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Teachers as team players? Exploring the relationship between collaborative practice, professional development, and work-related stress using diary data

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Abstract

Purpose – This study examines teachers' collaborative practice during non-instructional work time. It aims to explore teachers' collaborative practice using diary data, analyze daily and overall relations of collaboration to teachers' professional development (PD) and work-related stress by disentangling between- and within-person effects, and investigate whether these associations are stronger when including only collaborative activities that focus on further developing educational practice.

Design/methodology/approach – The study employed an end-of-day experience sampling method to investigate collaborative activities among primary school teachers in 56 schools in the German-speaking part of Switzerland. Data was collected longitudinally over three weeks, with teachers ($n = 559$) completing daily online logbook entries ($n = 7{,}110$). Mixed-effects models were employed for data analysis, exploring between- and within-person effects.

Findings – On average, one-third of teachers' non-instructional activities involved collaboration, but day-to-day variability and differences between teachers were high. Further, teachers who collaborated more overall did not report higher benefits of collaboration for PD or stress levels. However, these associations came to the fore on days when teachers collaborated more than usual. Moreover, favorable effects were identified for collaborative activities focused on advancing educational practices.

Originality/value – This study provides a differentiated overview of how teacher collaboration is associated with benefits for PD and work-related stress. It indicates that teachers do not perceive collaboration on exclusively organizational and administrative matters as valuable and beneficial for PD.

Keywords Teacher collaboration, Professional development, Work-related stress, Experience sampling method, Multilevel analysis

Paper type Research paper

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Introduction

For further developing educational practice, teachers are crucial change agents (Rechsteiner *et al.*, 2022; Mitchell and Sackney, 2011; Spillane and Louis, 2002). Previous research has found that teachers are more effective in this regard when they work not alone but as part of a team (Goddard and Goddard, 2007; Kelchtermans, 2006; Ronfeldt *et al.*, 2015; Vangrieken *et al.*, 2015; Weddle, 2022). This aligns with the *professional capital framework* (Hargreaves and Fullan, 2012), which considers teacher collaboration as a collective force for professional development (PD). Further, in the *job-demand resource (JD-R) model* (Bakker and Demerouti, 2007), collaboration is considered a job resource with the potential to reduce work-related stress levels through social support, sharing high workloads, and enhancing an individual's PD.

From an empirical perspective, however, findings on the benefits of collaboration between teachers are mixed, as not all teachers perceive collaborative activities as beneficial for PD (Johnson, 2003; Meredith *et al.*, 2022). Moreover, previous studies indicated that collaboration does not necessarily alleviate but may even increase work-related stress levels (Brägger, 2019; Cheng and Ko, 2009; McIntyre *et al.*, 2017; Woodland and Mazur, 2019).

Possible explanations for these mixed results have been discussed and related to differences in teachers' personal characteristics (Muckenthaler *et al.*, 2020), the context in which teachers collaborate (Spillane and Louis, 2002), the content of the collaborative activity (Camburn and Han, 2017), and the methodological approaches used to investigate teacher collaboration (Maag Merki *et al.*, 2022).

To shed further light on this inconsistent picture, this study addresses the following three aims: Our literature review revealed a need for more data on how often teachers collaborate in their everyday work. The notion persists that many teachers are not so much team players as lone wolves (Hargreaves and Fullan, 2012; Vangrieken and Kyndt, 2020). However, we argue that there has been a cultural shift towards more collaboration and teachers as lone wolves may soon be more the exception than the rule. The first aim of this study is to investigate how high the *proportion of collaborative activities* is in relation to the total sum of a teacher's activities.

Empirical evidence on the impact of collaboration on teachers' PD and work-related stress is based mainly on cross-sectional self-report data (Vangrieken *et al.*, 2015, 2017). However, a retrospective bias might occur when using a general assessment of daily activities that can change over time (Ohly *et al.*, 2010). Maag Merki *et al.* (2022) found that teachers' collaborative activities fluctuate over time. Hence, there is not only between- but also within-person variance in the extent to which a teacher is involved in collaborative activities. The second aim of this study is, therefore, to examine associations between teacher collaboration and perceived benefits for their PD and work-related stress by *untangling between- and within-person effects*. As a *between-person effect*, teachers who regularly work with others might perceive a higher benefit for PD and experience collaboration as a relief rather than a burden. As a *within-person effect*, teachers might perceive a day with high involvement in collaborative activities as more beneficial for PD but also more stressful, leading to an overall negative association between collaboration and stress.

As previous research on teacher collaboration indicated that different content needs to be considered (Camburn and Han, 2017), our third aim is to gain a more detailed understanding of how teachers' perceptions might differ when including *all kinds of collaborative activities versus a more focused set of activities* closely aimed at advancing educational practice.

This study is relevant and urgent, as there has been a structural shift towards a more collaborative working environment among school staff (Hargreaves, 2021). In Switzerland, where this study was conducted, there has been a growing imperative towards more collaboration during a teacher's work time because an increasing number of professionals are now working in the classroom. This is due to the shift towards inclusive education in response to the United Nations Convention on the Rights of Persons with Disabilities (UN CRPD, 2014). In inclusive schools, regular class teachers must de-privatize their practice and coordinate their work with special needs teachers. Also, job sharing is now common, as teaching has increasingly become a part-time job (BiBer, 2023). Moreover, Swiss primary

teacher education has recently adopted new training programs where student teachers focus on some subjects only (EDK, 2019). These recent changes have increased the demand for collaboration in schools. Accordingly, this study contributes substantially to understanding the associations between teacher collaboration, PD, and work-related stress by using diary data and untangling between- and within-person effects.

The sections below first explore the conceptual links between teacher collaboration and PD, followed by a review of the empirical evidence. We then examine the conceptual connections between collaboration and work-related stress, alongside empirical findings on their association.

Literature review

Teacher collaboration and PD

Teachers' PD is a fuzzy concept referring to all kinds of activities where a teacher "learns how to learn, and transforms knowledge into practice for the benefit of the students' growth" (Avalos, 2011, p. 10). However, there are at least three essential aspects that seem to be common ground in the vast literature on teachers' PD: First, a teacher needs to develop professionally because better abilities raise instructional quality (Desimone, 2009), which then improves student learning (Spillane and Louis, 2002). Therefore, successful PD from a teacher's perspective can be conceptualized as their experiencing increased ability to foster students' learning. Second, as teacher learning has "moved away from the traditional in-service teacher training" (Avalos, 2011, p. 17) over the last decades, the concept of teachers' workplace learning embedded in their day-to-day work has gained importance (Kyndt *et al.*, 2016). Therefore, a teacher's PD is a phenomenon best studied from a day-to-day perspective, embedded in a regular workday – including formal and informal activities. Third, in a systematic review of PD, Avalos (2011) stated that "the power of teacher co-learning emerges very strongly from the studies reviewed" (p. 10) – emphasizing close links between teachers' PD and collaboration.

Teacher collaboration can be defined as "cooperative actions of teachers, that is, their actual joint action to carry out their profession" (Kelchtermans, 2006). Teachers are socially embedded in a complex network of multi-professional actors–such as other teachers, principals, or school authorities – within and beyond their schools. In their *professional capital framework*, Hargreaves and Fullan (2012) pointed out that a collaborative environment in the form of social embeddedness is crucial in PD. They argue that teacher learning is not only about individuals being exposed to valuable new ideas and skills but also to a social environment where these ideas and skills can be shared, contextualized, tested, and refined. Teachers' PD is thus a product of bringing together human capital (teachers' knowledge and skills) and social capital (teachers' interactions with colleagues at work).

Research to date has reported primarily positive associations between teacher collaboration and PD: Muckenthaler *et al.* (2020) found that teachers associate collaboration with benefits such as increased professional abilities and improved student focus. In Weddle (2022), teachers reported benefits of collaboration: decreased isolation, supportive relationships, increased understanding of content knowledge, and positive changes in classroom practices. However, some studies found that collaboration is not necessarily perceived as beneficial for all individuals' PD (Cheng and Ko, 2009; Johnson, 2003; Meredith *et al.*, 2022). Some teachers view collaboration as a loss of professional autonomy and as ineffective for improving professional abilities (Johnson, 2003).

Teacher collaboration and work-related stress

Work-related stress, defined as the psychological and physiological response to job demands that exceed an individual's coping capacity (McIntyre *et al.*, 2017), is a significant concern in the teaching profession. Teaching involves high job demands – such as workload, accountability pressures, and emotional labor (Hargreaves and Fullan, 2012; Tschannen-Moran, 2014)—coupled with limited resources, including time, autonomy, and social support

(Jõgi *et al.*, 2023). Chronic exposure to such conditions can result in burnout, diminished job satisfaction, high turnover, and impaired performance (McIntyre *et al.*, 2017; Menghini *et al.*, 2023). Given these challenges, examining how teacher collaboration and PD interact with stress levels is essential.

The *JD-R model* (Bakker and Demerouti, 2007) provides a useful framework for understanding these interactions. Here, collaboration is seen as a job resource that plays a significant role in buffering job demands. There are at least three areas in which collaboration may function as a resource: First, collaboration is closely related to social support, an essential resource in the JD-R model, in the form of emotional support, knowledge sharing, and assistance with tasks. Social support can buffer the negative effects of job demands by reducing work-related stress levels (Bakker and Demerouti, 2007; Simbula, 2010). Second, collaboration can distribute the workload more evenly among team members, reducing the burden on individuals. This can mitigate the impact of high job demands, such as time pressure or heavy workloads, which are associated with higher stress levels (McIntyre *et al.*, 2017).

Research indicates that teacher collaboration can reduce work-related stress (Forte and Flores, 2014; Wolgast and Fischer, 2017). Work-related stress is associated with the working environment, and a more collaborative environment is perceived as less competitive, which reduces an individual's stress level (Canrinus *et al.*, 2012). Further, frequent collaborative lesson planning with colleagues, which leads to colleague support, is associated with reduced perceived work-related stress (Wolgast and Fischer, 2017).

However, Jõgi *et al.'s* (2023) study on teachers' daily physiological stress found no relationship between teachers' perceptions of social support through collaboration and their stress levels. Other studies even found that teacher collaboration was perceived as arduous and stressful when poorly structured (Cheng and Ko, 2009; Woodland and Mazur, 2019). Thus, collaboration can increase stress if perceived as a burden (Achinstein, 2002), but it can reduce stress if perceived as helpful and supportive (Lhospital and Gregory, 2009). Two facets of teachers' work-related stress illustrate this dual role of collaboration in shaping teachers' stress levels: task-related and social stress.

Task-related stress. Collaboration can enhance efficiency by promoting shared lesson planning, co-teaching, and exchange of instructional resources, thereby reducing workload-related stress (Wolgast and Fischer, 2017). Conversely, excessive administrative burdens, unstructured meetings, and compulsory collaboration may encroach upon individual planning time, exacerbating stress and limiting opportunities for self-directed PD (Woodland and Mazur, 2019).

Social stress. Collegial relationships based on trust and mutual respect can enhance job satisfaction and buffer against interpersonal stressors (Tschannen-Moran, 2014). Thus, a supportive professional network can reduce burnout risk by providing teachers with peers to rely on for emotional and instructional support (Canrinus *et al.*, 2012). However, dysfunctional team dynamics, unrealistic collaborative expectations, and overreliance on a few individuals may contribute to emotional exhaustion (Johnson, 2003). Moreover, power imbalances, forced collaboration, and misaligned goals may foster workplace conflict, distrust, and resistance to PD initiatives (Woodland and Mazur, 2019).

In sum, teacher collaboration is a complex and multifaceted phenomenon. From a conceptual and empirical standpoint, it is a double-edged sword regarding PD and work-related stress. Hence, collaborative efforts may potentially alleviate or hinder teachers' PD, be a protective factor against stress, or be a source of additional burden.

Empirical shortcomings

Previous research indicated that teachers often keep collaboration to a minimum, seeing it as an additional burden rather than providing relief (e.g., Bovbjerg, 2006; Vangrieken and Kyndt, 2020). Cross *et al.* (2016) introduced the notion of *collaborative overload*, which refers to excessive collaboration that overwhelms individuals with constant communication,

teamwork, and coordination. They argue that this overload may lower effectiveness and efficiency. In contrast to overload, however, many teachers still see themselves as lone wolves rather than team players (Vangrieken and Kyndt, 2020). There are plausible reasons for that: Going back to Lortie (1975), teaching has a long tradition of being considered a private practice. Hence, teachers might keep collaboration to the minimum, as they see it as illegitimate interference by others and are afraid of exposing their possible shortcomings (Vangrieken *et al.*, 2015). Some teachers refrain from working collaboratively because they consider it new territory (Vangrieken and Kyndt, 2020). Similarly, teachers may not engage in collaborative activities because they need more functional routines (Maag Merki *et al.*, 2023) and fear a poor return on investment in immediate improvements in their professional abilities (Bovbjerg, 2006). However, our search for concrete data on how often teachers collaborate in their daily work beyond their teaching duty did not turn up any studies.

Further, teacher collaboration has been extensively examined focusing on teachers in the classroom (Vangrieken *et al.*, 2015). Spillane and Louis (2002), however, pointed out that teachers' instructional worktime "is seldom considered a potentially rich area for teacher learning [. . .]. Instead, both scholarly and practical views of teacher learning are more likely to center opportunities to learn beyond the classroom" (p. 90). Studying teacher collaboration in the classroom is about analyzing the effects of co-teaching on student learning, but research on collaboration beyond the classroom focuses on teachers' workplace learning. The results of these different strands of research are often combined under the common denominator of teacher collaboration (Vangrieken *et al.*, 2015). However, in this study, we focus rather on how teachers' use of their non-instructional work time for collaborative activities corresponds to their experience of PD and stress levels.

Content-wise, teacher collaboration outside of teaching may take different forms: organizing and administering school- or class-related tasks, exchanging ideas or experiences, developing and discussing new materials, co-constructive lesson planning, getting feedback from colleagues, and giving moral support (Meirink *et al.*, 2010). However, not all collaborative activities are equally beneficial for increasing teachers' professional abilities (Camburn and Han, 2017). It is especially collaborative activities that allow in-depth reflection on teaching and student learning that may foster PD. In contrast, working together on organizational and administrative tasks without reflecting on current practice has little impact and is more often associated with a higher work-related stress level (Brägger, 2019). In this study, we aim to compare how the content of collaborative activities corresponds to teachers' experience of PD and work-related stress.

Collaborative activities beyond teachers' instructional practices can be both formal and informal (Kyndt *et al.*, 2016), situated in official staff meetings or informal open-door conversations. How often the activities occur fluctuates in teachers' daily routines. However, the empirical evidence presented up to now primarily captures teacher collaboration retrospectively through cross-sectional self-reports. Although a few studies related to the JD-R model employed diary methods (e.g., Jõgi *et al.*, 2023; Simbula, 2010), there remains a lack of empirical research distinguishing between-person and within-person effects in relation to teachers' collaborative activities beyond the classroom. Furthermore, content-specific analyses in this area are still scarce.

Research questions

To address these research gaps, we formulated the following overarching research question: How does teachers' engagement in collaborative activities during non-instructional work time relate to their perception of PD and work-related stress? To explore this, we examine the following sub-questions (RQs).

RQ1. What proportion of a teacher's non-instructional work time is spent on collaborative activities?

RQ2. To what degree does this proportion vary over time?

RQ3. How do different levels of collaborative activities relate to teachers' perceived PD benefits and work-related stress at the daily (*within-person*) and individual (*between-person*) levels?

RQ4. How do these relationships differ when focusing on collaboration aimed at student learning and educational change?

For RQ1 to 3, we opted for a purely descriptive and exploratory approach without specific hypotheses, as the existing empirical evidence base presented above is inconclusive, and the methodological approach to disentangling within- and between-person effects in this regard is uncharted territory. For RQ4, we assumed that teachers experience activities focusing on further developing educational practice as more beneficial for their PD than collaboration exclusively concerned with organizational and administrative tasks.

Method

Study design and sample

We based our analyses on diary logs of primary school teachers in 56 schools in the German-speaking part of Switzerland. We collected longitudinal data using an interval-contingent sampling technique (Fritz *et al*., 2023) with end-of-day logs over several weeks in the school year 2019/20. In three non-consecutive weeks (one week in November, December, and January), the participants received a push notification every day at 5 p.m. asking them to complete an online logbook entry within the next 24 h, recording all activities they engaged in during their non-instructional work time on that day (see Figure 1). To facilitate data entry and quantitative comparisons among teachers, 15 predefined activities in a multiple-choice format were provided (e.g., "Preparing and following up on lessons"). The online questionnaire was programmed to ask participants about further activities once an activity had been recorded (see Figure 2).

For each reported activity, teachers entered whether they executed it alone or with others (i.e., students, parents, teachers). After documenting the day's activities, teachers were prompted to evaluate the day's work overall, considering perceived benefits for improving their abilities to foster student learning, for developing their teaching team, and for their work-related stress levels. Evaluation of these constructs employed single-item measures, a practice commonly applied in experience sampling methods, such as quantitative self-report diary

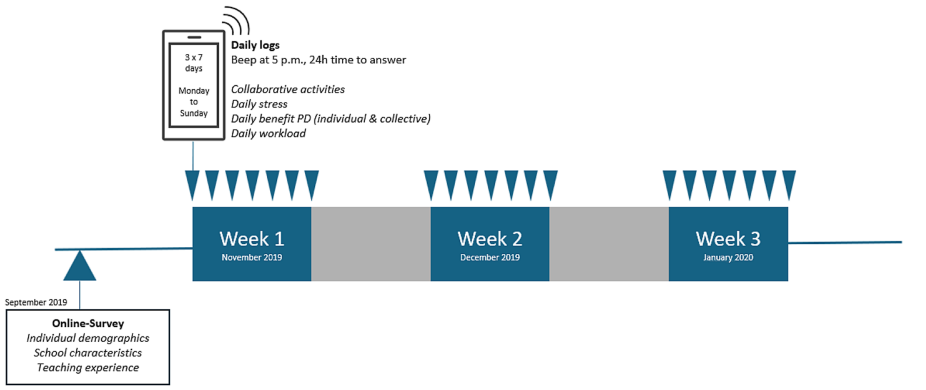

Figure 1. Data collection in the SIC study (2019/20). *Source*: Figure created by authors

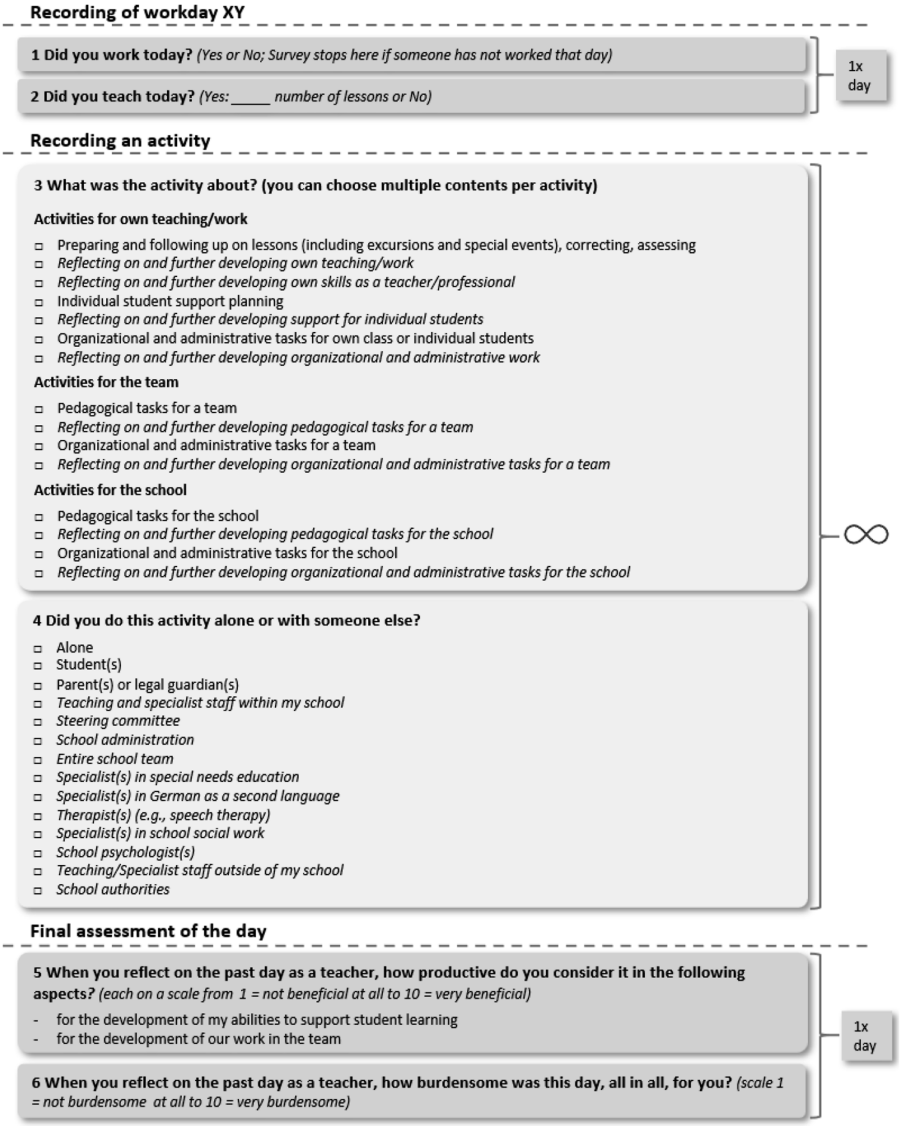

Figure 2. Daily log questionnaire. In *italics*: Activities focused on advancing educational practices (3) and professional stakeholders (4). *Source*: Figure created by authors

studies (Myin-Germeys and Kuppens, 2021); this aimed to prevent undue burden on teachers, which is crucial for sustaining high daily completion rates and commitment to participation.

Of the initially registered 1,550 school staff, 1,281 (82.6%) participated and registered a total of n_{days} = 21,269 daily entries. The study excluded weekends (n_{days} = 3,008) and non-working days (n_{days} = 5,582), resulting in 13,337 workdays. The analyses focused on school staff working as regular class teachers. Principals, special needs teachers, and subject teachers were omitted (n_{person} = 609), as previous research indicated that collaboration is often perceived differently by regular class teachers than by other staff (Paulsrud and Nilholm,

2023). Based on the suggestion in a simulation study with experience sampling data (Nezlek, 2020), we excluded teachers with response rates below 50% of the total of 21 days they were asked to record (n_{person} = 97) and those with fewer than seven workdays (n_{person} = 16). The final sample comprised 7,110 workdays nested in 559 primary teachers from 56 schools, with an average of 9.98 teachers per school (Min = 1, Max = 27).

Missingness analyses revealed that teachers participating in the online questionnaire but not providing sufficient log files (and therefore excluded from the study) were typically younger part-time teachers. The participating teachers' demographics were: average age 40.7 years (*SD* = 12.1), 82.1% women, and mean teaching experience 15.71 years (*SD* = 11.75), with roughly one-third of participants working less than 75%. The study covered schools in different areas (urban = 3, suburban = 23, peri-urban = 17, rural = 13).

Measures

Teachers' daily *collaborative activities (CA all)* were computed as the ratio of collaborative activities to total activities executed by teachers during their non-instructional work time. This yielded values within the range of 0–1, representing the percentage of activities teachers performed collaboratively with other professional actors (such as other teachers, principals, or school authorities). Personal means for each teacher were derived by calculating the average collaborative activity ratio across all workdays ($CA\ all_{between}$). Additionally, teachers' daily deviation from their personal means was computed ($CA\ all_{within}$), providing insights into day-to-day variations in collaborative engagement. The results for the ratio of collaborative activities to total activities ranged from 3.6% to 100%, with a person-related mean of 0.35 (*SD* = 0.16). The intra-class correlation coefficient (ICC) representing the variance proportion at the between-person level was computed at 0.14, indicating a modest level of consistency in teachers' day-to-day collaborative activities across the study period. For subsequent analyses, the ratios of collaborative activities (at the day and person level) were subjected to an arcsine transformation, as the percentage shares, especially in the zones below 20% and above 80%, were not linear.

Further, we examined teachers' collaborative activities related to advancing educational practices (*CA focused*). This involved excluding activities exclusively concerning organizational and administrative tasks (on a class, team, and school level). Through this refined approach, the computed person-related mean for this more focused set of collaborative activities was 0.19 (*SD* = 0.16; Min = 0, Max = 1), and the ICC was 0.19.

Teachers' perceptions of the daily benefit for their PD were assessed regarding their ability to foster student learning ($benefit\ PD_{individual}$) and team development ($benefit\ PD_{collective}$). For two distinct items, teachers provided subjective evaluations, each rated on a Likert-type scale from 1 (not at all beneficial) to 10 (extremely beneficial): "Thinking over your day, how beneficial do you think this day was for (a) developing your professional abilities to support student learning, and (b) the development of your team?" Personal mean scores over the three weeks and across all workdays ($benefit\ PD_{between}$) revealed that teachers perceived a relatively high degree of benefit for PD at an individual level, with a mean of 7.02 (*SD* = 1.28). The perceived benefit for PD at a collective level exhibited a lower mean score of 5.58, accompanied by a larger standard deviation of 1.71, indicating greater variability in teachers' perceptions. Here, too, teachers' daily deviations from their mean values were computed ($benefit\ PD_{within}$). The ICC was 0.40 for benefit PD individual and 0.35 for benefit PD collective, indicating substantial consistency in teachers' assessments over the days of the three weeks.

Teachers' work-related stress was assessed with a single item on their subjective evaluation of the day's burden (the German term *belastend* was used): "How burdensome was this day for you, all work-related things considered?" Respondents rated their overall work-related stress on a 10-point Likert scale, ranging from 1 (not at all burdensome) to 10 (extremely burdensome). The average stress level of all teachers across all workdays ($stress_{between}$) had a

mean value of 4.81 (SD = 1.87). Teachers' daily deviations from their mean values ($stress_{within}$) were calculated. The ICC was 0.47, denoting a substantial level of time-related consistency in teachers' self-reported work-related stress assessments. The reported stress levels ranged from 1 to 9.5, which highlights the diverse experiences of the participants.

Covariates. The workload per day, quantified by the number of periods/lessons taught, served as a key covariate to assess the impact of teaching demands on a given day. In addition, time-invariant covariates comprising teachers' characteristics, such as gender coded as 0 for women and 1 for men and teaching experience measured in years, were included for a more comprehensive analysis.

Data analysis

For the data analysis, mixed-effects models were employed to analyze multilevel data, drawing on established methodologies outlined in seminal works such as Raudenbush and Bryk (2002) and Hox *et al.* (2017). The daily surveys (Level 1) were nested within individual teachers (Level 2) and again nested in schools (Level 3), allowing for a comprehensive exploration of the interplay between daily experiences and teacher characteristics.

R studio version 4.3.2 (R Core Team, 2023) was used for all analyses. The analytical toolkit encompassed R-packages such as *esmpack* (Version 0.1–17) (Viechtbauer and Constantin, 2023) and *nlme* (Version 3.1–164), ensuring the appropriate handling of the hierarchical data structure. The *lmer* function estimated fixed and random effects within the two-level model to disentangle within and between variance. In this way, the analysis delved into both *between-person effects*, examining whether teachers who engaged in more collaboration experienced higher levels of benefit and stress, and *within-person effects*, investigating whether days characterized by increased collaboration were perceived as beneficial for PD but also as more stressful. To account for the variance components at each level, random effects (intercept and slope) were specified. We analyzed PD individual, PD collective, or stress as dependent variables on any given day. Teachers' daily collaborative activities were included both as a time-varying predictor (CA within, centered on the person mean) and a person-level predictor (CA between), allowing for the interpretation of within- and between-person effects, respectively (Wang and Maxwell, 2015). Additionally, teachers' gender and teaching experience were included as time-invariant covariates (Level 2). Given that intraindividual variance in PD and stress might fluctuate with workload, the number of lessons taught per day was included as a time-variant covariate. Accordingly, the same models were re-run for the more focused set of collaborative activities. The supplementary materials provide the R syntax used for the analyses to ensure transparency and reproducibility.

Results

The *first research question* (RQ1) investigated the extent of collaborative engagements among teachers during their non-instructional work time. Employing a scale ranging from 0 (no collaboration) to 1 (collaboration in every activity), the general mean score was 0.35 (Table 1). This suggested that, on average, approximately one-third of teachers' activities outside of their instructional work time involved collaboration with other professional stakeholders. Notably, nearly half of these collaborative endeavors (0.16 compared to 0.35) were focused solely on organizational and administrative tasks. Consequently, the mean proportion of teacher collaboration directed towards advancing educational work was calculated to be 0.19.

For RQ2, we examined the day-to-day variability of collaboration and the variance between teachers (averaged over three weeks). Yielding a standard deviation of 0.16 for both categories of teacher collaboration, it is noteworthy that the results depicted a wide range of teacher behaviors, spanning from "lone wolves" who predominantly worked independently to "team players" who engaged in collaborative efforts across all tasks, covering almost the entire spectrum (3.6%–100%). Moreover, variance decomposition within teachers revealed an ICC

Table 1. Means, standard deviations, ICCs, and between-person-correlations among study variables

	M	SD	ICC	4	5	6	7	8
Antecedents								
1. Sex (0: female, 1: male)	0.179	0.384		0.02	0.03	*−0.16***	0.04	*0.16****
2. Teaching experience	15.713	11.750		0.04	0.04	*0.10**	*0.09**	−0.04
3. Workload teaching	5.386	0.674		−0.02	−0.01	0.08	0.05	*0.09**
Daily collaborative practice								
4. CA all	0.354	0.164	0.14	–				
5. CA focused	0.187	0.155	0.19	*0.78****	–			
Daily outcomes								
6. Benefit PD individual	7.018	1.283	0.40	−0.01	*0.11***	–		
7. Benefit PD collective	5.579	1.707	0.35	*0.14***	*0.11***	*0.59****	–	
8. Work-related stress	4.810	1.870	0.47	0.06	*0.10**	−0.08	0.08	–

Note(s): CA all = all collaborative activities, CAs focused = collaborative activities focused on further developing educational practice. *M* = mean, *SD* = standard deviation, ICCs = intra-class correlation coefficients for teachers. Pearson correlation coefficients were computed. Significant *p*-values (two-tailed) are indicated with * < 0.05, ** < 0.01, *** < 0.001

Source(s): Table created by authors

of 0.14 (and 0.19, respectively, for the more focused set of collaborative activities), indicating moderate consistency (LeBreton and Senter, 2008). Hence, the majority of variance in collaborative activities occurred within individual teachers, indicating fluctuations from day to day rather than consistent patterns between the participants.

The bivariate correlation analyses at the between-person level (Table 1) showed that more collaboration among teachers was significantly associated with a more positive perception of the benefits for collective PD. No significant association was found for individual PD or stress level. However, when examining only the narrower set of collaborative activities explicitly focusing on advancing educational practice, the analyses revealed positive relationships between collaboration and the benefits associated with individual and collective PD and teachers' stress levels.

RQ3 delved more deeply into the associations between varying proportions of collaborative activities and teachers' perceptions of benefits for PD and work-related stress, examining both within- and between-person effects (Table 2). Regarding *within-person effects*, on days when teachers engaged in more collaborative activities than usual, there was a significant increase in their work-related stress ($\beta = 0.126$, SE = 0.026, $p < 0.001$). However, no significant correlation emerged between increased collaboration and the perceived benefit for individual PD ($\beta = -0.004$, SE = 0.023, $p = 0.875$). In contrast, a positive and significant relationship was identified between heightened collaboration and the perceived benefit for collective PD ($\beta = 0.700$, SE = 0.039, $p < 0.001$). Turning to the *between-person effects*, there were no significant associations between increased collaboration and the perceived benefit for PD (individual: $\beta = 0.011$, SE = 0.054, $p = 0.838$; collective: $\beta = 0.115$, SE = 0.069, $p = 0.098$) and teachers' stress levels ($\beta = 0.055$, SE = 0.081, $p = 0.497$).

RQ4 examined how these relationships differ when the analysis looked only at collaborative activities to improve educational practice. On the *within-person level*, days characterized by increased collaboration focused on advancing educational practice were still consistently associated with slightly increased levels of work-related stress ($\beta = 0.086$, SE = 0.024, $p < 0.001$) (Table 3). However, in contrast to the general picture, teachers associated these collaborative activities with a higher benefit for both individual PD ($\beta = 0.075$, SE = 0.020, $p < 0.001$) and collective PD ($\beta = 0.434$, SE = 0.034, $p < 0.001$). On

Table 2. Results of the mixed-effects models on the relationship between collaborative activities (ALL) and perception of work-related benefits and stress

	Benefit PD individual			Benefit PD collective			Work-related stress		
	β	SE	*p*	*β*	SE	*p*	*β*	SE	*p*
(*Intercept*)	*7.083*	*0.060*	*0.000*	*5.652*	*0.093*	*0.000*	*4.915*	*0.094*	*0.000*
CA all (*between-person*)	0.011	0.054	0.838	0.115	0.069	0.098	0.055	0.081	0.497
CA all *(within-person*)	−0.004	0.023	0.875	*0.700*	*0.039*	*0.000*	*0.126*	*0.026*	*0.000*
Workload teaching	−0.031	0.020	0.121	−0.025	0.029	0.379	*0.264*	*0.026*	*0.000*
Teaching experience	*0.134*	*0.055*	*0.016*	0.117	0.071	0.099	−0.049	0.083	0.550
Sex	*−0.224*	*0.055*	*0.000*	−0.096	0.070	0.176	*0.285*	*0.082*	*0.001*

Note(s): Workload teaching was introduced as a time-variant covariate (numbers of lessons taught on given day). Teaching experience (in years) and sex (0 = female, 1 = male) are time-invariant covariates. *β* = standardized regression coefficient, *SE* = standard error, *p* = *p*-value
Source(s): Table created by authors

Table 3. Results of the mixed-effects models on the relationship between collaborative activities (FOCUS) and the perception of work-related benefits and stress

	Benefit PD individual			Benefit PD collective			Work-related stress		
	β	SE	*p*	*β*	SE	*p*	*β*	SE	*p*
(*Intercept*)	*7.086*	*0.061*	*0.000*	*5.649*	*0.093*	*0.000*	*4.921*	*0.094*	*0.000*
CA focused (*between-person*)	*0.130*	*0.053*	*0.015*	0.109	0.069	0.115	0.134	0.080	0.096
CA focused *(within-person*)	*0.075*	*0.020*	*0.000*	*0.434*	*0.034*	*0.000*	*0.086*	*0.024*	*0.000*
Workload teaching	−0.034	0.020	0.088	0.007	0.030	0.820	*0.270*	*0.026*	*0.000*
Teaching experience	*0.133*	*0.055*	*0.016*	0.138	0.071	0.054	−0.045	0.083	0.582
Sex	*−0.232*	*0.055*	*0.000*	−0.090	0.071	0.206	*0.280*	*0.082*	*0.001*

Note(s): Workload teaching was introduced as a time-variant covariate (numbers of lessons taught on given day). Teaching experience (in years) and sex (0 = female, 1 = male) are time-invariant covariates. *β* = standardized regression coefficient, *SE* = standard error, *p* = *p*-value
Source(s): Table created by authors

the *between-person level*, there was still no significant association between increased collaboration and work-related stress ($\beta = 0.134$, SE = 0.080, $p = 0.096$) and perceived benefit for collective PD ($\beta = 0.109$, SE = 0.069, $p = 0.115$). However, contrary to the general findings, a positive relationship existed between a higher proportion of these collaborative activities and greater perceived benefit for individual PD ($\beta = 0.130$, SE = 0.053, $p = 0.015$).

Discussion

Several key contributions of this study can be derived from the results that shed light on our overarching research question on how teachers' engagement in collaborative activities during non-instructional work time relates to their perceptions of PD and work-related stress. The *first major finding* highlights the prevalence of collaboration among teachers in their daily practices (RQ1). Approximately one-third of daily activities beyond a teacher's classroom are executed collaboratively with other professional stakeholders (such as other teachers or principals). Two-thirds of teachers execute 20%–50% of all their activities collaboratively. Our findings, therefore, refute the notion that teachers predominantly work in isolation (Vangrieken and Kyndt, 2020) and underline that teamwork is already the norm for most teachers.

As a *second finding*, variability in teachers' collaboration is high day-to-day (RQ2). This confirms previous findings that there is substantial within-person variability in teachers' collaborative activities. As a consequence, teachers can be team players and lone wolves at the same time. The extent to which a teacher is involved in collaborative activities is not primarily about teachers' characteristics but depends on the given workday. It is, therefore, crucial to disentangle between- and within-person effects in future studies aiming to examine the costs and benefits of teacher collaboration.

In this regard, our *third contribution* concerns the nuanced examination of the variance in teacher collaboration, distinguishing between- and within-variance of teachers (RQ3). We found no significant between-person effect regarding teachers' collaboration and their perceived work-related benefit for PD and stress levels. This does not align with the basic assumptions of the professional capital framework (Hargreaves and Fullan, 2012) and JD-R model (Bakker and Demerouti, 2007) on the benefits of collaborative practice. However, we found evidence at least partially supporting these assumptions when considering within-person effects. Hence, on days teachers collaborate more than usual, they report higher benefits for collective PD but find their day more burdensome than usual. No such effect could be identified for individual PD. Two points can be derived from these findings: First, contrary to theoretical assumptions and existing empirical evidence (Muckenthaler *et al.*, 2020), our results indicate that more collaboration is not systematically associated with a lower stress level. As to the effect on daily stress level, more collaboration is even associated with higher stress levels. This finding, however, is based only on correlative analyses; the direction of these effects has not yet been clarified. It is also possible that higher stress levels on a workday are not triggered by collaboration but rather by a stressful challenge that teachers work on together, reflected in increased collaborative activity. However, further research is needed to distinguish cause from effect. Second, the ambivalent results on the benefits of teacher collaboration can at least partially be explained by separating between-from within-person effects.

Our *fourth finding* is that almost half of the teachers' collaborative activities focus exclusively on organizational and administrative work. On average, less than a fifth of all activities executed outside of instructional work involve teachers collaborating on issues related to improving student learning or educational practice. Related to this, we identified differential effects based on the content of collaborative activities (RQ4). Hence, examining the between- and within-person effects on a set of collaborative activities focused on advancing educational practice revealed that more collaboration goes hand in hand with a higher experience of benefit for PD on an individual level. Following Camburn and Han (2017), our findings suggest that working exclusively on organizational and administrative matters is not perceived as valuable and beneficial for further developing PD. Moreover, the within effect on stress becomes slightly weaker when the collaboration is focused on advancing educational practice.

As a *fifth contribution*, concerning the concept of *collaborative overload* (Cross *et al.*, 2016), we suggest that one-third of a teacher's activities during non-instructional work time might serve as an approximation or starting point to find out if there is a tipping point at which the benefits of collaborative activities decrease and work-related stress increases. However, we have not found evidence for such a tipping point and can only invite researchers to address this issue in future studies.

Limitations

This study has at least three limitations worth noting. First, it focused solely on the quantity and content of teacher collaboration. Although it effectively captured the extent of collaborative activities, it did not examine the interaction between the quantity, quality, and content of these activities (Ronfeldt *et al.*, 2015). As a result, the study offers a quantitative overview of collaboration but lacks the qualitative depth needed to explore the dynamics of teacher collaboration in greater detail. Regarding the JD-R model, it remains unclear whether teachers

in this study perceived specific collaborative activities as resources, such as social support, or rather as stressors.

Second, the measurement of collaboration was based solely on the number of activities and neglected the duration of the activities. By relying only on the ratio of collaborative activities, the study may overlook variations in duration. Unfortunately, our data did not allow the examination of duration. A more comprehensive assessment would provide a more nuanced understanding of teachers' collaborative practices.

A third limitation is that work-related stress was measured in a nonspecific way. We can, therefore, not distinguish to what extent the relationship between collaboration and stress could be different if, for example, a distinction had been made between task-related and social-related stress sources (McIntyre *et al.*, 2017).

Conclusion

This study contributes valuable insights into the collaborative landscape of teachers' workday practices outside the classroom. Prevalence of collaboration, nuanced variations in its impact, and differential effects based on the content of the activities underscore the multifaceted nature of collaborative efforts within the school context. Our findings provide a foundation for further exploration and refinement of teacher collaboration, with implications for PD and educational change initiatives.

The title of this study posed the question: "Teachers as team players?" Based on our findings, we might conclude that (at least in primary schools in Switzerland) a cultural shift has been underway. The notion of teachers as isolated islands seems to be no longer true. Nevertheless, researchers and practitioners are still challenged to find ways in which collaboration among teachers can reduce individual stress levels at work and be experienced as effective for their PD and student learning – the ultimate goal of educational change. Teacher collaboration should not be considered unconditionally as the panacea of all pending school issues (Hargreaves, 2021). Instead, what is needed is more tailored support for teachers so that they can integrate collaborative activities into their daily work life with a clear focus on their core business: fostering student learning via high-quality instruction.

References

Achinstein, B. (2002), "Conflict amid community: the micropolitics of teacher collaboration", *Teachers College Record*, Vol. 104 No. 3, pp. 421-455, doi: 10.1111/1467-9620.00168.

Avalos, B. (2011), "Teacher professional development in Teaching and Teacher Education over ten years", *Teaching and Teacher Education*, Vol. 27 No. 1, pp. 10-20, doi: 10.1016/j.tate.2010.08.007.

Bakker, A.B. and Demerouti, E. (2007), "The job demands-resources model: state of the art", *Journal of Managerial Psychology*, Vol. 22 No. 3, pp. 309-328, doi: 10.1108/02683940710733115.

BiBer (2023), *Bildungsbericht Schweiz 2023*, Schweizerische Koordinationsstelle für Bildungsforschung, Aarau, available at: https://www.skbf-csre.ch/en/education-report/education-report/

Bovbjerg, K.M. (2006), "Teams and collegiality in educational culture", *European Educational Research Journal*, Vol. 5 Nos 3-4, pp. 244-253, doi: 10.2304/eerj.2006.5.3.244.

Brägger, M. (2019), LCH Arbeitszeiterhebung, pp. 1-104, available at: https://www.lch.ch/fileadmin/user_upload_lch/Aktuell/Medienkonferenzen/Bericht_LCH_Arbeitszeiterhebung_2019.pdf

Camburn, E.M. and Han, S.W. (2017), "Teachers' professional learning experiences and their engagement in reflective practice: a replication study", *School Effectiveness and School Improvement*, Vol. 28 No. 4, pp. 527-554, doi: 10.1080/09243453.2017.1302968.

Canrinus, E.T., Helms-Lorenz, M., Beijaard, D., Buitink, J. and Hofman, A. (2012), "Self-efficacy, job satisfaction, motivation and commitment, exploring the relationships between indicators of teachers' professional identity", *European Journal of Psychology of Education*, Vol. 27 No. 1, pp. 115-132, doi: 10.1007/s10212-011-0069-2.

Cheng, L.P. and Ko, H.-K. (2009), "Teacher-team development in a school-based professional development program", *Mathematics Educator*, Vol. 19 No. 1, pp. 8-17, doi: 10.63301/tme.v19i1.1933.

Cross, R., Rebele, R. and Grant, A. (2016), "Too much teamwork exhausts employees and saps productivity: here's how to avoid it", *Harvard Business Review*, available at: https://hbr.org/2016/01/collaborative-overload

Desimone, L.M. (2009), "Improving impact studies of teacher's professional development: toward better conceptualizations and measures", *Educational Researcher*, Vol. 38 No. 3, pp. 181-199, doi: 10.3102/0013189X08331140.

EDK (2019), "Reglement über die Anerkennung von Lehrdiplomen für den Unterricht auf der Primarstufe, der Sekundarstufe I und an Maturitätsschulen (4.2)", available at: https://www.edk.ch/de/dokumentation/medienmitteilungen/medienmitteilung-28-3.2019

Forte, A.M. and Flores, M.A. (2014), "Teacher collaboration and professional development in the workplace: a study of Portuguese teachers", *European Journal of Teacher Education*, Vol. 37 No. 1, pp. 91-105, doi: 10.1080/02619768.2013.763791.

Fritz, J., Piccirillo, M., Cohen, Z.D., Frumkin, M., Kirtley, O.J., Moeller, J., Neubauer, A.B., Norris, L., Schuurman, N.K., Snippe, E. and Bringmann, L.F. (2023), "So you want to do ESM? Ten essential topics for implementing the experience sampling method (ESM)", OSF Preprints, doi: 10.31219/osf.io/fverx.

Goddard, Y.L., Goddard, R.D. and 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*, Vol. 109 No. 4, pp. 877-896, doi: 10.1177/016146810710900401.

Hargreaves, A. (2021), "Teacher collaboration: 30 years of research on its nature, forms, limitations and effects", in Hargreaves, A. (Ed.), *Policy, Teacher Education and the Quality of Teachers and Teaching*, Routledge, New York, pp. 103-121.

Hargreaves, A. and Fullan, M. (2012), *Professional Capital. Transforming Teaching in Every School*, Teachers College Press, New York.

Hox, J., Moerbeek, M. and van de Schoot, R. (2017), *Multilevel Analysis: Techniques and Applications*, 3rd ed., Routledge, New York, doi: 10.4324/9781315650982.

Jõgi, A.L., Aulén, A.M., Pakarinen, E. and Lerkkanen, M.K. (2023), "Teachers' daily physiological stress and positive affect in relation to their general occupational well-being", *British Journal of Educational Psychology*, Vol. 93 No. 1, pp. 368-385, doi: 10.1111/bjep.12561.

Johnson, B. (2003), "Teacher collaboration: good for some, not so good for others", *Educational Studies*, Vol. 29 No. 4, pp. 337-350, doi: 10.1080/0305569032000159651.

Kelchtermans, G. (2006), "Teacher collaboration and collegiality as workplace conditions: a review", *Zeitschrift für Padagogik*, Vol. 52 No. 2, pp. 220-237, doi: 10.25656/01:4454.

Kyndt, E., Gijbels, D., Grosemans, I. and Donche, V. (2016), "Teachers' everyday professional development: mapping informal learning activities, antecedents, and learning outcomes", *Review of Educational Research*, Vol. 86 No. 4, pp. 1111-1150, doi: 10.3102/0034654315627864.

LeBreton, J.M. and Senter, J.L. (2008), "Answers to 20 questions about interrater reliability and interrater agreement", *Organizational Research Methods*, Vol. 11 No. 4, pp. 815-852, doi: 10.1177/1094428106296642.

Lhospital, A.S. and Gregory, A. (2009), "Changes in teacher stress through participation in pre-referral intervention teams", *Psychology in the Schools*, Vol. 46 No. 10, pp. 1098-1112, doi: 10.1002/pits.20455.

Lortie, D.C. (1975), *Schoolteacher: A Sociological Study*, University of Chicago Press, Chicago.

Maag Merki, K., Grob, U., Rechsteiner, B., Rickenbacher, A. and Wullschleger, A. (2022), "Preconditions of teachers' collaborative practice: new insights based on time-sampling data", *Frontline Learning Research*, Vol. 10 No. 1, doi: 10.14786/flr.v10i1.911.

Maag Merki, K., Wullschleger, A. and Rechsteiner, B. (2023), "Adapting routines in schools when facing challenging situations: extending previous theories on routines by considering theories on self-regulated and collectively regulated learning", *Journal of Educational Change*, Vol. 24 No. 3, pp. 583-604, doi: 10.1007/s10833-022-09459-1.

McIntyre, T.M., McIntyre, S.E. and Francis, D.J. (2017), *Educator Stress*, Springer, New York, doi: 10.1007/978-3-319-53053-6.

Meirink, J.A., Imants, J., Meijer, P.C. and Verloop, N. (2010), "Teacher learning and collaboration in innovative teams", *Cambridge Journal of Education*, Vol. 40 No. 2, pp. 161-181, doi: 10.1080/0305764X.2010.481256.

Menghini, L., Spagnoli, P. and Balducci, C. (2023), "Uncovering the main and interacting impact of workaholism on momentary hedonic tone at work: an experience sampling approach", *Journal of Occupational Health Psychology*, Vol. 28 No. 6, pp. 380-394, doi: 10.1037/ocp0000365.

Meredith, C., Moolenaar, N.M., Struyve, C., Vandecandelaere, M., Gielen, S. and Kyndt, E. (2022), "The importance of a collaborative culture for teachers' job satisfaction and affective commitment", *European Journal of Psychology of Education*, Vol. 38 No. 1, pp. 43-62, doi: 10.1007/s10212-022-00598-w.

Mitchell, C. and Sackney, L. (2011), *Profound Improvement: Building Learning-Community Capacity on Living-System Principles*, Routledge, London.

Muckenthaler, M., Tillmann, T., Weiss, S. and Kiel, E. (2020), "Teacher collaboration as a core objective of school development", *School Effectiveness and School Improvement*, Vol. 31 No. 3, pp. 486-504, doi: 10.1080/09243453.2020.1747501.

Myin-Germeys, I. and Kuppens, P. (2021), *The Open Handbook of Experience Sampling Methodology: A Step-by-step Guide to Designing, Conducting, and Analyzing ESM Studies*, 2nd ed., KU Leuven, available at: https://www.kuleuven.be/samenwerking/real/real-book/index.htm

Nezlek, J. (2020), "Diary studies in social and personality psychology: an introduction with some recommendations and suggestions", *Social Psychological Bulletin*, Vol. 15 No. 2, e2679, doi: 10.32872/spb.2679.

Ohly, S., Sonnentag, S., Niessen, C. and Zapf, D. (2010), "Diary studies in organizational research: an introduction and some practical recommendations", *Journal of Personnel Psychology*, Vol. 9 No. 2, pp. 79-93, doi: 10.1027/1866-5888/a000009.

Paulsrud, D. and Nilholm, C. (2023), "Teaching for inclusion: a review of research on the cooperation between regular teachers and special educators in the work with students in need of special support", *International Journal of Inclusive Education*, Vol. 27 No. 4, pp. 541-555, doi: 10.1080/13603116.2020.1846799.

R Core Team (2023), "R: a language and environment for statistical computing (version 4.3.2) [computer software]", R Foundation for Statistical Computing, available at: https://www.R-project.org/

Raudenbush, S.W. and Bryk, A.S. (2002), *Hierarchical Linear Models: Applications and Data Analysis Methods*, 2nd ed., Sage, New York.

Rechsteiner, B., Compagnoni, M., Wullschleger, A., Schäfer, L.M., Rickenbacher, A. and Maag Merki, K. (2022), "Teachers involved in school improvement: analyzing mediating mechanisms of teachers' boundary-crossing activities between leadership perception and teacher involvement", *Teaching and Teacher Education*, Vol. 116, 103774, doi: 10.1016/j.tate.2022.103774.

Ronfeldt, M., Farmer, S.O., McQueen, K. and Grissom, J.A. (2015), "Teacher collaboration in instructional teams and student achievement", *American Educational Research Journal*, Vol. 52 No. 3, pp. 475-514, doi: 10.3102/0002831215585562.

Simbula, S. (2010), "Daily fluctuations in teachers' well-being: a diary study using the Job Demands–Resources model", *Anxiety, Stress and Coping*, Vol. 23 No. 5, pp. 563-584, doi: 10.1080/10615801003728273.

Spillane, J.P. and Louis, K.S. (2002), "School improvement processes and practices: professional learning for building instructional capacity", *The Yearbook of the National*

Society for the Study of Education, Vol. 101 No. 1, pp. 83-104, doi: 10.1111/j.1744-7984.2002.tb00005.x.

Tschannen-Moran, M. (2014), *Trust Matters: Leadership for Successful Schools*, John Wiley & Sons, Hoboken.

United Nations (2014), "Convention on the Rights of Persons with Disabilities (CRPD): Swiss ratification version. Swiss Confederation", available at: https://www.fedlex.admin.ch/eli/cc/2014/245/de

Vangrieken, K. and Kyndt, E. (2020), "The teacher as an island? A mixed method study on the relationship between autonomy and collaboration", *European Journal of Psychology of Education*, Vol. 35 No. 1, pp. 177-204, doi: 10.1007/s10212-019-00420-0.

Vangrieken, K., Dochy, F., Raes, E. and Kyndt, E. (2015), "Teacher collaboration: a systematic review", *Educational Research Review*, Vol. 15, pp. 17-40, doi: 10.1016/j.edurev.2015.04.002.

Vangrieken, K., Boon, A., Dochy, F. and Kyndt, E. (2017), "Group, team, or something in between? Conceptualising and measuring team entitativity", *Frontline Learning Research*, Vol. 5 No. 4, pp. 1-41, doi: 10.14786/flr.v5i4.297.

Viechtbauer, W. and Constantin, M. (2023), "Esmpack: functions that facilitate preparation and management of ESM/EMA data", R package version 0, pp. 1-20.

Wang, L.P. and Maxwell, S.E. (2015), "On disaggregating between-person and within-person effects with longitudinal data using multilevel models", *Psychological Methods*, Vol. 20 No. 1, pp. 63-83, doi: 10.1037/met0000030.

Weddle, H. (2022), "Approaches to studying teacher collaboration for instructional improvement: a review of literature", *Educational Research Review*, Vol. 35, 100415, doi: 10.1016/j.edurev.2021.100415.

Wolgast, A. and Fischer, N. (2017), "You are not alone: colleague support and goal-oriented cooperation as resources to reduce teachers' stress", *Social Psychology of Education*, Vol. 20 No. 1, pp. 97-114, doi: 10.1007/s11218-017-9366-1.

Woodland, R.H. and Mazur, R. (2019), "Or teams and ties: examining the relationship between formal and informal instructional support networks", *Educational Administration Quarterly*, Vol. 55 No. 1, pp. 42-72, doi: 10.1177/0013161X18785868.

Supplementary material

The supplementary material for this article can be found online.

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