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The (in)direct effect of student population's Socio-Economic Status on the amount of Collaborative Professional Development among teachers in Dutch Primary Schools

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Foreword

Before you lies the master thesis "The (in)direct effect of student population's Socio-Economic Status on the amount of Collaborative Professional Development among teachers in Dutch Primary Schools". The master thesis is written to fulfill the graduation requirements of the master Educational Science and Technology, at the University of Twente.

During the process I truly experienced the highs and lows of writing a master thesis. The establishment of the final research question was a challenge, and asked a lot of thinking and trial-and-error to find an exact terminology. However, answering that same question was the real challenge. In the process of answering the research question, I had to train myself in using a data program I had not worked with before. I experienced how a magnificent and challenging coding program, once I knew how to gain output, can truly be fun and interesting. It even made me dance a little at some point.

I would like to thank my supervisor, dr H. Luyten, for your excellent guidance and support during this process. Your straightforward feedback and genuine guidance have thought me valuable lessons. You made me understand that struggles are part of the process. I also want to thank Dr. M. van Geel for your guindance in finding a suitable research subject and assigning me to dr. H. Luyten.

Finally, I would like to thank my family and friends for being there. Always.

Tessa Rouwenhorst,

Apeldoorn, may 31, 2023.

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Abstract

Studies from TALIS on collaborative teacher learning showed that teachers in schools with a low level of low-SES students are less often involved in collaborative professional development than teachers of schools with a high level of low-SES population (OECD, 2020). With the achievement gap between high- and low-SES students, attention should be paid to ensure in educational quality. A way to do so is to research the collaborative professional development among teachers in high & low-SES schools, and find out what lies at the foundation of this collaborative professional development (Torff & Sessions, 2009).

In this study, secondary data from TALIS 2018 is used to answer the question how collaborative professional development is realized in Dutch primary schools with students from different levels of socio-economic status. An exploratory factor analysis was conducted and produced two latent variables, collaborative culture and contrived collegiality. These were used in Structural Equation Modelling.

The effect of contrived collegiality on collaborative culture shows the central role of collaborative culture as a predicter for the amount of collaborative professional development. This indicates that there is a potential for school leaders and teachers to invest and stimulate collaborative culture in schools in the Netherlands. The need for contrived collegiality as the basis of collaborative professional development is worth to study. Since the present study showed that teachers in schools with low levels of low-SES students are less often involved in contrived collegiality, a qualitative study could be performed to research the reasons why. Is that because they work with a less demanding population, or is it because they are more experienced or better performing teachers?

Keywords:

Collaborative professional development; contrived collegiality; collaborative culture; socio-economic status;

Introduction

One way to improve student achievement is by improving teacher qualities. In recent times collaboration between teachers is considered as an important aspect of enhancing teachers' competences. Sharing ideas, experiences, resources, feedback and supporting each other improves teacher learning and enhances the quality of teaching practice (Goddard et al., 2007; Meirink et al., 2007; Woodland et al., 2013). When it comes to collaborative professional development (CPD), teachers share obligations, values and involvement in shared teaching practice to promote student achievement and professional development of the teaching staff (Achinstein, 2002; Chan & Fai Pang, 2006; Clement & Vandenberghe, 2000; Kruse, 1999).

Talis

Every three years, the Organization for Economic Co-operation and Development (OECD) initiates an international survey for education. The Teaching and Learning International Survey (TALIS) is conducted to gather data on teachers, education and policies all over the world. With TALIS 2018 results, the importance of providing support activities to mentor novice teachers by school leaders or colleagues was highlighted. TALIS questioned teachers about collaborative professionalism and the way teachers and other educators work together to pursue challenges in work. They found that 44 % of the teachers participated in this form of professional development (OECD, 2020). Teachers in schools with a high socio-economic status (SES) population overall support professional development (Torff & Sessions, 2009), but studies from TALIS on collaborative teacher learning showed that teachers in schools with a high-SES student population are less often involved in collaborative professional development than teachers of schools with a low-SES student population. With the achievement gap between high- and low-SES students, attention should be paid to ensure in educational quality. A way to do so is to research the collaborative professional development among teachers in high & low-SES schools, and find out what lies at the foundation of this collaborative professional development (Torff & Sessions, 2009).

Socio-economic status

It is regularly concluded that schools with a low level of low-SES students attract more experienced and better-performing teachers, leaving less experienced and proficient teachers in schools with a high level of low-SES students (Clotfelter et al., 2006; Darling-Hammond, 2005). Experienced and better-performing teachers are less dependent on colleagues and cooperation. They are autonomous and self-sufficient. They are confident enough to take the time and space to experiment, experience and learn from their mistakes. As Snoek and van Rossum (2017) show, professional growth and confidence as a teachers comes with experience. Less experienced and proficient teachers have basic information about children, curriculum or schools, and often experience stress and professional loneliness (Darlin-Hammond, 2005; Snoek & van Rossum, 2017). They are less confident, and rely on their colleagues for input and association. This could explain the pattern that collaborative professional development is more applied in schools with a high level of low-SES students.

What helps explain the paradox that teachers in schools with a high level of low-SES students are urged to collaborate more since their work environment is more demanding. A more demanding work environment in education could be explained by social factors and socio-political contexts (Hargreaves & Dawe, 1990). Social factors encompass group potency and group cohesion. Teachers in schools with a high level of low-SES students do experience that their students often are affected by a negative selfullfilling prophecy. Where students' results are failing because of this prophecy, it's harder for teachers to remain having high expectations of their students (Rubie-Davies, 2010). The Pygmalion Effect, where the teachers' expectation are translated to a teachers' direct and indirect communication, could result in a lower group potency. Also, the socio-political factors such as (the lack of) parents' interest in their child's education and focus on early employment instead of pursuing educational dreams do create a more demanding work environment. In contrary, a more demanding work environment could be experienced by teachers as enjoyable when there is a psychologically safe environment, or the feeling of 'being in it together' during tough times.

Collaborative Professional Development

Collaborative professional development is grounded on the assumption that every school contains experts and experienced teachers with a range of (tacit) knowledge and experiences that could be shared. Nonetheless, teachers do not collaborate 'just because'. Shatzer et al., (2013) show that the amount of collaborative professional development can be influenced by a schools' collaborative culture. Sharrat & Planche (2016) and Shakenova (2017) state that a collaborative culture empowers collaborative work and learning by increasing commitment to co-learning and supporting the learning of others 'just because we do it like this'. The warm, respectful relationships among teachers promote open discussions and solutions. In this study we will focus on these two contextual factors that could explain the basis for collaborative professional development in relation to the school's population. Findings from OECD (2020) and Rubie-Davies (2010) show that teaching in schools with a low-SES population is more demanding on social and educational levels. Therefore the findings from the OECD (2020) of higher amounts of collaborative professional development among teachers in schools with a low-SES population could be explained by a collaborative culture. Or, the feeling that 'we're all in this together' (Johnson, 2003). Another factor could be the need for formal collaborative learning in schools with a low-SES population to ensure educational quality progress, which Hargreaves (1992) called contrived collegiality. This type of formal collaboration among school staff is administratively regulated, compulsory, implementation orientated, predictable, and fixed in times and place. Reasons to implement formal collaborative professional development can be to reduce workload, improve teachers practices and student achievement. Where teachers in a collaborative culture often learn from each other or within their team, contrived collegiality is, among other things, covering the part where (remote) professionals are appointed to support teachers in all types of processes.

The Netherlands

In the Netherlands, the performance gap between low-SES students and high-SES students has gotten bigger because of COVID-19, especially in primary schools (Engzel et al., 2021; Schuurman et al., 2021). It was found that children from a low-SES home often did not have the right resources and coaching available at hand. Examples are the lack of laptops or other devices to follow online courses. Students

that were lucky to borrow a device from their school, had to share it with siblings or were dependent on their parents, who did not always understand the online environment and/or could not help with assignments. Teachers in all primary schools also experienced a lack of available resources, such as laptops and online curriculum, and the lack of collaboration, collegiality and team feeling (Robinson et al., 2022). Although the lack of collegiality and team feeling were felt by teachers in all primary schools, the amount of collaborative professional development differs between schools with different levels of low-SES students. Teachers in a school with a higher level of low-SES students will more often participate in collaborative professional development (OEVD, 2020). Therefore, it is important to find explanations for the variation in collaborative professional development of teachers in the different levels of SES schools. Findings of the study could help school leaders to reinforce collaboration among teachers in a school in a way that fits the level of experience and needs of the teachers. They could enlarge the sufficiency of collaboration and reduce the time and workload for all teachers, or invest in a healthy work environment. This contributes to the development of educational quality.

This paper explores how collaborative professional development evolves among teachers in schools with different levels of SES students. The main explanatory variables are collaborative culture and contrived collegiality. Collaborative cultures involve the development of the curriculum and pedagogical reform from within the team. Forms of contrived collegiality on the other hand, are designed to smoothen the path of externally imposed collaboration. The foundation for collaborative professional development in schools is explored in an effort to extend the literature on teaching in more demanding environments. Prior research has not investigated collaborative cultures and contrived collegiality in context to different levels of SES in school populations. As implied by OECD (2020) and De Jong et al. (2019), further analysis could help to examine the conditions for collaboration in more demanding teaching and learning environments. The main research question is: Is there a significant correlation between the presence of a collaborative culture or contrived collegiality and the amount of collaborative professional development among teachers in the different levels of SES in primary schools in the Netherlands?

Theoretical constructs on which the research is based will be elaborated upon in the following sections. Subsequently we address the hypotheses that will be tested using

TALIS data. Data analysis is explained in the method and results, which is followed by a conclusion and discussion section. This section will hold the interpretation of the results, in line with the stated hypotheses. The thesis closes with an elaboration on the limitations of this study and opportunities for future research.

Theoretical framework

Collaborative professional development

Teachers are the school's personnel that are most directly and frequently in contact with students and their education. The interaction between the teacher, school policies and school context contribute to educational effectiveness. Teachers are expected to adapt and enhance their professional skills, knowledge and attitude throughout their teaching careers to keep up with the rapid changes in society and education. Professional development is defined as development with a focus on the profession as a whole and as an improvement in knowledge, skills, attitude with the purpose to improve the quality of teaching and education (Evans, 2008; Garet et al., 2001). Professional development can take place under formal or non-formal, inter- or intraschool, individual or collaborative conditions (Desimone, 2009; Meirink et al., 2007). While professional development often focuses on professional development of individuals, collaborative professional development signifies any relationship between colleagues developing their teaching collaboratively. Collaborative professional development is all about working together in reflective dialogue with a common goal to improve teaching practice and increase students' learning outcomes. In collaborative professional development teachers share ideas, experiences, thoughts, resources, feedback among colleagues in order to improve their teaching practice or teaching experience (DuFour, 2004; Garet et al., 2001; Goddard et al, 2007; Woodland et al., 2013).

Collaborative professional development is said to be effective when eight key characteristics are exhibited in the right context and settings. These eight characteristics are summed up by Bolam et al. (2005) as

- shared values and vision. Having a common goal is what binds people together in their collaboration and enables them to achieve positive outcome;
- collective responsibility for pupils' learning

- collaboration focused on learning
- individual and collective professional learning
- reflective professional enquiry
- openness, networks and partnerships
- inclusive membership
- mutual trust, respect and support

These characteristics result in the feeling of "being in it together*".* Teachers find that they are not alone in their search for new modes of education, they improve their efficacy and develop a more positive attitude towards teaching. Most of all, teachers experience a higher level of trust among colleagues, mutual responsibility, reciprocity and a sense of belonging to a community with a shared identity, values and goals (Lima et al., 2021). Studies also suggest that collaboration influences the motivation and career commitment of teachers and their classroom practices (McLaughlin & Talbert, 2001, Bolam et al., 2005; DuFour, 2004; Goddard et al., 2007). These findings show that collaboration among colleagues helps everyone in the organization, teachers and students, to flourish.

Although many studies find positive outcomes and show the value of collaborative professional development, there are some challenges and constraints to collaborative professional development. It is an ongoing process that is not simply achieved when two colleagues work together on a common goal. It requires professional attitudes, consideration and expertise (Cousins et al, 1992; Garet et al, 2001). One challenge to collaborative professional development is the subject of voluntary participation. According to most aforementioned studies, collaborative professional development is most effective when participants engage voluntary. Cousins et al, (1992) and Garet et al, (2001) suggest that implementing collaborative professional development takes time, effort and training. Hence, inspiring teachers to voluntarily engage in collaborative professional development without experiencing the workload of engaging in collaborative professional development training and effort is a big challenge. Along these lines collaborative professional development can be arranged into two categories, contrived collegiality and collaborative culture. Although seprated, their interaction should not be undervalued.

Contrived collegiality

Contrived collegiality is described as a form of collaborative professional development in which the setting and context are planned and organized. In conditions of contrived collegiality, collaborative relations are not spontaneous or voluntary, but administratively regulated. Mostly fixed in time and space. Activities of contrived collegiality require teachers to meet up and collaborate. The activities are compulsory, implementation-oriented, and the outcomes are predicted or steered by a regulator (Hargreaves, 1994). Contrived collegiality can be realized by mandated preparation time use, consultation with special education resource teachers and peer coaching. Mandated preparation time enables teachers to meet and consult with their colleagues during the school day, in which expertise and control are involved. This type of peer coaching consists of a structured process for teachers to work together to improve practices. This structured process starts with the presentation of a underlying theory, demonstrating or modeling, practice of the approach and ends with feedback on the new practice (Hargreaves, 1994).

Some contextual factors ask for administrative designs for collaborative professional development, such as intraschool visitations, in school consults and professional learning communities (Lieberman & Miller, 2008; McLauglin & Talbert, 2001). This amounts to a kind of contrived collegiality which might act as a start to a more enduring collaborative relationship among colleagues. The development of contrived collegiality is a, mostly mandatory, process which creates collegiality and partnership that is needed for wider criticism and reflection (Hargreaves & Dawe, 1990). It derives from the thought that collaborative development does not evolve spontaneously, but results from administrative regulation to produce highly predictable outcomes. As said before, where regulators steer the conversations in a particular direction, with implementation as a goal (Hargreaves, 1994).

In short, contrived collegiality has the following features:

- Initiation is top-down. Working together does not evolve spontaneously;
- There are mandates that teachers are required to meet;
- It results from administrative regulation. There are arranged times and places in which this form collaboration takes place;
- The purpose and regulation are designed to achieve certain goals and predictable outcomes. (Hargreaves, 1994).

The above features are in clear contrast with a more spontaneous type of collaborative professional development, namely collaborative culture.

Collaborative culture

School cultures are a complex pattern of norms, attitudes, beliefs, behaviors, values, ceremonies, traditions and myths (Barth, 2002). Some cultures are favorable, others are toxic (Mannix-McNamara et al., 2021). A favorable school culture consists of healthy cultural norms, such as collegiality, realistic expectations, trust and confidence, tangible support, appreciation and recognition, involvement, protection, caring and open communication (Mannix-McNamara et al., 2021; Saphier & King, 1985). Many of these healthy cultural norms can be found in a collaborative culture. A collaborative culture is found in small details of school life that give meaning and value in gestures, jokes and glances that signal sympathy and understanding. These norms of collegial reciprocity lead to sharing and discussing ideas and resources (Barth, 2002; Mannix-McNamara et al., 2021; Nias, 1987). These norms of collegial relationships display qualities of trust, support and sharing (Ponzio, 1987 as cited in Hargreaves & Dawe, 1990).

Not only do school cultures affect teachers, but they also affect students' school attitudes. A toxic school culture can lead to students' disliking school. A healthy school culture can lead to students as lifelong learners, since their teachers modelled a healthy perception on learning and development (Barth, 2002; Mannix-McNamara et al., 2021; Nias et al., 1987).

Collaborative professional development in collaborative cultures tend to be spontaneous, emerging from teachers as a social group. Although it may be administratively supported and facilitated or exampled in the behavior of educational leaders, collaborative cultures evolve from the teaching community itself. Collaborative cultures evolve from voluntary work relations that are both enjoyable and productive. Collaborative cultures are development-orientated and pervasive across time and space. Brief yet frequent informal social exchanges in a collaborative culture lead to unpredictable outcomes. These cultures can take some time and sensitivity to build and may need administrative support and leadership to help them grow. Often the school leader models what is expected of the teachers, and teachers

in their turn develop their practice and their projects (Hargreaves, 1994). A collaborative culture can only be built upon a trustworthy, sharing and reflective community.

Collaborative cultures

- May be administratively supported and facilitated by helpful scheduling arrangements, but ultimately must be sustained by the teaching community;
- Do not arise from compulsion but from their perceived value among teachers and a belief that working together is productive and enjoyable;
- Teachers establish the tasks and the purposes for working together, rather than implementing the purposes of others;
- May be characterized by scheduled meetings, but such sessions do not dominate the arrangements for working together;
- Outcomes of collaboration are uncertain and unpredictable (Hargreaves, 1994).

Hypotheses

Prior research has shown that the amount of collaborative professional development is higher in schools with a low-SES population (OECD, 2020). Collaborative cultures or contrived collegiality can affect the amount of collaborative professional development. The goal of this research is to find what lies at the root of collaborative professional development at schools with different levels of student population SES.

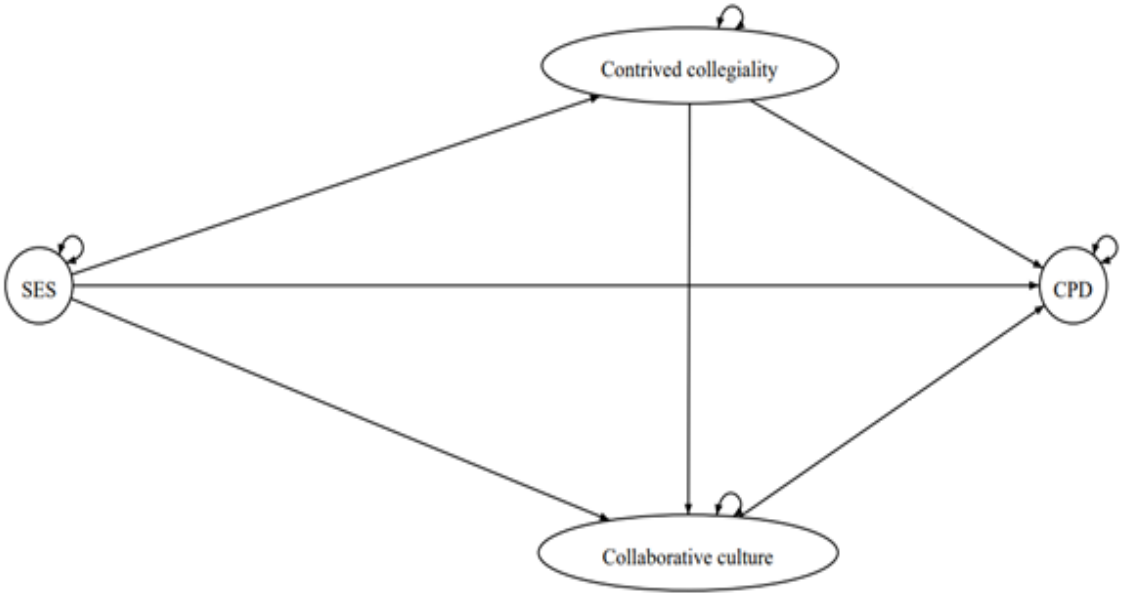

Figure 1. Conceptual diagram of the proposed SEM

As one would assume when reading the theoretical framework, the collaborative culture and contrived collegiality influence the amount of collaborative professional development in every school. In the conceptual model in figure 1 on which the data analysis is based, collaborative culture is assumed to mediate the relation between contrived collegiality and collaborative professional development. Contrived collegiality is a planned and organized attempt to stimulate professional development. It could set the standards for a workplace where people are used to developing together. This could lead to a healthy work environment where informal professional exchanges are standard. With this, the question arises if contrived collegiality influences the amount of collaborative professional development or the collaborative culture in schools. Therefore, the first hypothesis is:

Hypothesis 1: The effect of contrived collegiality on the amount of collaborative professional development is mediated by collaborative culture.

As stated before, the causes for collaborative professional development can differ. As significant relations have been found between the level of SES and the amount of

collaborative professional development (OECD, 2020), we expect to find this in the present study. This leads to the second hypothesis:

> Hypothesis 2: There is a negative direct effect from a schools SES population on the amount of collaborative professional development.

The third hypothesis revolves around the expectation that both contrived collegiality and collaborative professional development could be a mediating variable between a schools' students population and the amount of collaborative professional development. As discussed before, contrived collegiality might act as a start to a more enduring collaborative culture. The theoretical framework implies that there is some overlap between contrived collegiality and collaborative cultures, as it shows that a collaborative culture could be a sub goal of contrived collegiality. Contrived collegiality revolves around organizing and planning the setting and context in which collaborative professional development can take place. However, the goal of contrived collegiality is collaboratively work towards a common goal, which can only endure in a healthy work environment. Facilitating teachers with such activities can enhance the engagement in collaborative professional development. This implies that contrived collegiality does not only directly impact the amount of the collaborative professional development, but also directly impacts the collaborative culture in schools.

Furthermore, we expect the amount of collaborative professional development in schools to derive from the feeling of involvement, protection, caring and open communication. Schools with a low-SES population are often more demanding, resulting in a higher need for casual consultation and guidance. Additionally, healthy norms of reciprocity lead to sharing and discussing ideas and resources (Barth, 2002; Nias, 1987). Such a type of collaborative professional development can only evolve in a healthy collaborative culture. When a school has accomplished such a collaborative culture, it will result in spontaneous collaborative professional development. This leads to the third hypothesis:

> Hypothesis 3: The effect of SES on the amount of collaborative professional development is mediated by contrived collegiality and collaborative culture.

Research questions

As described earlier, this study is designed to answer the main research question: Is there a significant correlation between the presence of a collaborative culture or contrived collegiality in the amount of collaborative professional development among teachers in the different levels of SES in primary schools in the Netherlands?
In addition to the main research question, the following questions are addressed:

1. Do the data support the hypothesis of an indirect effect of contrived collegiality on the amount of collaborative professional development mediated by collaborative culture?
2. Do the data support the hypothesis of a positive direct effect of SES on the amount of collaborative professional development?
3. Do the data support the hypothesis of an indirect effect of SES on the amount of collaborative professional development via contrived collegiality and/or collaborative culture?
4. To what extent is the effect of SES on collaborative professional development mediated by contrived collegiality?
5. To what extent is the effect of SES on collaborative professional development mediated by collaborative culture?

Method

TALIS is an international series of surveys that focuses on the learning environment and working conditions of teachers in schools. The international aspect of the study offers the opportunity to contribute to policy development and educational analysis by using cross-country analysis. To answer the research questions in this explorative study, a secondary analysis was conducted on data from the TALIS 2018 study by OECD. TALIS results are based on self-reports from teachers and school leaders. Two questionnaires were administered, one for teachers and one for school leaders. Each questionnaire required 45-60 minutes to complete. The research question we want to answer, and its related constructs rely on teachers' unique experiences and beliefs (OECD, 2020).

The TALIS 2018 survey collected data for different levels of education and multiple countries. All questionnaires were translated into the respective language and vetted for linguistic equivalence. Adaptations to the questionnaire were made by the OECD

to conduct a valid analysis and interpretations of the results for secondary use of the data.

Sample

For this study the Dutch ISCED level 1 dataset was used. This dataset relates to primary education in the Netherlands. A two-stage stratified cluster sampling procedure was used. The OECD computed survey weights to take the sample design and differences in participation into account. TALIS specified a required response rate of 75% of sampled schools, with each school attaining minimum response rate of 50%. A minimum overall participation rate of 75% of teachers for each country is also required. Convincing evidence of no or low non-response bias could result in data being adjudicated as sufficient even when those criteria were not fully met. Samples of teachers were drawn within the schools. Before, during and after data collection, a number of quality assurance and control procedures were implemented to ensure high quality and international comparability. Standardized checks were conducted on the data to detect inconsistencies, duplicate records or erroneous data entry. During data processing, IEA Hamburg investigated the quality of the data using more than 200 structure, validation and consistency checks (OECD, 2020). 1504 primary teachers completed the TALIS ISCED level 1 questionnaire.

Participants

Tabel 1. Participants specifications

Gender	Female	84.7%
	Male	15.3%
Age in years	< 25	4.4%
	25-29	11.7%
	30-39	33.8%
	40-49	22.8%
	50-59	18.3%
	>60	9%
Level of education	Level 3 and 4 (MBO niveau 3,4, havo, vwo)	4.1%
	Level 5 (Associate Degree)	0%
	Level 6 and 7 (HBO & WO bachelor)	94.9%
Years in education	m = 16,26	
	s = 10,66	
	Min = 0	
	Max = 45	
Hours p/w	100% of full time	31.3%
	71-90% of full-time hours	20.2%
	50-70 % of full-time hours	34.7%
	Less than 50 % of full-time hours	13.8 %
Contract	An on-going contract with no fixed end	92%
	A fixed-term contract for a period of more than 1 school year	2.2%
	A fixed-term contract for a period of 1 school year or less.	5.8%

This demographic information shows that the sample is moderately skewed with a value of .071 towards tricenarian, higher education females. DUO showed, as cited by Ministerie van Onderwijs, Cultuur en Wetenschap (2020), that the average age of teachers in primary education in the Netherlands in 2018 was 42.8 years, slightly older than the sample but still representable. They found that 88% of all teachers had an on-going contract with no fixed end, and 45% worked a full time job (>0,8 fte). 84.7% of primary school teachers are women. It is a given that all teachers in primary education have, at least, completed level 6 education. Remarkable is the 4.1% that have completed level 3 and 4 education. This could represent the interns and Onderwijs Ondersteunend Personeel that have completed the TALIS questionnaire. The sample is a fair resemblance of the true population.

Study design

To empirically examine the proposed research model (Figure 1), data from TALIS 2018 was used. The dataset ATGNLD3 includes 493 variables that measure 11 themes.

Variables

To explore collaborative professional development the direct and indirect relation between contrived collegiality and collaborative cultures on the amount of collaborative professional development in schools with different levels of SES will be investigated. Contrived collegiality and collaborative culture are seen as a bundle of factors, where the presence or the lack of one of these activities could affect the impact of the other. An exploratory factor analysis (varimax rotation) will be conducted on 42 items to create the two constructs. In Appendix A and B there is a more elaborate overview of all 42 items involved in the exploratory factor analysis. Some of the items needed recoding. SPSS was used to recode these items.

In the model in Figure 1, the dependent variable is a latent variable constructed by the OECD. This latent variable is labeled as T3COOP and consists of 8 scale items that measure exchange and collaboration among teachers. These 8 items were excluded from the exploratory factor analysis, since they partake in the SEM as a construct variable. T3COOP is labeled as CPD in the conceptual model. The socio-economic status of the school's population was measures by variable TT3G35E. TT3G35E is an ordinal variable that inquires the percentages of low-SES students in school. Its 5-point range (none, 1-10%, 11-30%, 31-60%, more than 61%) displays that teachers who checked none, 0-10% or 10-29% are considered to work in a school with a low level of low-SES students. As OECD (2020) suggested, a school with more than 31% low-SES students is considered a low-SES school. Teachers who checked 31-60% and more than 61% are considered to work in a school with a high level of low-SES students. In the conceptual model, TT3G35E is labeled as SES.

Model specification of SEM

Following the exploratory factor analysis, Structural Equation Modeling (SEM) was used to assess the relationships between SES, collaborative culture, contrived collegiality and CPD. In the model in Figure 1 and further in this study, contrived

collegiality and collaborative culture are used as latent variables. As shown in the conceptual model in Figure 1, we investigate the paths of contrived collegiality on collaborative culture, contrived collegiality and collaborative culture on CPD and how SES intervenes with those paths.

Data analysis

In order to answer the research questions and test the hypotheses, RStudio was used to compute the latent variables via exploratory factor analysis (EFA) and to conduct Structural Equation Modeling (SEM).

EFA was conducted to uncover observed and latent variables to be measured at the interval level. The observed variables are first standardized, and then inferred from the correlation matrix (Fontaine, 2005). Latent variables are called factors, and the associations between them and the observed variables are called factor loadings. Factor loadings over .30 are satisfactory (Hair et al., 2011). Only items are considered if the factor loading is higher than .30, if the item does not have a factor loading higher than .10 on another factor and the items' subject is content-related to fit the concepts from the theoretical framework.

SEM is a technique that is used to test and evaluate multivariate causal relationships. It can also be used to test the theories in this exploratory research (Ravand & Baghaei, 2016). It is also used where theory is less developed since it can quantify relationships among multiple latent and observed variables (Dodge, 2008; Hooper et al., 2008; Wright, 1921).

To test our hypotheses, SEM was used to quantify the relationships among multiple latent and observed variables. Only indicators and latent variables that reached the *p* value of < 0.05 were maintained in the model. In this study, SEM can explain mediation of collaborative culture and/or contrived collegiality on CPD, with SES as the independent variable.

For both the EFA and SEM, the model was tested to check the goodness-of-fit. The term goodness-of-fit refers to a statistical test that determines how well sample data fits a distribution from the actual population.

To check the goodness-of-fit to measure a valid EFA, the Kaiser-Meyer Olkin (KMO) test for sampling adequacy is conducted. Values ranging between .80 and 1.00

indicate sampling adequacy. A value between .70 and .80 are middling. KMO values below .60 are not adequate (Dodge, 2008). Barletts' test of sphericity examines the significance of the correlation. If the test is significant, the variables are suitable for factor analysis (Hooper et al., 2008; Dodge, 2008; Hu et al, 2009).

To check the goodness-of-fit of the model for SEM, we take a look at the root mean square of approximation (RMSEA). This is an absolute fit index that assesses deviation between the observed value and the expected value. A RMSEA value below .08 indicates a good fit. The upper bound of the 90% confidence interval of RMSEA should not exceed .10, and its lower bound should be less than .05. The root mean square residual (SRMR) should not exceed a value of .08.

For SEM, the robust Comparative Fit Index (CFI) and the robust Tucker-Lewis Index (TLI) simulate the correlation matrixes with various degrees of model misspecification. A value close to 1 shows a perfect model fit. The CFI analyzes the model fit by examining the discrepancy between the observed data and the model data. Sample size is adjusted for. For CFI, values over .90 are considered as a good model fit. For TLI, a value of .95 indicates a good model-data fit (Hooper et al., 2008; Dodge, 2008; Hu & Bentler, 1999).

Results

EFA

This section describes the findings of the exploratory factor analysis (EFA) and the structural equation modelling (SEM). These findings and how they relate to the research questions are described in the next section, discussion. 1504 participants filled in the questionnaire. Omitting and returning the object through pairwise deletion resulted in 1406 observations. These 1406 observations were clustered in 130 schools.

The EFA was concluded with an overall Kaiser-Meyer-Olkin measure of .76. This indicated that the data were suitable for factor analysis. One factor emerged with an eigenvalue of 5.26. The second factor's eigenvalue was 2.98. This shows that the EFA model can be used to distinguish the two factors contrived collegiality and collaborative culture. The model passed Bartlett's sphericity test with a chi square value of 2189 and degrees of freedom of 778. It shows a *p*-value of .000. This shows

that the EFA variables are correlated enough to where the correlation matrix diverges significantly from the identity matrix.

Two factors were found with varimax rotation. Appendix B shows that 11 items are sufficient with a .30 loading in the EFA. Loadings below . Items that load above .10 on both factors are excluded from the latent variable. After conducting EFA items were found to load sufficient on one factor. Some variables could have been excluded before EFA was conducted, but weren't due to the description of their subject. After closer inspection, their content was not related sufficiently to the concepts of the theoretical framework. Examples are the measures of collaboration among students, or feedback from school leaders. This shows that items were included after an exacting selection. 5 Items were selected for the latent variable contrived collegiality. 6 Items were selected for the latent variable collaborative culture. The factor loadings are shown in Table 2 with loadings above .30. In Table 3 and 4 there is a more elaborate overview of the items included in the latent variables.

Table 2. EFA factor loadings

Variable	Factor 1	Factor 2
TT3G48D	.663	
TT3G48E	.683	
TT3G32D	.615	
TT3G48F	.640	
TT3G48A	.554	
TT3G49E	.613	
TT3G19A2		.396
TT3G22H		.450
TT3G22E		.319
TT3G20F		.300
TT3G20G		.378

Table 3. standardised items of the latent variables

Latent variables	Observed variable	Coeff.	S.E.
Collaborative culture			
	TT3G48D	** .738	.019
	TT3G48E	** .775	.018
	TT3G32D	** .509	.020
	TT3G48F	** .616	.018
	TT3G48A	** .529	.023
	TT3G49E	** .537	.018
Contrived collegiality			
	TT3G19A2	** .188	.023
	TT3G22H	** .343	.026
	TT3G22E	** .356	.026
	TT3G20F	** .409	.038
	TT3G20G	** .325	.027

*** Coefficient is significant at the .01 level (one-tailed).*

Table 4. Information on included items per latent variable

		Scale	Range	mode	Subject
Latent variable	Observed variables				
collaborative culture					
	TT3G48D	Ordinal	Strongly disagree-strongly agree	agree	Sch has a culture of shared responsibility for school issues
	TT3G48E	Ordinal	Strongly disagree-strongly agree	Agree	There is a collaborative sch culture characterised by mutual support
	TT3G32D	Ordinal	Strongly disagree-strongly agree	Agree	Most teachers provide practical support to each other
	TT3G48F	Ordinal	Strongly disagree-strongly agree	Agree	Sch staff share a common set of beliefs about teaching and learning
	TT3G48A	Ordinal	Strongly disagree-strongly agree	Agree	Sch. provides staff w. opp. to actively participate in sch decisions
	TT3G49E	Ordinal	Strongly disagree-strongly agree	Agree	Teachers can rely on each other
Contrived collegiality					
	TT3G19A2	nominal	Yes/no	No	Take part in induction activities Formal induction programme
	TT3G22H	nominal	Yes/no	No	Prof.dev. act. Participation in a network of teachers
	TT3G22E	nominal	Yes/no	No	Prof.dev. act. Observation visits to other schools
	TT3G20F	nominal	Yes/no	No	Networking collaboration with other new teachers
	TT3G20G	nominal	Yes/no	No	Team teaching with experienced teachers
T3COOP	TT3G33A	Ordinal	Never-once a week or more	Never	How often you do teach jointly as a team in the same class
	TT3G33B	Ordinal	Never-once a week or more	Never	How often you do observe other teachers classes and provide feedback
	TT3G33C	Ordinal	Never-once a week or more	2-4 times a year	How often you do engage in joint activities
	TT3G33D	Ordinal	Never-once a week or more	Once a week or more	How often you do exchange teaching materials with colleagues
	TT3G33E	Ordinal	Never-once a week or more	1-3 times a month	How often you do engage in discussions about the learning development
	TT3G33F	Ordinal	Never-once a week or more	2-4 times a year	How often you do work with other teachers in this school
	TT3G33G	Ordinal	Never-once a week or more	1-3 times a month	How often you do attend team conferences
	TT3G33H	Ordinal	Never-once a week or more	5-10 times a month	How often you do take part in collaborative professional learning
SES	TT3G35E	Ordinal	None-more than 60 %	none	Perc. stud. charac. Students from socioeconomically disadvantaged homes

A structural equation model (SEM) was specified to examine the direct and indirect relations between SES, collaborative culture, contrived collegiality and CPD. CPD was used as the dependent variable. Table 5 provides detailed findings regarding the goodness of fit for the conceptual models fitted to answer research questions. The scores on the fit indices in table 5 show favorable scores for the model. The CFI-value is larger than .90 and is showing a good fit. The model shows an acceptable fit with a TLI-value just below .90. RMSEA is smaller than .08 in the model and shows a good fit. The upper bound of the 90% confidence interval of RMSEA does not exceed .10, and its lower bound is .05. It shows an acceptable fit. SRMR is smaller than .08, and shows a good fit.

Table 5. Standardized goodness of fit

model fit	
χ^2-value	240.249
Degrees of freedom	62
p-value	.000
CFI	.919
TLI	.899
RSMEA	.053
RSMEA 90% confidence interval (robust)	.045-.061
SRMR value	.043

The results of SEM are shown in Figure 2 and Table 6. Four out of six hypothesized path coefficients are statistically significant at the .01 and one at the .05 level. The significance levels of the path coefficients all relate to one-tailed tests, as all effects between the variables are expected to be positive. The highest coefficient of .494 relates to the effect of collaborative culture on the amount of CPD. The path from contrived collegiality to the amount of CPD shows a positive effect with a coefficient of .297. The effect of contrived collegiality on collaborative culture shows a direct positive effect of .285. The direct path of SES to CPD does not show a significant effect. The positive significant effect of SES on contrived collegiality has a coefficient of .133. The path of SES to collaborative culture shows a negative coefficient of -.079, but is not significant.

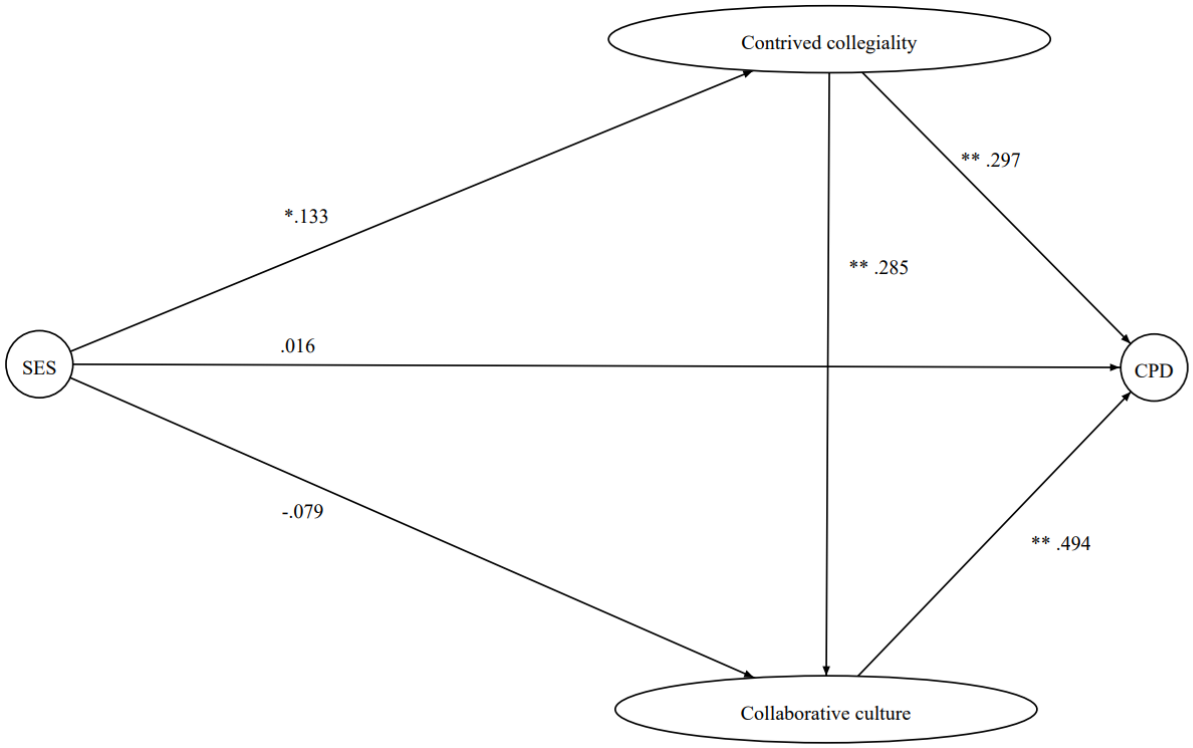

Figure 2. SEM analysis, standardized path coefficient.
** Path coefficient is significant at the .05 level (one-tailed).*
*** Path coefficient is significant at the .01 level (one-tailed).*

(In)direct effects

In Table 6 the indirect effects of the hypothesized paths are calculated. All effects are included in the calculation, both significant and insignificant. The calculations are shown in Appendix D.

Table 6. SEM analysis, standardized path coefficient and (in)direct effects

Paths	From	To	Direct effect	Indirect Effect	Total effect
	Collaborative culture	CPD	**.494	…	**.494
	Contrived collegiality	CPD	**.297	.146	**.444
	Contrived collegiality	Collaborative culture	**.285	…	**.285
	SES	Collaborative culture	-.082	…	-.082
	SES	Contrived collegiality	* .133	…	*.133
	SES	CPD	.016		.016
	SES	CPD (via contrived collegiality)	.016	.040	
	SES	CPD (via collaborative culture)	.016	-.039	
	SES	CPD (via contrived collegiality and collaborative culture)	.016	.019	-.004

** Path coefficient is significant at the .05 level (one-tailed).*
*** Path coefficient is significant at the .01 level (one-tailed).*

Discussion

Before discussing the findings in more detail limitations of this study will be addressed. The data that was used in this study, was data collected by OECD and readily available for this research (OECD, 2020). However, the data was not collected for this particular study, but it was well suited to answer the research question and generate new insights. And, since the data was collected in 2018, it can be slightly outdated and inconsistent with post COVID-19 data. The findings of the present study might have been different with newly gathered data, and conclusions could differ based on post COVID-19 input. In 2021, OECD conducted another survey. With this in mind, the study could be replicated with the data from 2021. TALIS 2018 and TALIS 2021 are both observational and non-experimental. This type of cross-sectional data implies that causal relationships cannot be established with this data alone. Therefore, the same study design with experimental data could also strengthen the outcomes from this study (Fontaine, 2005).

Another shortcoming of the questionnaire could be that the terms collaborative culture and contrived collegiality are sometimes carried with different values. The collaborative culture is often carried with positive values, such as supportive, stimulating and equity. The term contrived collegiality is more often carried with less positive values, such as organization norms and preconditioned. This could have affected the data in such a way that teacher feel like contrived collegiality happens (too) often, because of the negative emotions involved.

The empirical validity of the model only relates to the perception of teachers. It needs to be mentioned that social and professional desires could affect the level of scores. It may lead to more positive or desirable outcomes. Although socially desired answer could affect the data, a consistently socially desirable response to all questions does not affect the correlations between the variables. School leader perceptions could be included in order to answer the research question with a more valid empirical dataset with less social influences. But, school leaders could experience collaborations differently.

In the TALIS international studies (OECD, 2020), the response rate of 58.2% in the Netherlands was deemed insufficient to use the data for international comparison. However, since the sample obtains 1504 observations it could be representative for

national purposes. As described in the section Sample, the sample is a fair comparison to the true population of primary school teachers in the Netherlands.

Out of 1504 observations, 1406 observations were included in SEM by excluding cases pairwise. Pairwise deletion may result in a different subset of cases for each computing statistic. This issue was accepted due to the large sample size, since listwise deletion would have resulted in dropping 67,8% of all cases. As with any sample, the sample size is inversely proportional to the standard error (Fontaine, 2005). With a sample of only 483 out of 1504 cases, the standard error would have been substantial.

Conclusion

The present study has partially shown that there is a significant correlation between the presence of contrived collegiality and the amount of collaborative professional development among teachers in the different levels of SES in primary schools in the Netherlands. The correlation of a collaborative culture on the amount of collaborative professional development was significant when the levels of SES were not included. The present study provides empirical support for a part of the conceptual model in figure 1 and its hypothesized paths.

In accordance with prevalent theoretical notions on the positive effect of collaborative culture on the amount of collaborative professional development (Shatzer et al., 2013; Sharrat & Planche, 2016; and Shakenova, 2017), the present study showed a positive direct effect of collaborative culture on the amount of collaborative professional development. Its impact is significant at the .01 level and is considered a large effect.

As expected, contrived collegiality has a direct positive effect on CPD with a significance at .01 level. The direct effects of contrived collegiality on CPD is .297 and the direct effect of contrived collegiality on collaborative culture is .285 and significant at .01 level. The indirect effect of contrived collegiality on CPD is .141. The total effect of contrived collegiality to CPD is .438 and significant at the .01 level. The indirect effect is smaller than the direct effect. This means that contrived collegiality positively impacts the amount of collaborative professional development, and this effect is partially (.438-.141) mediated by collaborative culture. As the literature

states, our findings show that contrived collegiality could set the standards for a workplace where people are used to developing together. This could lead to a healthy work environment where informal professional exchanges are standard. (Hargreaves, 1994).

In contrary to the findings of the OECD (2020) in the international study on the effect of a schools level of low-SES students on the amount of collaborative professional development, data from the Netherlands do not support that finding. There was no significant direct effect.

The results show a significant positive effect of the level of low-SES students on contrived collegiality, meaning that schools with a high level of low-SES students show a higher level of contrived collegiality. The indirect effect of the level of low-SES students on the amount of collaborative professional development via contrived collegiality is .040. This is bigger (and more significant) than the direct effect of the level of low-SES students on the amount of collaborative professional development. This could explain the pattern that collaborative professional development is less in schools with a low level of low-SES students. This can be explained by the statement of Darling-Hammond (2005) that schools with a low level of low-SES students attract more experienced and better-performing teachers. Better-performing and more experienced teachers are less dependent on colleagues and cooperation, and school leaders are aware of this.

With regard to the research questions in section 1.4. the following conclusions can be drawn:

1. The data does support the hypothesis of an indirect effect of contrived collegiality on the amount of collaborative professional development mediated by collaborative culture.

2. The data does not support a direct effect of the level of low-SES students on the amount of collaborative professional development.

3. The data does support the hypothesis of an indirect effect of the level of low-SES students on the amount of collaborative professional development mediated by contrived collegiality. There is no significant indirect effect of the

level of low-SES students on collaborative professional development mediated by collaborative culture.

4. The analyses show empirical support to some extent for an indirect relationship between the level of low-SES students and the amount of collaborative professional development through contrived collegiality

5. We cannot conclude that the effect of the level of low-SES students on collaborative professional development is mediated by collaborative culture, since the path of SES to collaborative culture is not significant.

In the end, the findings point towards an indirect effect of the level of low-SES students on the amount of collaborative professional development mediated by contrived collegiality. This indicates that the SES-level of a school's population does indeed relate to the contrived collegiality activities of teachers. A low level of low-SES students shows a low level of contrived collegiality. A high level of low-SES students show a high level of contrived collegiality.
To answer the main research question: Yes, there is a significant correlation between the presence of contrived collegiality and the amount of collaborative professional development among teachers in the different levels of SES in primary schools in the Netherlands. However, there is no significant correlation between the presence of collaborative culture and the amount of collaborative professional development in primary schools with different levels of low-SES students in the Netherlands.

The effect of contrived collegiality on collaborative culture shows the central role of collaborative culture as a predicter for the amount of collaborative professional development. This indicates that there is a potential for school leaders and teachers to invest and stimulate collaborative culture in schools in the Netherlands. However, a collaborative culture does not ensure educational quality or the quality of collaborative professional development. The capacity of teachers to change their routines and expand their professional circle determines the success of each type of collaborative professional development (Cousins et al., 1992; Hargreaves, 1995; Garet et al., 2001; Schuurman et al., 2021).

The need for contrived collegiality as the basis of collaborative professional development is worth to study. Since the present study showed that teachers in schools with low levels of low-SES students are less often involved in contrived collegiality, a qualitative study could be performed to research the reasons why. Is that because they work with a less demanding population, or is it because they are more experienced or better performing teachers?

References

Achinstein, B. (2002). Conflict Amid Community: The Micropolitics of Teacher Collaboration. *Teachers College Record*, *104*(3), 421–455. https://doi.org/10.1111/1467-9620.00168

Barth, R. S. (2002). The Culture Builder. *Educational Leadership*, *59*(8), 6–11. https://www.mass.gov/files/documents/2016/10/sw/culture-builder-roland-barth.pdf

Bolam, R., McMahon, A., Stoll, L., Wallace, M., Greenwood, A., Hawkey, K., Ingram, M., Atkinson, A., & Smith, M. (2005). *Creating and Sustaining Effective Professional Learning Communities* [E-book]. DfES Publications. Retrieved March 11, 2022, from https://dera.ioe.ac.uk/5622/1/RR637.pdf ISBN 1 84478 460 6

Chan, C. K. K., & Fai Pang, M. (2006). Teacher Collaboration in Learning Communities. *Teaching Education*, *17*(1), 1–5. https://doi.org/10.1080/10476210500527899

Clement, M., & Vandenberghe, R. (2000). Teachers' professional development: a solitary or collegial (ad)venture? *Teaching and Teacher Education*, *16*(1), 81–101. https://doi.org/10.1016/s0742-051x(99)00051-7

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2006). Teacher-student matching and the assessment of teacher effectiveness. Journal of Human Resources, 41, 778-820. doi:10.3368/jhr.XLI.4.778

Cousins, J. B., Ross, J. A., & Maynes, F. J. (1992*). Teacher-teacher Interaction and Knowledge Use*. Peterborough: Ontario Institute for Studies in Education, Trent Valley Centre

Darling-Hammond, L. (2005). *A good teacher in every classroom: Preparing the highly qualified teachers our children deserve.* San Francisco: Jossey-Bass.

Desimone, L. M. (2009). Improving Impact Studies of Teachers' Professional Development: Toward Better Conceptualizations and Measures. *Educational Researcher*, *38*(3), 181–199. https://doi.org/10.3102/0013189x08331140

De Jong, L., Meirink, J., & Admiraal, W. (2019). School-based teacher collaboration: Different learning opportunities across various contexts. Teaching and Teacher Education, 86, 102925. https://doi.org/10.1016/j.tate.2019.1029254

Dodge, Y. (2008). The Concise Encyclopedia of Statistics. Springer.

DuFour, R. (2004). What is a Professional Learning Community. *Educational Leadership*, *61*(8), 6–11. https://www.allthingsplc.info/files/uploads/DuFourWhatIsAProfessionalLearningCommunity.pdf

Engzell, P., Frey, A. and Verhagen, M. D. (2021) '*Learning Loss Due to School Closures During the COVID-19 Pandemic'*, Proceedings of the National Academy of Sciences, 118 (17). https://doi.org/10.1073/pnas.2022376118

Evans, L. (2008). Professionalism, Professionality and the Development of Education Professionals. *British Journal of Educational Studies*, *56*(1), 20–38. https://doi.org/10.1111/j.1467-8527.2007.00392.x

Fontaine, RJ. (2005). *Encyclopedia of Social Measurement.* Academic Press.

Fullan, M.& Hargreaves, A. (1992) *What's Worth Fighting for in your School: Working Together for Improvement.* Buckingham: Open University Press in association with the Ontario Public School Teachers' Federation

Kruse, S. (1999). Collaborate. *Journal of Staff Development, 20*(3), pp14-16

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What Makes Professional Development Effective? Results From a National Sample of Teachers. *American Educational Research Journal*, *38*(4), 915–945. https://doi.org/10.3102/00028312038004915

Goddard, Y. L., Goddard, R. D., & Tschannen-Moran, M. (2007). A Theoretical and Empirical Investigation of Teacher Collaboration for School Improvement and Student Achievement in Public Elementary Schools. *Teachers College Record: The Voice of Scholarship in Education*, *109*(4), 877–896. https://doi.org/10.1177/016146810710900401

Hair, J. F. , Ringle, C. M. , & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice* , 19 , 139–152.

Hargreaves, A. (1994). Changing teachers, changing times: teachers' work and culture in the postmodern age. *Choice Reviews Online*, *32*(01), 32–0440. https://doi.org/10.5860/choice.32-0440

Hargreaves, A. (1995). *Beyond collaboration: Critical teacher development in the postmodern age*. In J. Smyth (ed.) Critical Discourses on Teacher Development (pp. 149 179). London, UK: Cassell.

Hargreaves, A., & Dawe, R. (1990). Paths of professional development: Contrived collegiality, collaborative culture, and the case of peer coaching. *Teaching and*

Teacher Education, *6*(3), 227–241. https://doi.org/10.1016/0742-051x(90)90015-w

Hooper, D., Coughlan, J., & Mullen, M. T. (2008). Structural Equation Modelling: Guidelines for Determining Model Fit. The Electronic Journal of Business Research Methods, 6(1). https://doi.org/10.21427/d7cf7r

Hu, L.-t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling, 6(1), 1–55. https://doi.org/10.1080/10705519909540118

Johnson, B. (2003). Teacher collaboration: good for some, not so good for others. *Educational Studies*, *29*(4), 337–350. https://doi.org/10.1080/0305569032000159651

Lieberman, A., & Miller, L. (Eds.). (2008). *Teachers in professional communities*. New York: Teachers College Press. Doi 10.1007/s10833-008-9094-6

Lima, W., Northover, K., Hewitt, G., & Newell-McLymont, E. F. (2021). Teacher Collaboration: The Need for Trust in the Classroom Context. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3839572

Mannix-McNamara, P. M., Hickey, N., MacCurtain, S., & Blom, N. (2021). The Dark Side of School Culture. *Societies*, *11*(3), 87. https://doi.org/10.3390/soc11030087

McLaughlin, M. W., & Talbert, J. E. (2001). *Professional Communities and the Work of High School Teaching*. Chicago, IL: University of Chicago Press.

Meirink, J. A., Meijer, P. C., & Verloop, N. (2007). A closer look at teachers' individual learning in collaborative settings. *Teachers and Teaching*, *13*(2), 145–164. https://doi.org/10.1080/13540600601152496

Ministerie van Onderwijs, Cultuur en Wetenschap (Director). (2020). Trendrapportage Arbeidsmarkt Leraren po, vo en mbo 2020. In *Open Overheid* (No. 26059103). Retrieved May 29, 2023, from https://open.overheid.nl/documenten/ronl-de3d7ec8-f391-47a4-afab-cea1f73ed7bf/pdf

Nias, J. (1987). The Primary School Staff Relationships Project: origins, aims and methods. *Cambridge Journal of Education*, *17*(2), 83–85. https://doi.org/10.1080/0305764870170201

OECD. (2020). *Professional collaboration as a key support for teachers working in challenging environments*. https://www.oecd-ilibrary.org/docserver/c699389b-en.pdf?expires=1640253013&id=id&accname=guest&checksum=F2C00E6A0AAA8EAF3CB8BF0E83E81568

Ravand, H. , & Baghaei, P. (2016). Partial least squares structural equation modeling with R. *Practical Assessment, Research & Evaluation* , 21 (11), 1–16. Retrieved from https://pareonline.net/getvn.asp?v=21&n=11]

Robinson, L. E., Valido, A., Drescher, A., Woolweaver, A. B., Espelage, D. L., LoMurray, S., Long, A. C. J., Wright, A. A., & Dailey, M. M. (2022). Teachers, Stress, and the COVID-19 Pandemic: A Qualitative Analysis. *School Mental Health*. https://doi.org/10.1007/s12310-022-09533-2

Rubie-Davies, C. M. (2010). Teacher expectations and perceptions of student attributes: Is there a relationship? British Journal of Educational Psychology, 80(1), 121–135. https://doi.org/10.1348/000709909x466334

Saphier, J., & King, M. (1985). Good seeds grow in strong cultures. *Educational Leadership*, 42(6), 67-74.

Schuurman, T. M., Henrichs, L. F., Schuurman, N. K., Polderdijk, S., & Hornstra, L. (2021). *Learning Loss in Vulnerable Student Populations After the First Covid-19 School Closure in the Netherlands*. Scandinavian Journal of Educational Research, 1–18. https://doi.org/10.1080/00313831.2021.2006307

Shakenova, L. (2017). The Theoretical Framework of Teacher Collaboration. *Khazar Journal of Humanities and Social Sciences*, *20*(2), 34–48. https://doi.org/10.5782/2223-2621.2017.20.2.34

Sharratt, L. D., & Planche, B. M. (2016). *Leading Collaborative Learning: Empowering Excellence* (First ed.). Corwin.

Shatzer, R. H., Caldarella, P., Hallam, P. R., & Brown, B. L. (2013). Comparing the effects of instructional and transformational leadership on student achievement. *Educational Management Administration & Leadership*, *42*(4), 445–459. https://doi.org/10.1177/1741143213502192

Snoek, M., & van Rossum, B. (2017). *Goede condities voor startende leraren: het waarom en hoe van een goed begeleidingsprogramma*. Steunpunt Opleidingsscholen.

Torff, B., & Sessions, D. (2009). Teachers' attitudes about professional development in high-SES and low-SES communities. *Learning Inquiry*, *3*(2), 67–77. https://doi.org/10.1007/s11519-009-0040-1

Woodland, R., Lee, M. K., & Randall, J. (2013). A validation study of the Teacher Collaboration Assessment Survey. *Educational Research and Evaluation*, *19*(5), 442 - 460. https://doi.org/10.1080/13803611.2013.795118

Wright, S. (1921). Correlation and causation. *J Agric Res*, 20(7), 557–585.

Appendix A. Items involved in exploratory factor analysis.

Observed variables	Scale	range	Subject
TT3G18B	scale	0-99	Hours spent on tasks Team work and dialogue w. colleagues within school
TT3G18E	scale	0-99	Hours spent on tasks Participation in school management
TT3G18G	Scale	0-99	Hours spent on tasks Professional development activities
TT3G19A2	nominal	Yes/no	Take part in induction activities Formal induction programme
TT3G19B2	nominal	Yes/no	Take part in induction activities Informal induction activities
TT3G20A	nominal	Yes/no	Provisions part of induction In-person courses seminars
TT3G20B	nominal	Yes/no	Provisions part of induction Online courses seminars
TT3G20C	nominal	Yes/no	Provisions part of induction Online activities (e.g. virtual communities)
TT3G20D	Nominal	Yes/no	Provisions part of induction Planned meetings with principal/exp colleagues
TT3G20F	Nominal	Yes/no	Provisions part of induction Networking collaboration with other new teachers
TT3G20G	nominal	Yes/no	Provisions part of induction Team teaching with experienced teachers
TT3G20H	Nominal	Yes/no	Provisions part of induction Portfolios diaries/journals
TT3G21A	Nominal	Yes/no	Inv. in ment. act. I currently have an assigned mentor to support me
TT3G21B	Nominal	Yes/no	Inv. in ment. act. I am currently assigned mentor for one or more teacher
TT3G22E	Nominal	Yes/no	Prof.dev. act. Observation visits to other schools
TT3G22C	Nominal	Yes/no	Prof.dev. act. Education conferences
TT3G22H	Nominal	Yes/no	Prof.dev. act. Participation in a network of teachers
TT3G22I	Nominal	Yes/no	Prof.dev. act. Reading professional literature - T
TT3G28C	Nominal	Yes/no	Barr.Prof.dev. There is a lack of employer support
TT3G28F	Nominal	Yes/no	Barr.Prof.dev. There is no relevant professional development offered
TT3G28G	Nominal	Yes/no	Barr.Prof.dev. There are no incentives for participation in prof. developm.
TT3G29A4	nominal	Yes/no	Observation of classroom teaching I have never received this feedback
TT3G29F2	Nominal	Yes/no	Self-assessment of my work Principal or member(s) of management team
TT3G29F3	Nominal	Yes/no	Self-assessment of my work Other colleagues within the school
TT3G29F4	Nominal	Yes/no	Self-assessment of my work I have never received this feedback
TT3G32A	Nominal	Yes/no	Agree Most teachers strive to develop new ideas for teaching
TT3G32B	Nominal	Yes/no	Agree Most teachers are open to change
TT3G32D	Ordinal.	Strongly disagree-strongly agree	Agree. Most teachers provide practical support to each other

TT3G48A	Ordinal.	Strongly disagree-strongly agree	Sch. Climate. Sch provides staff w. opp. to actively participate in sch decisions
TT3G48C	Ordinal.	Strongly disagree-strongly agree	Sch.climate Sch provide studs w. opp. to actively participate in sch decisions
TT3G48D	Ordinal.	Strongly disagree-strongly agree	Sch.climate Sch has a culture of shared responsibility for school issues
TT3G48E	Ordinal.	Strongly disagree-strongly agree	Sch. Climate. There is a collaborative sch culture characterised by mutual support
TT3G48F	Ordinal	Strongly disagree-strongly agree	Sch. Climate. Sch staff share a common set of beliefs about teaching and learning
TT3G48G	Ordinal	Strongly disagree-strongly agree	Sch.climate Sch staff enforce rules for stud behaviour consistently via the sch
TT3G49B	Ordinal	Strongly disagree-strongly agree	Agree Most teachers believe that the students well-being is imp
TT3G49C	Ordinal	Strongly disagree-strongly agree	Agree Most teachers are interested in what students have to say
TT3G49E	Ordinal.	Strongly disagree-strongly agree	Agree. Teachers can rely on each other
TT3G53E	Ordinal.	Strongly disagree-strongly agree	Feeling I enjoy working at this school
TT3G54C	ordinal	Strongly disagree-strongly agree	Teachers views valued by policymakers

TT3G54D	ordinal	Strongly disagree-strongly agree	Teachers can influence educ. Policy
TT3G56D	ordinal	Strongly disagree-strongly agree	Abroad for prof.purp. As a teacher as arranged by my school or school district
TT3G56E	ordinal	Strongly disagree-strongly agree	Abroad for prof.purp. As a teacher by my own initiative

Appendix B. Factor loadings exploratory factor analysis

	factor		
	1	2	Reasons for excluding items with factor loadings above .30
TT3G18B	.078	-.255	
TT3G18E	.129	-.258	
TT3G18G	.064	-.203	
TT3G19A2	-.092	.396	
TT3G19B2	-.060	.287	
TT3G20A	-.117	.509	Loading on two factors
TT3G20B	-.118	.393	Loading on two factors
TT3G20C	-.019	.237	
TT3G20D	-.181	.123	
TT3G20F	-.028	.300	
TT3G20G	-.034	.378	
TT3G20H	-.135	.450	Loading on two factors
TT3G21A	-.027	.090	
TT3G21B	-.093	.291	
TT3G22C	-.105	.276	
TT3G22E	-.089	.337	
TT3G22H	-.078	.367	
TT3G22I	-.064	.145	
TT3G28C	-.460	-.043	Subject unrelated to collaborative culture among teachers. Employer-employee.
TT3G28F	-.419	.133	Loading on two factors
TT3G28G	-.508	.119	Loading on two factors
TT3G29A4	.094	-.116	
TT3G29F2	-.245	.542	Loading on two factors
TT3G29F3	-.211	.445	Loading on two factors
TT3G29F4	.267	-.632	Loading on two factors
TT3G32A	.604	.073	Subject unrelated to collaborative culture. Teacher conception.
TT3G32B	.578	.148	Loading on two factors
TT3G32D	.615	.035	
TT3G48A	.554	.013	
TT3G48C	.423	-.003	Subject unrelated to collaborative culture among teachers. Towards students.
TT3G48D	.663	.067	
TT3G48E	.683	.069	
TT3G48F	.640	.078	
TT3G48G	.576	.095	Subject unrelated to collaborative culture among teachers. Towards students.
TT3G49B	.479	.145	Subject unrelated to collaborative culture among teachers. Towards students.
TT3G49C	.542	.174	Loading on two factors
TT3G49E	.613	.023	
TT3G53E	.553	.111	Loading on two factors
TT3G54C	.057	-.089	
TT3G54D	-.034	-.083	
TT3G56D	-.063	.100	
TT3G56E	-.068	.113	

Appendix C. Sem Analysis, Path coefficients

Paths	From	To	coefficient	S.E.
	Collaborative culture	CPD	**.494	.071
	Contrived collegiality	CPD	**.297	.045
	Contrived collegiality	Collaborative culture	**.285	.048
	SES	CPD	.016	.055
	SES	Collaborative culture	-.079	.051
	SES	Contrived collegiality	* .133	.068

** Path coefficient is significant at the .05 level (one-tailed).*
*** Path coefficient is significant at the .01 level (one-tailed).*

Appendix D. Calculation indirect effects

Paths	From	To	Direct effect	Indirect effect	Total effect
	Collaborative culture	CPD	**.494	…	**.494
	Contrived collegiality	CPD	**.297	..141 (.494 * .285)	**.438 (.297 + .141)
	Contrived collegiality	Collaborative culture	**.285	…	**.285
	SES	Collaborative culture	-.079	…	-.079
	SES	Contrived collegiality	* .133	…	* .133
	SES	CPD	.016		.016
	SES	CPD (via contrived collegiality)	.016	.040 (.133 * .297)	
	SES	CPD (via collaborative culture)	.016	-.039 (-.079 * .494)	
	SES	CPD (via contrived collegiality and collaborative culture)	.016	.019 (.133*.285*.494)	-.004 (.016 - .039 + .019)