning of all staff is promoted. The third element, *promoting team learning and collaboration among staff*, refers to collaborative work and all types of non-intentional learning at the workplace such as collaboration, team learning, peer consultation and advice, reflections and school conditions to allocate time and other resources for collaboration and collective learning. Element 4, *establishing a culture of inquiry, innovation and exploration*, requires staff experimenting and innovating their practice, using inquiry for improving teaching practice and showing an open mind towards doing things differently. *Embedding systems for collecting and exchanging knowledge and learning* (element 5) means that examples of practices are made available to all staff, structures for regular dialogue and knowledge exchange are in place and schools evaluate the impact of professional learning. The sixth element, *learning with and from the external environment*, includes all relationships with the outside world, such as collaboration with parents/guardians and the community as partners in the educational process, collaboration and partnerships with other schools and other educational institutions, and welcoming approaches from external experts. Finally, *modelling and growing learning leadership* (element 7) implies that school leaders model learning leadership, distribute leadership and help other leaders and teachers to grow, and should ensure the establishment of the other six elements of a school as learning organisation.

This study

As part of a national programme of the Dutch government, schools set up strategies to develop as learning organisation and strengthen their culture of professional learning in which teacher collaboration is purposefully embedded in teachers' designing, implementing, evaluating and learning about teaching – replacing the image of secondary schools in which most teachers teach classes behind closed doors, learn about teaching by teaching, and are solely responsible for the learning of their students (Hodkinson and Hodkinson 2003, 2004). Interventions and conditions in school can either hinder or enhance teachers' professional learning and collaboration (Jensvoll and Lekang 2018, Schaap *et al.* 2018, Dogan *et al.* 2019). Yet it is unclear what kind of interventions schools could implement to support teachers' professional learning and collaboration, to establish and enhance a culture of professional learning and collaboration, and to further develop as learning organisation. In line with Giles and Hargreaves (2006) we advocate the concept of School as Professional Learning Community (PLC) to capture individual, collaborative and collective aspects of professional learning in schools, analogous to teacher PLCs in which teachers informally share practices, support each other and collaborate (Little 1990, 2003, Westheimer 1999) or work and learning together for a specific purpose (Lomos *et al.* 2011, Schaap *et al.* 2018, Thornton and Cherrington 2019). The following research question guided our study:

'How can interventions in school be characterised that are aimed at establishing, supporting and enhancing a school as professional learning community?'

Methods

Participants

Data have been collected from 14 secondary schools during three school years. These schools received funding from the Dutch government to set up and extend activities that support their school as a PLC. March 2014 the Dutch Ministry of Education launched a call for proposal to finance activities in school to further develop as PLC. School leaders submitted a proposal to get activities financed for three school years. Of the 18 schools who submitted a valid proposal, 15 schools were granted. One school dropped out half-way the project period because of many changes in the school management. Together with the submission of the proposal, the schools

gave their consent for the current research. In collaboration with each school, a tailor-made research plans have been set up, which was confirmed by the school leader, the financier and the research institute.

The starting position of each school with respect to school as PLC varied. Some schools had already some years of experience with similar activities financed by another national program (LeerKRACHT; school 1, 6 and 13), some schools started up similar activities before the program started (school 2, 8, 9 and 11), some schools were well prepared to start (4, 7, 10) and some schools were at the beginning of the development of activities that support the school as PLC (school 3, 5, 12, 14). The role of the school principal also differed between the 14 schools. In Table 1, we summarised general information about the schools.

Data

During three school years (September 2014 to June 2017), four types of data were collected: 1) project documents, 2) interviews with the project leader and school leader, 3) group interviews with 5 to 8 teachers in school, and 4) focus-group meetings with all project leaders. In Table 2, we summarise the data sources.

The *documents* include a school plan (at the start of the project), three progress reports and one final report. In these documents, each project leader described the current situation with respect to a culture of professional collaboration in school, school interventions to further develop this school culture, and the affordances and obstacles in school related to these interventions. In addition, they rated the level of a school culture of professional collaboration, based on perceptions of their teachers and other documents.

The goal of the first *interview* was to ascertain what interventions were planned with what reasons and with what expected short-term and long-term effects. In the subsequent interviews, the project progress was discussed, the affordances and obstacles in school, and whether the interventions were modified. All interviews followed a similar structure (see Figure 1).

Table 1. Schools that participated in this study.

School	Number of teachers	Number of students	School as PLC
1	180	1630	Principal and project leader directive; school participates in LeerKRACHT ¹
2	100	1300	Principal switches halfway the project; school with a strong culture of sharing knowledge and experiences within school
3	70	720	Directive project leader; new school
4	177	1800	Influencing role of a lector and his network of teacher-researchers on learning culture in school
5	170	2140	Directive project leader, large school with increasing student numbers in a region with shrinking population
6	80	990	School participates in LeerKRACHT ¹
7	123	1700	Principal and project leader started an initiative together to implement learning labs
8	67	700	School prepares to start a school academy ²
9	200	2635	Principal and project leader directive, strong PDCA cyclus ³ , prepares to start a School Academy
10	83	1050	Principal non-directive, but with a lot of ideas, strong induction program for starting teachers
11	195	1130	Principal at a distance, team leaders more directive, teams with a lot autonomy in organisation of education and professional learning activities
12	80	1190	Principal directive, school is in the beginning of the development of a learning culture
13	90	1110	Principal switches halfway the project; school participates in LeerKRACHT ²
14	210	2510	Directive project leader who switches halfway the project; school on a campus with separate buildings for each educational level

¹LeerKRACHT is a national project initiated and financed by the Dutch government to strengthen teachers' professional learning activities. ²School academy represents a formal structure to bring together all professional development activities.

³PDCA = Plan-Do-Check-Act.

Table 2. Data collection.

	Autumn	Winter	Spring
School year 1 (2014–15)			
Documents	September 2014	January 2015	
Interview	November 2014	February 2015	
Group interview			April 2015
Focus group			April 2015
School year 2 (2015–16)			
Documents	September 2015	January 2016	
Interview		January 2016	
Group interview			April 2016
Focus group			April 2016
School year 3 (2016–17)			
Documents	September 2016		April 2017
Interview			April 2017
Group interview			May 2017

A similar procedure was followed with the *group interviews* with teachers, but more focused on teachers' own experiences, activities and ideas. The goal of the first group interview was to identify the teachers' awareness of and involvement in the school interventions. In the second and third group interview teachers mentioned the progress of the interventions and possible enabling and hindering factors.

Focus-group meetings with project leaders were organised twice during the project. Project leaders were divided into three groups. The participants prepared the meetings with a description of one intervention that was successful, one that was less successful, and their perceptions of the impact of both kinds of interventions on teachers. During the 2-h focus-group meeting, these interventions and their impact were discussed.

Analyses

All interviews and meetings were audio recorded and transcribed verbatim; the transcripts were sent to the participants for comments though none of them made any. The data analyses included three steps. In the first step, the interventions were listed that participants indicated in the starting document. This list was elaborated with new interventions and additional information from the documents of year 2 and 3 and from the interviews and focus groups. This step resulted in a list of 145 intervention schools implemented to support their school as PLC.

In the second step, the results of step 1 were further analysed using a two-column method (Argyris 1993). In the left column, the interventions were listed together with a short description; in the right column, the authors included their interpretations, references to data sources, and examples of conditions, barriers, experiences, evaluations and so on. The right-column annotations refer to data from documents, individual interviews, group interviews and focus group meetings.

In the third step, based on the results step 2 the interventions were categorised into the seven elements Kools and Stoll (Kools and Stoll 2016, Stoll and Kools 2017) distinguished in their literature review on schools as learning organisations (see above). The data in the two-column output did not fit exactly with two elements. We decided to merge elements 5 and 6 with element 2 and broaden element 2 with all opportunities for professional learning. Furthermore, the labels of the five remaining elements were adjusted to fit with the descriptions of the listed interventions. This final step resulted in a list of 145 interventions of schools as PLCs that were categorised into five clusters of interventions, which will be presented below. Most interventions are combinations of activities and 90 interventions could therefore be categorised into two or three clusters.

	2 Interventions to reach the School as PLC aims in one year 3 Expectation about the impact of these interventions		6 Interventions to reach the School as PLC aims in three years 7 Expectation about the impact of these interventions	
Before	➡ now	➡ In 1 year	➡	In 3 years
1 School context and prior experiences with PLCs		4 Outcomes that should be reached 5 Critical factors and conditions		8 Outcomes that should be reached 9 Critical factors and conditions

Figure 1. Interview format.

Each pair of researchers analysed the interventions of five schools following the approach described above and cross-validated the results of the analyses of the other researchers of the other schools. Differences were discussed until agreement was reached about the final categorisation of each intervention. This means that the categorisation of the 145 school interventions was agreed upon by the five researchers.

Results and discussion: characterisation of interventions in school

In [Table 3](#), we present the frequencies of the five clusters of interventions for each school. As some interventions were categorised into more than one cluster, the total frequency is higher than 145.

From [Table 3](#) it is clear that interventions that aimed at Promoting professional learning opportunities for all staff (cluster 2) and Stimulating collaborative work and learning (cluster 3) are the most frequent ones participants mentioned. The clusters of school interventions can be described as follows.

Cluster 1 – **Shared school vision on learning**- includes activities that directly or indirectly aim to *develop an explicit school vision* such as implementation of a group teachers with the assignment to document the school vision, study days or information days with a presentation and

Table 3. Frequencies of the school interventions.

School	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	N
1	1	5	5	2	1	8
2	2	10	8	5	2	13
3	1	3	4	3	3	5
4	2	6	2	0	3	10
5	3	7	5	1	4	11
6	4	6	5	2	0	12
7	1	11	11	0	0	11
8	6	2	2	2	3	13
9	4	6	6	5	4	15
10	0	7	4	1	0	9
11	4	6	5	3	1	11
12	3	5	6	2	3	13
13	2	2	3	3	0	8
14	2	5	5	0	2	6
Total	35	81	71	29	26	145

Note. Cluster 1 = Shared school vision on learning; Cluster 2 = Professional learning opportunities for all staff; Cluster 3 = Collaborative work and learning; Cluster 4 = Change of school organisation; Cluster 5 = Learning leadership. N= number of interventions in school.

discussion of the vision of the school, and activities such newsletters, websites and video clips to communicate the vision of the school. Indirect activities relate to how the school vision has been included in *HRM policies in school*.

Cluster 2 – **Professional learning opportunities for all**- includes activities that aim at promoting learning opportunities either in school or outside school (e.g. workshops and masterclasses at the university). The school-based learning opportunities are either *work-based* (e.g. mentoring and coaching newcomers, peer review) or *intentional learning* (e.g. workshop organised by colleagues in school).

Cluster 3 – **Collaborative work and learning**- includes all kinds of activities that promote teacher collaboration and connect teachers' work and professional development. Some activities emphasise the *shared work of teachers* (e.g. team teaching, collaborative action research), others stress *collaborative learning* (knowledge networks, book clubs, learning labs). A third type of activities relate to the facilitation of *working and learning together* (e.g. study days, knowledge café).

Cluster 4 – **Change of school organisation**- refers to activities that aim at *changing existing ways of organising schoolwork, professional development and meetings* including organising work in teams and departments, redesigning the workplace and rescheduling meetings. The implementation of a School Academy was the most frequently mentioned change.

Finally, cluster 5 – **Learning leadership**- refers to activities that strengthen leadership, of either *school leaders* (team leaders, school management or school principal) or *teacher leaders*. Interventions characterised by this element were the least frequently mentioned.

Shared school vision on learning

Based on the development of their school vision, schools can be clustered into three groups, varying in the degree a school has developed as PLC. The first – small-group of schools just started to develop a shared vision on learning and teaching and used the current project as a trigger to set up activities to speed up the process. Activities were the start of a 'writing group' or advisory board of teachers with responsibility for this process, and scheduling the development of a school vision on regular staff and school meetings or study days. A second group of other schools had already (re)developed a printed school vision, but still had to implement it in regular school practices and HRM policies. Activities of these schools were mainly related to communication of the vision at school meetings, in newsletters and on websites. These schools started to pay attention for the school vision in individual interviews, which meant that teachers would be

accountable for their contribution to the vision and how they applied it in practice. Finally, a third group of three schools already managed to implement their school vision on learning and teaching in their school practice. This became evident from the interviews with the teachers. Activities of these three schools focused on improving the link of the school vision with HRM policies (individual interviews and staff review) and the Plan-Do-Check-Act (PDCA) cycle. In school 11, the redevelopment of a school vision on teaching and learning even resulted in a new school organisation with a focus on autonomy of teacher teams organising their teaching and professional learning together. In the interview at the beginning of the project, the school's project leader mentioned that

... the transition towards a new organization started in 2009 with a revised school vision that good quality teaching is a result of teacher collaboration, not of individual expertise per se. All kinds of evaluations amongst our teachers and parents showed that teachers were not satisfied with their work and that their engagement with their colleagues and school in general was low. The culture in school was too individualistic, a more collaborative culture was needed. [project leader school 11, interview 1].

The development and implementation of a shared vision on learning and teaching in school appeared to be a slow process as most schools did not make much progress during the project. In general, the lower the degree of development, the more progress schools made during the project. The few schools which just started to develop a vision at the beginning of the project, communicated about their vision at the end of the project in regular school meetings and study days. To act as a PLC a school needs a shared vision on teaching, learning and development and about what goals should be pursued in this respect. A shared school vision is the equivalent of a shared goal, which is a core feature of more mature and institutionalised forms of teacher PLCs (Lomos *et al.* 2011, Admiraal and Lockhorst 2012); without a shared goal a PLC cannot develop (Bellah *et al.* 1985, Admiraal, Lockhorst and Vander Pol 2012).

Professional learning opportunities for all staff

Except for one intervention, activities in this category refer to the support of professional learning of the teaching staff. The exception was a learning lab of team leaders, which will be addressed with cluster 5 Learning leadership. Interventions of this cluster referred to be work-based learning (learning directly related to teachers' work processes), intentional learning organised in school and intentional learning organised outside school.

Work-based learning activities included sharing knowledge and experiences amongst colleagues, in some cases guided by a coach from outside school. A related intervention was mentoring and coaching newcomers. Teachers who started in school (either starting teachers or experienced teachers from other schools) were mentored during an induction period of one or 2 years by a colleague (who was called buddy, mentor or coach). This kind of induction programs appeared to be quite common in the schools of this study. In a group interview, a teacher of school 10 mentioned about their induction program:

Newcomers are noticed, intensively guided in their new job. This helps them to teach with confidence, giving them a secure base. A mentor visits their classes and give them feedback, about aspects they probably did not noticed themselves. They receive tips and tricks. But most importantly, the newcomers always have someone to go to, a sparring partner, but also someone to blow off some steam. Actually, it is not a new initiative; it was already part of the learning culture in this school. [teacher from school 10 in group interview]

A third group of interventions included peer observation and peer review: teachers who observe each other's classes, reflect together on these classes and provide peer feedback. In some schools, teachers should account for peer observation and peer review in their individual interviews with their supervisors. Generally, work-based learning activities started up slowly and were difficult to maintain; continuous support was needed. This was especially the case for activities that were not

integrated into existing formal procedures in school: teachers had trouble with planning to meet each other and to observe lessons as they taught at the same times and no meeting time was scheduled. In an interview, school leader of school 2 mentioned;

Peer observation is not a focus we choose in our school, mainly because of time. Teachers are already busy and they asked themselves whether it pays off. Do teachers learn from it and does it help them to improve their teaching? Teachers are curious and they have positive attitudes towards peer observation, but if it is not well organized, they just do not do it. [school leader of school 2 in interview 3]

The formally introduced induction programs were more facilitated with possibilities to observe teaching and meet each other. For these types of work-based learning activities, conditions of time and resources, commonly mentioned as essential conditions for teachers' professional development (c.f. Zwart *et al.* 2008, Zwart, Smit and Admiraal 2015), seem to be crucial as formal structures are mostly absent. Although proximity to workspaces and collegial availability and support are core features of effective professional learning (see, e.g. Cordingley 2015), the informal and work-based character of learning might also have some repercussions.

Intentional learning – activities with the primary intention to learn from (Bereiter and Scardamelia 1989) – consisted of workshops, masterclasses and courses organised by institutions outside school. This represents the traditional model of institutional supply of professional development for teachers (Opfer and Pedder 2011). In some schools, this supply of professional development was partly organised through the *School Academy*, which also offered workshops provided by teachers who teach their colleagues (see also cluster 4. Change of school organisation). The more professional development activities were embedded at the school level in, for example, a School Academy or a school policy plan, the more sustainable their impact seemed to be. This institutional embedding of teacher professional learning activities can improve the essential conditions for effective learning such as time scheduled for professional learning, quality of support and guidance of learning processes, availability of resources and support and management support and educational leadership (Louis *et al.* 1996, Zwart *et al.* 2008, Zwart, Smit and Admiraal 2015).

Collaborative work and learning

Interventions categorised in this cluster show an overlap with interventions that are mentioned with the cluster 2 Professional learning opportunities. Two types of collaborative activities that were mostly focused on teachers' work were peer observation and review (already described above), and team teaching. Some schools had set up a pilot with team teaching with teachers from one discipline or subject domain. One school moved to another building and restructured the physical space to support collaborative work of teachers of each domain and team teaching with teachers preparing, teaching and evaluating their classes together.

Additionally, knowledge networks existed in all schools and differed in the level of formal organisation. In all schools, teachers or teacher teams had relationships with teachers in other schools and from the university, which allowed them to share knowledge and experiences, attending workshops and masterclasses and good practice days. Three types of knowledge networks had a more formal organisation. First, some teacher groups functioned as a *PLC in school*. They collaboratively designed educational materials for their school subject, studied literature, shared knowledge and experiences about a particular topic, performed collaborative action research, and so on. These teachers were also involved in networks with teachers from other schools, organised by one of the schools or a teacher educational institution.

Second, some schools have a *Knowledge network led by a lector* (who is appointed at a university). Generally, this kind of network consisted of two or three groups of teachers in school who shared knowledge and experiences, studied literature, and carried out Self Study, action research or other types of teacher research (c.f., Admiraal, Smit and Zwart 2014). Progress in this lector-led networks seemed to be heavily dependent on the efforts of the lector. The

difference between both types of networks is that PLCs are more work-based and lector-led knowledge networks are more aimed at teachers' professional development.

Third, *Learning lab* is a kind of network with an aim that lies between PLCs and lector-led networks. In school 7, learning labs (for two school years) and mini-learning labs (for one school year) were organised. In these learning labs, teachers learned and worked together about a particular topic such as adaptive teaching, providing feedback, and game-based learning. In each lab, teachers worked in regular meetings with a buddy on one of the topics, studied literature, exchanged experiences, and set goals they would like to work on in the current school year. One of the learning labs was about Physical Education (PE). In a group interview, a PE teacher from school 7 reported:

Last year our PE team leader suggested to start our own learning lab with PE teachers. We started with a list of what we could do together. As PE teachers, we teach two or three student groups at the same time with a focus on one group. So, we wanted to examine how we could have more control on the physical activities of other two student groups. We asked two educators from the PE teacher education in the Hague to join our meeting, one to mentor and one to have some input on "play" as part of PE. We video-taped some classes, met four times, discussed the videotapes and shared experiences. We became more aware of how the main activity and ancillary activities could be better adjusted to one another. [PE teacher from school 7 in group interview]

All schools scheduled school meetings, study days, knowledge cafes and 'pizza evenings', either within the framework of the more formally organised groups mentioned above or for all staff in school. In these meetings, teachers discussed the school vision, shared readings and educational materials, presented outcomes of their action research, and so on.

In this study, teachers groups working and learning together mainly matched with the third type of PLCs distinguished by Little (1990): joint work; the other two types (Sharing practices and Aid and assistance) are less found. The importance of collaborative work and learning for a culture of learning in school is confirmed by Admiraal, Kruiter and Lockhorst. et. al., (2016). In their previous research on affordances of teacher professional learning in secondary schools, these authors report that teachers and school managers mentioned as the main affordance an open, but critical way in which teachers share their practices, collaborate and reflect upon their teaching practice. They indicated that collaborative practices appeared to underlie many interventions in school that were supposed to stimulate teachers' professional learning.

In most teacher groups, teacher research was not mentioned as a key activity. Giles and Hargreaves (2006) and Thornton and Cherrington (2019) emphasised teacher research – in addition to collaborative work and learning – as a key component of teacher PLCs in school. They described teacher research as the collection and use of assessments and other data to inquire into and evaluate progress over time. This means that PLCs can be understood as a way to support teacher research exceeding teachers' work as evidence-informed (using scientific literature for teaching), evidence-based (analysing data for teaching) and colloquial evidence (using expert knowledge for teaching; Voogt *et al.* 2012). Examples of teachers collaboratively examining teaching and learning are Teacher design teams (PLCs that collaborative design and redesign their teaching; Handelzais 2009), Data teams (PLCs that learn to use data to examine and improve the quality of education; Hubers *et al.* 2016), Lesson study (PLCs that design and implement an innovative lesson series and observe, evaluate, reflect and redesign this lesson series starting a new cycle; Fernandez and Yoshida 2004, Bocala 2015), and forms of action research such as Collaborative Action Research (Harding and Haven 2009) and Participatory Action Research (Trauth-Nare and Buck 2011). What these PLCs have in common is that they refer to teachers' collaborative work and learning on how to improve teaching practice based on assessments and evaluations. An explanation for the lack of teacher research in our study might be that schools did have some teacher groups doing research, but that these groups were not yet well integrated in the interventions of Schools as PLC.

Change of school organisation

Interventions that brought about changes in school organisation range from minor changes in regular meetings to major changes that organised both teachers' learning and work in a different way. Schools reorganised study days, staff meetings and meetings with team and departments to support teachers' discussion of the school vision, their collaborative work on a particular project or on design of educational materials, or their evaluation of classes. In general, these changes were minor and easy to implement, but they were not sustainable; after some time, regular meetings had their regular agendas back.

Changes in teachers' *work* refer to (1) integrating peer observation and review into the system with yearly individual interviews with teachers and (2) (re)organising the school structure with teams, sections and/or departments. In two schools, peer observation and review – already mentioned as part of the elements Professional learning opportunities and Collaborative work and learning – became a mandatory activity that was discussed in the yearly individual interviews. Teachers had to show that their classes were observed and debriefed, and that they themselves observed and reviewed classes of their colleagues. In school 2, the team leader observed and reviewed classes. In both schools, teachers indicated that peer observation and review were informative, but difficult to schedule because teachers had to teach at the same times. Class observation and review by the team leader was valued negatively as teachers mentioned that they felt supervised and did not learn much from it.

A second way interventions changed the school organisation refers to the introduction of another work organisation in three schools through teams, clusters, sections and/or departments. Accompanying this organisational change, management responsibilities, collegial collaboration and meetings altered. With this reorganisation of the school structure, schools aimed at stimulating teacher collaboration (in class preparation, teaching and class review), making meetings more directly relevant for teachers' work and creating shorter lines of management responsibilities. This kind of changes were laborious but seemed to have a sustainable impact. The project leader of school 11 who related the school vision to changes in the school organisation (see quotation under cluster 1 Shared school vision on teaching and learning) mentioned:

The most important intervention in this project was a change towards working in clusters of school subjects. This change was based on our vision that teaching improves when teachers work and learn together. In these clusters, teachers of the same cluster of school subjects design their pedagogy and teaching materials, evaluate their teaching and make plans to improve their teaching. This change meant that all teachers were required to change their work process, which also meant that direction and leadership was needed to some extent. [project leader school 11 in final interview]

Two types of interventions included changes in school organisation to structurally strengthen teachers' *professional learning*: 1) school-wide introduction of PLCs, learning labs or knowledge networks and 2) School Academy. The PLCs, learning labs and knowledge are described above (see Cluster 3 Collaborative work and learning). In schools with a school-wide introduction of the teacher groups, working procedures were more formalised with a work plan and yearly evaluation for each group, compared to teacher-initiated PLCs. Some schools started a School Academy; some prior to the project, others during the project. In a School Academy, a school brought together all activities that aimed at the professional learning of their teachers. These activities could be course activities such as workshop and masterclasses led by an educator from either inside or outside the school, meetings to share knowledge and experiences, reflection sessions, and train-the-trainer sessions for coaches and mentors in school. In general, a School Academy started with learning activities that were organised internally in school and was stepwise extended with new learning activities and course activities led by external partners.

Activities related to this cluster of Change of school organisation relate to the school level factors Opfer and Pedder (2011) distinguished in their review of conceptualising professional learning. Norms and values in schools as well as their structures and practices both enable and

constrain teachers and teacher learning (Pedder 2006). Opfer and Pedder (2011) listed a number of processes and practices that promote both organisational and individual learning, such as nurturing a learning environment across all levels of the school, using self-evaluations as a way of promoting learning, examining practices and beliefs via reflection and research, and creating systems of knowledge management. School-wide implementation of teacher PLCs and the formation of a school academy can be understood as positive examples of beneficial school organisation factors.

Learning leadership

Two types of interventions can be distinguished in this cluster: activities for team leaders and principals, and for teachers as teacher-leaders. Interventions of the cluster learning leadership were the least frequently mentioned. Activities aimed at school principals and team leaders only seem to be successful if these activities were embedded in a wider plan of changes in school. Then, team leaders attended workshops and lectures, mostly outside school, in order to support school policies and organisational changes. In school 7, which structurally implemented learning labs in their school, team leaders together with the school principal started a learning lab about leadership issues. Although the learning labs with teachers had a quite sustainable impact, this learning lab with team leaders was not perceived as very successful: some team leaders dropped out and their meetings faded. As with other the cluster of activities, learning activities for school leaders should also be embedded in the school culture and organisation, which is confirmed by, for example, Rodriguez-Gomez *et al.* (2019).

Interventions with teacher-leaders -like the activities with team leaders – were also rare. One activity included the training of teachers as coaches of newcomers and starting teachers. This short training had a sustainable impact as the teachers coached a newcomer for 1 or 2 years directly after their training. In other activities, teachers were asked to take up project leadership by their school principal. One example was the co-ordination of the activities of the School Academy. In this way, teachers obtained an active and directive role in their school organisation, mediating between teachers and school principals. This kind of teacher leadership – also called distributed leadership – has been found to be positively related to teachers' professional development as well as the school effectiveness in terms of learning outcomes (Harris 2003, Derrington and Angelle 2013). Killion and Harrison (2017) conclude that teacher leadership is the key to contribute to the development of the collective capacity of schools.

The low frequency of interventions directed at team leaders and principals in the current study contrasts the findings of Vanblaere and Devos (2018), who carried out a questionnaire study with 248 teachers from 62 departments of 32 secondary schools. They conclude that departmental leaders who focused on facilitating and stimulating teacher collaboration enhance teachers' feelings of shared responsibility for the quality of teaching and learning in their school. The authors also argue that more attention should be paid to the selection of departmental leaders with the ability to stimulate teachers' collaborative work and learning as the most important criterion.

Concluding remarks

The interventions 14 secondary schools implemented to establish, support and further develop as PLC can be characterised by activities in five clusters: 1) Shared school vision on learning; 2) Professional learning opportunities for all staff; 3) Collaborative work and learning; 4) Change of school organisation, and 5) Learning leadership. Interventions aimed at teacher-leaders, team leaders and school principals were relatively rare. Interventions in the elements Professional learning opportunities and Collaborative work and learning were the ones most frequently mentioned. Peer observation and review – which receives a lot of attention in secondary schools in the Netherlands – was laborious to organise and difficult

to sustain. The sustainability improved by integrating peer observation and review in the yearly individual meetings, although this had negative consequences for teachers' appreciation of the activity. Teacher groups that were structurally embedded in the school organisation were appreciated for their link between work and learning. Examples are professional learning communities in school, knowledge networks led by a lector, and learning labs, all combining professional learning and teacher work. In general, we can conclude that the more embedded an intervention is in the organisation and culture of a school, the more sustainable impact it has, moving schools towards a culture of professional learning and collaboration.

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