



Research paper

Collective teacher efficacy, perceived preparedness for future school closures and work-related stress in the teacher community during the COVID-19 pandemic

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ABSTRACT

Based on survey data collected from 2159 teachers, multilevel structural equation modelling was applied to explore associations between collective teacher efficacy, teachers' perceptions about the school's preparedness to confront school closure in the future and work-related stress in the teacher community during the COVID-19 pandemic. Higher levels of collective teacher efficacy in a school were associated with the teacher community perceiving school as better prepared for future challenges. Collective teacher efficacy was also related to lower levels of work-related stress in the teacher community.

1. Introduction

The COVID-19 pandemic challenged school systems all over the world. When Finland closed its schools in March 2020 for more than two months, a transition to remote learning was required almost overnight. While some schools quickly developed relatively well-functioning routines, others delivered assignments to pupils with little teacher-pupil interaction (Ahtiainen et al., 2021; Mankki, 2021). The rapid change in teaching practices had an impact on how teachers experienced their competence in teaching and how they perceived teaching in their school (Kupers et al., 2022; Pressley & Ha, 2021). Remote working due to COVID-19 increased the complexity of teaching and challenged the teacher communities' ways of working together, which may have affected teachers' beliefs not just concerning their own capabilities and their own teaching task (i.e., self-efficacy), but also their perceptions about teaching efficacy in the teacher community (collective efficacy) of their school. Shortly after the first wave of the pandemic, researchers suggested that teacher professional communities with collaborative work cultures and strong collective efficacy beliefs were better able to encounter the challenges schools faced during the pandemic

(Hargreaves & Fullan, 2020). However, empirical research on school level factors contributing to teacher communities' capacity to deal with pandemics or similar challenges in the future is scarce (Herman et al., 2021).

It has been suggested that the collective teacher efficacy constitutes one of the stronger school-level predictors of pupils' academic achievement (Hattie, 2015). Although Hattie's meta-analysis has been criticised (Cheung & Slavin, 2016) and the causality of the relationship disputed due to methodological problems in the research (Hoogsteen, 2020), there has been general agreement that teachers' efficacy beliefs influence their decision-making, teaching quality, and work-related stress (Klassen & Tze, 2014; Lauermaann & ten Hagen, 2021). Worrying about students, one's own or family health and arranging remote learning in the uncertain pandemic situation increased the risk of stress for teachers and the teacher communities (Ozamiz-Etxebarria et al., 2021). However, there is a gap in the literature concerning the variation of stress between teacher communities (Collie & Mansfield, 2022), factors related to stress in the teacher community and the ability of teacher communities to confront unexpected challenges like remote teaching periods. Therefore, we took a multilevel approach to examine

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the relationships between collective teacher efficacy, teacher's perceptions about the school's preparedness for school closures in the future and work-related stress in the teacher community.

2. Study framework

2.1. Collective teacher efficacy in confronting school closures

This study is based on Bandura's (1997) social cognitive theory in which people's beliefs about their ability to produce desired outcomes with their actions is a central incentive to act and adapt to novel situations. As people do not live in isolation, but they work together to produce the results that are desired, the theory expands from the individual to describe collective efficacy as shared beliefs of a group's power to produce desired outcomes (Bandura, 1998; Donohoo, 2018; Tschannen-Moran & Barr, 2004; Zhang et al., 2022). In this study, collective teacher efficacy (CTE) refers to teachers' shared perceptions that the conjoint capabilities of the members of the teacher professional community in a school have a positive effect on students' learning (Goddard et al., 2015). Whereas self-efficacy beliefs refer to an individual's perception of their ability to act successfully to complete a specific task (e.g., Dicke et al., 2015; Skaalvik & Skaalvik, 2007, 2010; Tschannen-Moran et al., 1998; Tschannen-Moran & Hoy, 2001), CTE is an "emergent group-level attribute rather than simply the sum of members' perceived personal efficacies" (Bandura, 1997, p. 478; see also Donohoo, 2018; Klassen et al., 2011). CTE consists of context-specific appraisals that can oscillate according to how members of the teacher community interpret everyday observations, engagements and interactions (Bandura, 1997; Chesnut & Burley, 2015; Usher & Pajares, 2008) and may influence the persistence of teacher communities and their ability to cope with the various changes and challenges schools face (Klassen et al., 2011, p. 23).

CTE consists of teachers' evaluations of the teaching competence of the professional community (i.e., group competence) and assessment of the teaching task from the community's perspective (i.e., task analysis) (e.g., Goddard et al., 2015). That is, teachers' perceptions of the teacher community's competence and the teaching task in the school they are working are interrelated components of CTE. Hence, CTE can be improved by planning work processes and periods in ways that emphasise controllable variables yielding success (e.g., dividing long term challenging goals into smaller tasks for the teacher community, accomplishing them step by step) and by focusing on the achievements of the group, which further may improve well-being in the group (Durham et al., 1997). For example, Goddard and Goddard (2001) found a relationship between CTE and teacher self-efficacy and suggested that school communities with a strong shared sense of competence for teaching may contribute positively to self-perceived efficacy of teachers (see also, Skaalvik & Skaalvik, 2007; Donohoo, 2018).

While there have been decades of research on teacher self-efficacy, research on CTE has received less attention in school development research until the more recent findings highlighting its importance (Donohoo, 2018; Klassen et al., 2011). There is evidence of the positive relationship between CTE and student achievement, even after controlling for student prior achievement and the demographic features of the school (e.g., Goddard et al., 2000; Goddard et al., 2015; Moolenaar et al., 2012). A review study conducted by Donohoo (2018) showed multiple positive consequences for CTE, including teachers' job satisfaction, teachers' commitment to the teaching profession and students, positive attitudes about teaching students with special education needs, and professional development. Whereas teachers with strong self-efficacy beliefs are more resilient, persist longer when dealing with challenges and are perceived as being more effective by others (e.g., Dicke et al., 2015; Guskey, 1988; Wolters & Daugherty, 2007), CTE can be considered to be a central factor for the community level persistence and commitment to educational goals even in difficult situations (Klassen et al., 2011). For example, differences between pupils' learning

results related to demographic features have been shown to be smaller in schools with strong CTE (Goddard et al., 2017).

2.2. School's preparedness for future school closures

The COVID-19 pandemic led to unprecedented disruptions in schooling all over the world. Although schools may today focus on repairing the damage, they also need to prepare themselves for unpredictable events of the future. Therefore, not only do individual teachers need to learn and develop their capacity to "maintain or re-establish wellbeing in the face of challenges" (Hascher et al., 2021, p. 422), the teacher communities and schools as organisations will also benefit from building contextual resources that support them in difficult situations. Consequently, the situation has increased the interests of researchers to develop novel means to measure how schools have responded to and learned from the pandemic (e.g., The PISA Global Crises Module) to increase understanding of the ways schools could prepare for future disruptions to schooling (Bertling et al., 2020).

As the pandemic was developing differently across Finland, there may have been differences between schools in how prepared the teacher communities perceived their school to be for future challenges. It has been suggested in the literature that CTE supports teacher communities in enhancing persistence and commitment to goals even when challenges are met (Klassen et al., 2011), but its association with how prepared the teacher community perceives their school for possible future challenges has been less studied. However, some international evidence has shown that when school communities were built on collaborative practices, they were better able to conquer challenges compared to less collaborative and more hierarchical schools (Hargreaves & Fullan, 2020). Examining teacher communities' perceptions of school's preparedness for school closures in the future (Bertling et al., 2020) may shed light on how the pandemic experiences in different districts may have prepared schools for future challenges. To advance the understanding of schools' contextual resources when future challenges are met (Hascher et al., 2021) and to improve measures of teacher communities' perceived preparedness, it is important to investigate its school level association with teachers' stress.

2.3. Teachers' work-related stress

Stress is the body's response to any demand including job demands, followed by adverse effects such as anxiety, depression or post-traumatic stress disorder (de Kloet et al., 2005; Fink, 2016). If prolonged, extreme levels of stress may lead to exhaustion or even burnout and morbidity like cardiovascular disease, (e.g., Demerouti et al., 2001; Kivimäki et al., 2002). For this study we defined teachers' work-related stress as an unpleasant situation in which the teacher feels tense, nervous, restless, anxious, unable to recover from workload or unable to sleep at night because of a troubled mind caused by some aspect of work as a teacher (Elo et al., 2003; Kyriacou, 2001). During the last 15 years, recovery from stress has begun to be emphasised more in stress research (Sonnentag et al., 2017). To maintain the equilibrium of the body and mind and to minimise mental and physical effects, a person needs to recover from job stress. Recovery means a dynamic process aimed at restoring the energetic resources of the person to a pre-stressor level, thus retaining their work performance (Zijlstra et al., 2014; Sonnentag et al., 2017). The literature also separates recovery as a process and recovery as an outcome, the latter meaning how a person can perform tasks in their workplace (Sonnentag et al., 2017), which is considered in our study.

The pandemic forced teachers to adopt new teaching modalities and different communication methods compared to the usual situation. This increased job demands (Demerouti et al., 2001) in the physical domain (digital equipment and programmes, physical restrictions), on the psychological domain (remote teaching, worried parents, own health) as well as on the social and organisational side (meeting colleagues,

support). While teaching is considered to be one of the more stressful white collar professions in the western world (e.g., Aulén et al., 2021; Johnson et al., 2005; Lim & Eo, 2014; Pietarinen et al., 2013), teachers' stress and mental health problems may have even been amplified during the pandemic (Chen, 2022; Ma et al., 2022; Ozamiz-Etxebarria et al., 2021; Santiago et al., 2023; Silva et al., 2021).

There is a growing amount of research about the effects of COVID-19 pandemic on students' learning and wellbeing (e.g., Engzell et al., 2021; Hossain et al., 2022; Maldonado & De Witte, 2022), but the pandemic has also put pressure on teachers in terms of needing to re-design teaching routines and learning activities (e.g., Kupers et al., 2022). Studies have shown high levels of teacher stress (Chan et al., 2021), increasing levels of teachers' burnout symptoms (Sokal et al., 2020) and decreased levels of teachers' work-related wellbeing during the lockdown period (Alves et al., 2021). Although some studies focused on the factors causing stress for teachers during the pandemic (e.g., Pressley, 2021), less is known about factors buffering teachers' work-related stress in challenging situations such as the pandemic.

There is evidence that CTE is related to lower levels of teacher stress and burnout (Lim & Eo, 2014) and higher levels of job satisfaction (Donohoo, 2018; Klassen, 2010). Klassen (2010) found that collective teacher efficacy to maintain student discipline was associated with low levels of job stress from student behaviour and high levels of job satisfaction. Studies have also shown that teachers with low commitment to the profession and low-quality teacher-student interactions report higher levels of teacher stress and burnout (Buettner et al., 2016; Virtanen et al., 2019). However, studies focusing on the relationship between CTE and teacher burnout have often focused only on the individual level variance, instead of the role of organisational factors (e.g., Lim & Eo, 2014; Malinen & Savolainen, 2016). Some recent studies have highlighted the need for a group level perspective focusing on stress or burnout in the teacher professional community (e.g., Collie & Mansfield, 2022; Pietarinen et al., 2021). For example, one study found that in schools with high concentrations of teachers vulnerable to stress, teachers also perceive more work-place fatigue and lower levels of commitment to the teaching profession (Fitchett et al., 2021). Accordingly, there is limited knowledge about the school level variance in teacher stress and its relationship with CTE and school's preparedness for future challenges.

2.4. CTE and work-related stress in the context of different school organisations

CTE is a result of the dynamics, interactions and collaborative experiences in the professional community, on which teachers base their joint analysis of the teaching task and their evaluations of the teaching competence of that community (e.g., Goddard et al., 2015). Thus, collaboration within the professional community and the leadership practices in the school are central building blocks of CTE that are also positively related to student learning (Brinson & Steiner, 2007; Derington & Angelle, 2013; Goddard et al., 2015, 2021). Moolenaar et al. (2012) collected data from 53 Dutch elementary schools and found that teacher networks that were well connected were associated with strong CTE, which further supported student achievement (see also Goddard et al., 2000).

CTE may also contribute to work-related wellbeing in the teacher community by reducing teachers' stress even in difficult circumstances (Klassen, 2010). In South-Korea, Lim and Eo (2014) found that CTE works as a mediating factor; high levels of reflective dialogues in school were associated with a higher level of CTE and a lower level of teacher burnout. They also found that a conflicting school organisational climate was associated with lower CTE (see also Hong, 2012). Sørli and Torheim (2011) found that CTE was irreversibly and reciprocally related to student misconduct. This means that the higher the CTE, the lower was the amount of student misconduct that was observed at the school. Low levels of CTE, school climate and organisational justice have also been

found to be associated with burnout and depression in a study involving 609 Italian teachers (Capone et al., 2019; see also Huotilainen & Saarikivi, 2018).

Variations in district policies, school organisations and teacher communities may determine how schools face novel situations. For example, teachers have been shown to receive less support from their professional community in large schools (Skaalvik & Skaalvik, 2009). In a study examining factors related to CTE, the effect of school size was controlled for, but showed no statistically significant association with CTE (Belfi et al., 2015). There is some evidence that school location is associated with collective-teacher efficacy (Angelle & Teague, 2014). In autumn 2020, the pandemic was developing differently across Finland and the Ministry of Social Affairs and Health determined a categorisation describing the situation of the district (i.e., plateau, accelerating or spreading). There are also differences between primary and secondary school teachers in how they perceive work and wellbeing related factors (e.g., Hargreaves, 2000; Heikonen et al., 2017). Accordingly, variables describing the school context, such as school size, school type and the pandemic situation, need to be considered when investigating CTE and related factors.

As CTE has been considered to be a central factor in constructing teacher community's persistence and ability to cope with unexpected changes the school faces (e.g., Donohoo, 2018; Klassen et al., 2011; Tschannen-Moran & Barr, 2004), it is assumed that CTE is positively associated with teachers' perceptions of a school's preparedness to confront future challenges and negatively related to work-related stress in the teacher community (Fig. 1). Perceptions of the school's preparedness is considered to be a contextual resource that is expected to correlate negatively with work-related stress in the teacher community (Hascher et al., 2021).

3. Aim of the study

The aim of this study is to gain a better understanding of the school level associations between CTE, teacher community's perceptions about their school's preparedness to encounter school closures in the future and work-related stress in the teacher community. Based on the study framework, CTE is considered to be a school level phenomenon determining a teacher community's preparedness to encounter challenges in the future (Donohoo, 2018; Klassen et al., 2011; Tschannen-Moran & Barr, 2004). Furthermore, CTE and teacher communities' perceptions of a school's preparedness are expected to be associated with lower levels of work-related stress in teacher communities (Capone et al., 2019; Hascher et al., 2021; Klassen, 2010; Lim & Eo, 2014). As the study aims to examine variation between teacher communities, the hypotheses have been set to include only school level associations, despite simultaneously modelling individual level relations (Fig. 2). Accordingly, the following hypotheses were set:

H1. CTE is positively related to the teacher community's perceptions about their school's preparedness to encounter school closures in the future.

H2. CTE is negatively related to work-related stress in the teacher community.

H3. Teachers' perceptions about the school's preparedness to encounter school closures in the future is negatively related to work-related stress in the teacher community.

4. Method

4.1. Research context

The education system in Finland is decentralised and based on the 310 municipalities having the main responsibility for providing comprehensive school education locally, and the school system is

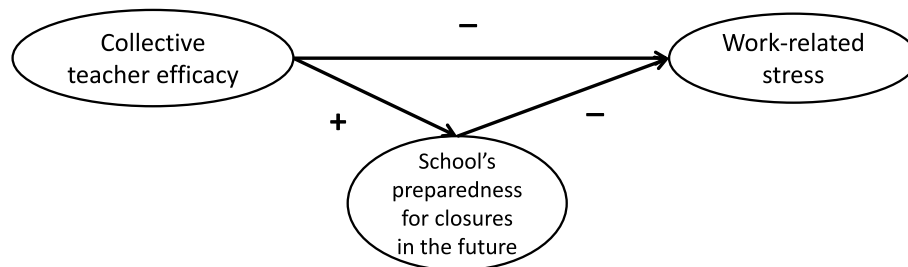


Fig. 1. Study framework: Associations between CTE, teacher community's perceptions of school's preparedness and work-related stress in the teacher community. Note: The figure presents school-level associations examined by means of multilevel modelling (+ = positive relation, - = negative relation; individual-level not shown in this figure).

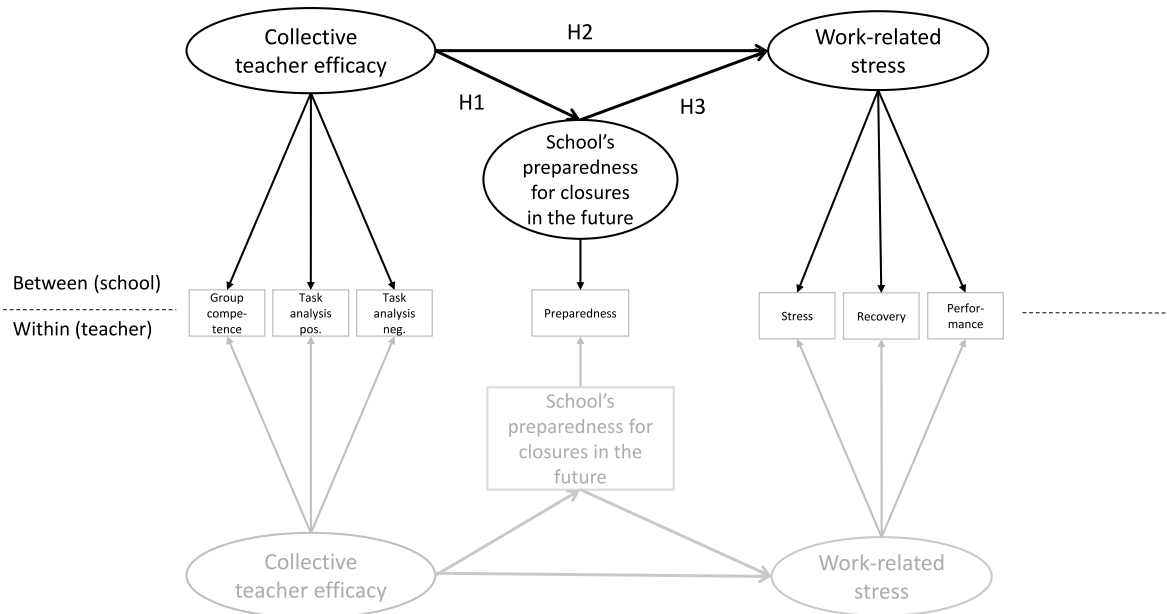


Fig. 2. Hypothesised model of the associations between CTE, teacher communities' preparedness for future school closures and teacher work-related stress.

predominantly public (Hammerness et al., 2017). The proportion of students attending private schools, or schools run by the state is marginal (under 2%) (Ministry of Education and Culture, n.d.). All qualified comprehensive schoolteachers have a master's degree in education from one of the country's research universities (Hammerness et al., 2017). There are no external accountability measures for teachers and the profession is regarded as being autonomous (Rytivaara & Kershner, 2012). Yet, there has been a subtle shift, and the understanding of what teacher autonomy is has moved slightly towards the autonomy of the profession (collectively) instead of seeing it from the perspective of an individual teacher (Ahtiainen & Heikonen, 2023). Moreover, the national regulations guiding the work in schools increasingly emphasise collective working methods (Finnish National Board of Education, 2014).

At the time of the data collection in November 2020, Finland was experiencing a rise in the number of COVID-19 cases. Due to variations in the stage of coronavirus spreading between regions around the country, the responsibility for taking necessary measures regarding the need for remote learning (e.g., for 1–2 weeks) for their schools had been given to the local education authorities in August 2020. That made the course of actions concerning temporary local remote learning arrangements more flexible in contrast to the centrally-led nationwide school closures between March and May earlier that year.

4.2. Participants

The data were collected as part of a large project funded by the Ministry of Education and Culture and the data collection took place during November 2020 (Ahtiainen et al., 2021). Accordingly, responses were received from 4440 teachers from primary and lower secondary schools. An online survey system called Qualtrics was used, and the survey could be answered in either Finnish or Swedish, Finland's official languages. Principals were asked to provide teachers with the link to the survey via their usual communication methods. Participation was voluntary and data were collected anonymously. Participants were informed that school and municipality codes were automatically included in their survey responses.

As the study focused on variables related to the teacher community, responses from schools with fewer than eight participating teachers were removed (2281 responses). Altogether 2159 participants from 162 schools were included in the study, representing 7.5% of the 2187 basic education schools in Finland. Thus, there was missingness on behalf of both the teachers and school levels, as teachers may have been too busy to take part, or the principals may have been reluctant to distribute the link to the survey to them. However, the sampling had wide coverage, as participating schools were located in 85 municipalities corresponding to 27% of the 310 municipalities in Finland. The average was 16 participants from each school ($M = 16.26$, $SD = 7.96$, $Min = 8$, $Max = 37$).

The participants were class teachers (29.4%), subject teachers (47.8%), special education teachers (16.6%) and other teaching

personnel (e.g., vocational counsellors, 6.1%). The teachers were working in primary schools (grades 1–6, 21.7% of schools), lower secondary schools (grades 7–9, 27.2%) or combinations of the two (grades 1–9, 48.5%). Most of the participants were female (78.5%), about one-fifth were male (19.0%), a minority chose the “other” category (0.1%), did not want to express their gender (2.3 %) or left the question blank (0.1%). Together, the participants represented the teacher population relatively well in terms of gender and age (20–29 years 6.7%, 30–39 years 21.1%, 40–49 years 35.1%, 50–59 years 31.3%, 60 or older 5.7%). For items concerning CTE, there were fewer than 1.2% of missing values. Since the items measuring teachers’ stress and perceptions about schools’ preparedness for school closures in the future were situated in a latter part of the relatively long questionnaire, they included 5.8% of missing values, respectively.

4.3. Measures

CTE was measured with the 12-item version of the *Collective Efficacy Scale* (Goddard, 2002; Goddard et al., 2015, Appendix). The scale was translated into Finnish by two experienced researchers. The scale consists of seven-point Likert items measuring Group competence (3 items worded positively, 3 negatively) and Task analysis (3 positively worded, 3 negatively). Thus, it is in line with the theoretical construction by Tschannen-Moran et al. (1998), in which teachers assess both the competence related to the task and the difficulty of the task by considering the capability of the whole teacher community in organising the courses of action required for students to reach learning goals set in the curriculum (Goddard et al., 2015). All negatively worded items were reverse coded. There are two interrelated dimensions in CTE: perceptions about colleagues’ capability to act successfully to complete a specific task (i.e., Group competence) and evaluations of the difficulty of that particular task (i.e., Task analysis). However, items measuring teachers’ perceptions of the difficulty of the teaching task in their community were split according to the wording of items (positive/negative wording) to create the statistical structure used in earlier studies (Mean variables: *Group competence*; *Task analysis, pos.*; *Task analysis, neg.*, Goddard et al., 2015). In line with the prior study, these three mean variables were used when reporting the descriptive results and in the multilevel structural model to create the latent CTE-constructs.

Teacher work-related stress was investigated with a three-item scale measuring stress response, perceived recovery from workload and work performance (five-point Likert items, Appendix). Stress response was measured by a single item measure that has been used and validated in previous studies (Elo et al., 2003), including teachers (Winding et al., 2022); stress was defined as a situation in which the person feels tense, restless, nervous, anxious, or has sleeping difficulties because things are bothering them. The other two items (five-point Likert items) were perceived recovery from workload during the last two weeks and work performance during the last two weeks. The three items were used when reporting the descriptive results and in creating the latent *Work-related stress* factors in multilevel modelling.

Perceptions about the school’s preparedness for future school closures was measured with a single item translated from an OECD working paper (Bertling et al., 2020): “Overall, how prepared do you feel your school is for providing remote instructions if your school is closed to students for an extended period in the future?”. The item consisted of a 4-point scale with options “Not at all prepared”, “Not very prepared”, “Well prepared” and “Very well prepared”. Using an item developed by the OECD may enhance the cumulativeness of the research results, since the item could be applied internationally in research on how schools differ in their preparedness for future challenges.

Epidemic situation refers to a classification of the 21 Finnish health care districts in terms of how fast and seriously the virus was spreading in the area. It was provided by the Ministry of Social Affairs and Health (2021) and included three categories: plateau, accelerating and

spreading. At the time of the data collection, only the two lower-level categories were in use. Therefore, the epidemic situation was included as a dichotomous variable to indicate whether the school was located in a district where the pandemic was in the accelerating or in the plateau phase at the time of data collection. Also, school type (primary, secondary, combination) as two dichotomous items and school size as a standardised continuous variable were included as school-level controlled variables. Furthermore, teacher gender and age were included at the individual level to enhance the reliability of the results.

4.4. Data analyses and model building strategy

The analysis was conducted in four phases. In the first descriptive phase, distributions of and correlations between the study variables were analysed. In the second phase, MPLUS version 8.6 was applied to test for the measurement invariance of the latent factors (CTE and Work-related stress) between the two levels. The intraclass correlations (ICC) of the standardised study variables were calculated to determine the proportion of school level variation. ICC2-values were calculated for the latent structures (CTE and Work-related stress) and the Preparedness-variable to determine their reliability on the school level. According to Koo and Li (2016) ICC2 values between 0.50 and 0.75 indicate moderate reliability whereas values above 0.75 are considered to be good.

In the third phase, a measurement model testing the multilevel structure of the latent variables without determining their relations was tested with MPLUS. As can be seen from Fig. 1, CTE and teacher stress were included to the model as latent factors which consisted of three items. Teachers’ perceptions about the school’s preparedness for future school closures was included as a single item. In order to take the sampling error in our data into account, in the final multilevel model, these variables (two three-item factors and one single-item) were aggregated to the second level with latent aggregation (Marsh et al., 2009; Morin et al., 2014). Thus, CTE and Work-related stress were included as doubly latent factors. Finally, MPLUS was used to test a multilevel structural equation model including all study variables, control variables (school type, school size, gender, age) and their hypothesised relationships. The model fit was estimated with several indices including the chi-square test, the root mean squared error of approximation (RMSEA), the comparative fit index (CFI) and the Tucker-Lewis index (TLI). The following traditional criteria were applied to evaluate the model fit: CFI and TLI scores above 0.95 and 0.90 and the RMSEA below 0.06 and 0.08 indicating excellent or adequate model fit (Morin et al., 2014).

5. Results

5.1. Descriptive statistics

Cronbach’s alphas were calculated to test scale reliability on level 1. This showed acceptable internal consistency for the scales comprising CTE (0.76 - 0.65) and good internal consistency for the three-item Work-related stress scale (0.84, Appendix). Descriptive statistics of the three summated scales composing CTE (Group competence, Task analysis neg., Task analysis pos.), perceived preparedness of the school and the three items composing teacher work-related stress (Symptoms,

Table 1
Descriptive statistics.

	N	M	SD	Min	Max	ICC
CTE: Group competence	2159	5.30	0.94	1.17	7.00	.107
CTE: Task analysis (pos.)	2159	4.40	1.00	1.00	7.00	.211
CTE: Task analysis (neg.)	2155	5.56	1.08	1.00	7.00	.184
School’s preparedness	2035	2.94	0.59	1.00	4.00	.128
Stress: Symptoms	2034	2.85	1.18	1.00	5.00	.037
Stress: Recovery	2034	3.02	1.09	1.00	5.00	.040
Stress: Work performance	2034	2.31	0.85	1.00	5.00	.024

Recovery, Work performance) are shown in Table 1. Participants mostly considered their colleagues as persistent and capable of creating meaningful learning experiences for every student in their school, as they reported relatively high means for *Group competence* ($M = 5.30$, $SD = 0.94$, $\min/\max = 1.17/7$). Teachers also perceived the teaching task positively in terms of students being committed to learning and the community and the environment surrounding them as safe and supportive. The results showed relatively high means for both positively ($M = 4.40$, $SD = 1.00$, $\min/\max = 1/7$) and negatively worded ($M = 5.56$, $SD = 1.08$, $\min/\max = 1/7$) *Task analysis*. Most teachers felt their school was well prepared for school closures in the future ($M = 2.94$, $SD = 0.59$, $\min/\max = 1/4$). Participating teachers showed varying levels of perceived stress symptoms ($M = 2.85$, $SD = 1.18$, $\min/\max = 1/5$), recovery from workload ($M = 3.02$, $SD = 1.09$, $\min/\max = 1/5$) and work performance ($M = 2.31$, $SD = 0.85$, $\min/\max = 1/5$). Overall, they reported mediocre means of items measuring *Work-related stress* with relatively high standard deviations.

5.2. Measurement invariance and school-level variation

Measurement isomorphism entails constructs having the same measurement structure with factor loadings set equal between the levels. According to Morin and colleagues (2014) it is not a necessary prerequisite for structures of group level phenomena, but it provides advantages. Testing the measurement invariance of latent constructs between the two levels showed poor fit for CTE (Table 2), thus isomorphism was not achieved for the construct. The model with items loading freely showed that at the individual level, CTE were more strongly determined by Group competence compared to positively and negatively worded Task analysis items. However, school level factor loadings were the opposite: Task analysis items showed stronger factor loadings compared to Group competence. The model with factor loadings set equal showed acceptable fit for teachers' Work-related stress (Table 2).

The intraclass correlations (Table 1) showed that there was considerable variation between schools in teachers' perceptions about their colleagues' competence (i.e., Group competence: $ICC = .11$). The two Task analysis items showed even more variation between schools (Task analysis pos: $ICC = 0.21$; Task analysis neg: $ICC = 0.18$) indicating that perceptions of teaching differed according to school context. The between-schools variance in teachers' perceptions about the school's preparedness to encounter school closures in the future was also relatively high ($ICC = 0.13$). Items measuring teachers' work-related stress showed to be less dependent on the school (Symptoms: $ICC = 0.04$; Recovery: $ICC = 0.04$; Work performance: $ICC = 0.02$).

The intraclass correlations of the latent constructs (CTE: $ICC = 0.10$; Work-related stress: $ICC = 0.05$) showed that the data were hierarchically constructed (nested in schools) and therefore required multilevel modelling of the relationships between CTE, teachers' work-related stress and teachers' perceptions about the school's

Table 2

The fit indexes of models determining measurement invariance of latent constructs, the measurement model with the latent variables and the final multilevel model.

Model	Chi square	CFI	TLI	RMSEA
CTE: CFA, no invariance	$\chi^2(1, N = 2159) = 0.91$, $p = .342$	1.00	1.00	<.01
CTE: CFA, invariance	$\chi^2(2, N = 2159) = 39.63$, $p < .001$	.95	.84	.09
Work-related stress: CFA, no invariance	$\chi^2(1, N = 2035) = 0.00$, $p = 1.000$	1.00	1.00	<.01
Work-related stress: CFA, invariance	$\chi^2(2, N = 2035) = 6.35$, $p = .042$	1.00	1.00	.03
CFA: Measurement model	$\chi^2(28, N = 2159) = 55.16$, $p = .002$	.99	.99	.02
SEM: Final Multilevel model	$\chi^2(58, N = 2047) = 159.58$, $p < .001$	.97	.96	.03

preparedness to encounter school closures in the future. The ICC2 values were calculated for the latent structures and the outcome variable to determine their reliability on level 2. This showed relatively good reliability for CTE ($ICC2 = 0.59$) and fair for work-related stress ($ICC2 = 0.40$) indicating that the structures can be applied in multilevel modelling.

The measurement model including the latent factors CTE (items loading freely) and Work-related stress (item loadings equal between levels) and the single outcome item (school's preparedness) fitted the data well (see Table 2). At the teacher level, correlations were in line with the hypothesised associations: CTE was positively associated with a school's preparedness ($r = 0.34$, $p < .001$) and negatively related to work-related stress ($r = -0.39$, $p < .001$) whereas perceived school preparedness for closures in the future positively correlated with work-related stress ($r = -0.23$, $p < .001$). At the school level, however, perceived school preparedness was not statistically significantly related with teachers' work-related stress ($r = 0.16$, $p = .404$) and CTE ($r = 0.15$, $p = .155$) whereas CTE was statistically significantly related to lower work-related stress ($r = -0.33$, $p = .024$).

5.3. Relationships between collective teacher efficacy, perceived school's preparedness and work-related stress

The multilevel model showed a good fit with the data (see Fig. 3). Teacher communities in which teachers perceived their colleagues to be competent and persistent in facing the teaching task at their school were more likely to report that their school was well prepared for future challenges, such as remote teaching periods. The model showed that CTE was positively related to how prepared the teachers perceived their school to be for school closures in the future ($\beta_B = 0.19$, $p = .076$). However, it should be noted that this association was on the edge of being statistically significant with the traditional cut off level $p < .05$. Thus, the results only partly confirmed H1 by showing that CTE was positively associated with teachers' experiences of the school's preparedness to provide remote instruction if their school building was closed to students for an extended period in the future.

CTE, entailing perceptions about the competence in the teacher professional community and the evaluation of the teaching task, was associated with lower levels of work-related stress in the professional community. The result confirmed H2 by showing that CTE was negatively related to teachers' work-related stress on the teacher community level ($\beta_B = -0.33$, $p = .047$). In other words, teacher communities with strong beliefs in the competence and persistence of their members in facing the teaching task and the challenges in that school community showed to experience less stress and to recover better from work.

The results further showed that teacher communities' evaluation of their school as being prepared for future school closures was not related to work-related stress. School level association between teachers' assessment of the school's preparedness to encounter remote teaching periods in the future and work-related stress in the teacher community was not statistically significant ($\beta_W = 0.08$, $p = .693$). Thus, the model rejected H3.

The dependent variables were regressed on the background variables (school level: school size, school type, epidemic situation) to control for their effect. Teachers' communities in areas with an accelerating epidemic situation were shown to consider their school to be better prepared than teachers working in schools in areas with a less difficult COVID-19 situation. The difficulty of the epidemic situation (plateau, accelerating) of the district was positively related with how prepared the teachers at a school perceived it to be for school closures in the future ($\beta_B = 0.27$, $p < .001$).

Overall, the results showed that there are small to moderate school level variations in CTE, teachers' perceived preparedness of the school for future school closures and teachers' work-related stress. The multilevel model confirmed that CTE was positively related to the teacher community's perceptions about a school's preparedness for future

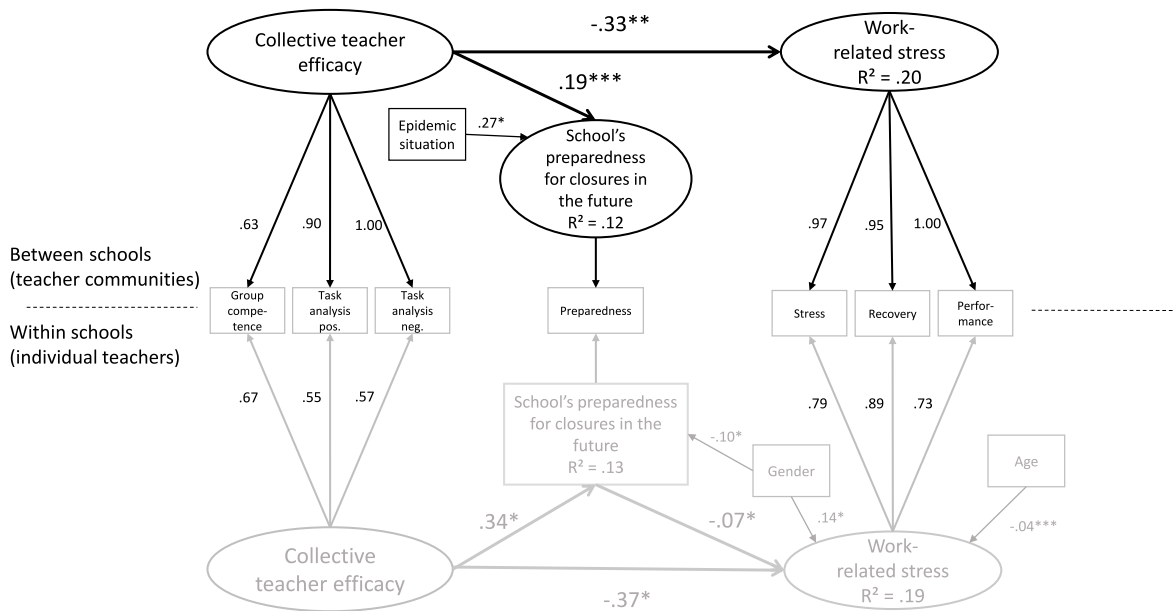


Fig. 3. Multilevel structural equation model with the hypothesised relations between study variables (Model fit: χ^2 (58, N = 2047) = 159.58, $p < .001$, CFI = 0.97, TLI = 0.96, RMSEA = 0.03). Statistically not significant regression coefficients are not shown in the figure (* $p < .01$, ** $p < .05$, *** $p < .01$).

school closures and negatively associated with work-related stress in the teacher community. Teachers' evaluation of school's preparedness was not associated with work-related stress in the teacher community. The model explained moderate proportions of variance in work-related stress in the teacher community ($R^2 = 0.20$) and small proportions of variance in teacher community's perceptions about school's preparedness to encounter school closures in the future ($R^2 = 0.12$).

6. Discussion

6.1. Collective teacher efficacy, work-related stress and school's capacity to encounter challenges in the future

Results of this study contributed to research on the association between collective efficacy and teacher wellbeing by providing evidence of the school level relationship between CTE and teacher work-related stress. The results showed that teacher communities with high CTE perceived less work-related stress (i.e., fewer symptoms of stress, better recovery, stronger work performance) during the pandemic. The result is in line with prior studies that have also emphasised the role of CTE as the mechanism through which school leadership and organisational climate relate to teachers' wellbeing (Lim & Eo, 2014) and teachers' commitment (Dumay & Galand, 2012; Qadach et al., 2020; Zhang et al., 2022). Furthermore, the study contributes to research on teacher wellbeing by applying a group level perspective on teachers' work-related stress (Collie & Mansfield, 2022; Pietarinen et al., 2021) and its association with CTE. Some studies have considered differences in perceived stress between teacher communities to be associated with stress contagion. This is a crossover process whereby teachers' appraisals of their environment affect the appraisals of their teacher colleagues (Fitchett et al., 2021). However, interpreting differences between teacher communities in stress as contagion of stress should be done cautiously due to qualitative differences between the concepts. Nevertheless, to our knowledge, this is among the first studies providing school level evidence showing that teacher communities with strong collective efficacy beliefs perceived less work-related stress during the pandemic. Future research will hopefully determine the mechanism of the relation and whether stress contagion is involved in it.

Our results showed that CTE was positively associated with how prepared the teacher community perceived their school to be for future

challenges even when controlling for the effect of the pandemic situation. However, the result needs to be interpreted cautiously as the relation was on the edge of being statistically significant. This indicates a lack of power in the analysis and a need for further investigation. Still, the result can be considered to be a preliminary finding that supports the idea that CTE is a key factor for the teacher communities' persistence and commitment to educational goals in challenging situations (Donohoo, 2018; Klassen et al., 2011; Tschannen-Moran & Barr, 2004) and may further contribute to teachers' commitment to their school and the teaching profession (Zhang et al., 2022; Qadach et al., 2020). The role of leadership is crucial not only in constructing CTE in schools (Goddard et al., 2021; Yada & Savolainen, 2023), but also in the processes through which schools encounter changes and challenges like the pandemic (Ahtia et al., 2022), since the principal needs to facilitate CTE even when the structures of everyday communication of the teacher community are missing.

Furthermore, this study contributes to the literature by providing evidence through multilevel analysis focusing on the differences between schools instead of individual teachers' perceptions. Teacher communities with high CTE may have applied more collective forms of working in a school culture in which changes in schooling are met or implemented together. From this perspective, our finding is in line with the idea that schools built on collaboration were better able to encounter the pandemic (Hargreaves & Fullan, 2020).

Our results demonstrated that at the end of the first pandemic year in Finland, teacher communities working in the districts where the pandemic was in the accelerating phase considered their school to be better prepared for future school closures compared to those working in areas in the plateau phase. In other words, the more serious the pandemic situation was, the better prepared the teacher community perceived their school to be for future challenges. Variation in how schools were affected by the pandemic may have resulted in differences between schools in what and how their teacher communities have learned during it and from their experiences (Hargreaves & Fullan, 2020). Thus, learning from the pandemic and constructing schools' capacity to encounter school closures in the future requires not only school level or local level collaboration, but also actions to support teacher communities' learning across the nation even if they were not at core of the pandemic.

The literature has emphasised providing emotional support for

teachers and facilitating their autonomy and self-efficacy when protecting them from stress and burnout during COVID-19 (Chan et al., 2021; Chen, 2022; Kupers et al., 2022; Pressley & Ha, 2021). Our results showed considerable variation between teachers' work-related stress in the same school community. In our study, the emphasis was more on a collective approach by emphasising the role of teachers' perceptions about the joint teaching competence in their professional community when encountering the pandemic. In addition to supporting the engagement and autonomy of individual teachers, our study indicates the importance of structures for teacher collaboration and opportunities for teachers to innovate and contribute together to the professional community's capacity to encounter challenges (planned or unplanned) in the future (Kunnari et al., 2018; Kupers et al., 2022). In teacher education, this could mean supporting students in learning to identify, analyse and create practices for shared planning, collective reflection and for utilising others' developing expertise, for example, through co-teaching (Pietarinen et al., 2021; Rytivaara & Kershner, 2012).

6.2. Limitations

However, future studies could address some limitations. First, this was a cross-sectional study with data collected at one time-point in November 2020. Longitudinal studies could provide a deeper understanding of whether the difficulties and complexities in teaching brought up by the COVID-19 pandemic caused changes in collective teacher efficacy and if those changes remained stable throughout the various waves. Furthermore, organisational factors such as leadership, collaboration and socioeconomic status of the school, could be included to detect the causes of trajectories of collective teacher efficacy (see also, Pressley & Ha, 2021).

Secondly, in this study we applied self-report measures to gain a broad perspective of how competent teachers perceived their colleagues at their school and how they evaluated the preparedness of their professional community during the pandemic in Finland. Future studies could include observations and school documents to analyse how schools have changed their practices and constructed plans for similar challenges in the future. Third, focusing on one school type and determining the cut-off for the ratio of participants per school-to-school size could provide more detailed information and increase the power of the analysis. However, this study contributed to the existing literature by applying a multilevel analysis of CTE and its relationship with work-related stress, further suggesting that facilitating CTE is a key factor in schools getting ready for disruptive challenges in the future, such as the pandemic. Finally, the use of a single-item measure (school's preparedness for future school closures) is a limitation due to its narrowness and epidemic-specific nature. To further investigate the association between CTE and school's preparedness for future challenges would require a multiple-item measure widening the perspective to be included as a doubly latent variable similar to CTE and work-related stress in this study (Zhang et al., 2022).

6.3. Future directions

Efficacy beliefs cannot protect teachers from stress or buffer strain in the teacher community, if teachers' duties and responsibilities are unclear (Chan et al., 2021). This highlights the role of leadership and communication practices in the professional community both before and during the crisis (Ahtiainen et al., 2022; Ahtiainen & Heikonen, 2023; McLeod & Dulskey, 2021; Qadach et al., 2020). Therefore, more research is needed on principals' efficacy beliefs for leadership, the mechanisms between leadership and collective efficacy beliefs and how they could contribute to schools' preparedness for school closures in the future (see also Goddard et al., 2015, 2021).

Considering that it has been a while since the pandemic started, it is time to construct a research-based understanding of what has been learned and what more could be learned. More information is needed on

how members of professional communities (i.e., teachers, principals, other professionals) were able to support each other, and how these professional communities differed in their ways of dealing with the pandemic.

Declaration of competing interest

All authors declare that they have no conflicts of interest.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tate.2023.104399>.

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