Author(s): Yada, Takumi; Savolainen, Hannu

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Principal self-efficacy and school climate as antecedents of collective teacher efficacy

Takumi Yada [a] and Hannu Savolainen [b,c]

[a]Finnish Institute for Educational Research, University of Jyväskylä, Jyväskylä, Finland; [b]School of Educational Sciences and Psychology, University of Eastern Finland, Joensuu, Finland; [c]Optentia Research Focus Area, North-West University, Vanderbijlpark, South Africa

ABSTRACT
The importance of collective teacher efficacy (CTE) has been increasingly emphasised, but few studies have focused on how it can be enhanced. Since CTE is assumed to be related to factors that differ between schools, the belief-shaping sources of CTE could be related to principals' beliefs of their efficacy. Moreover, a school climate that centralises teachers' attempts to improve student learning could enhance CTE. This paper examines a proposed analytical model that links principal self-efficacy (PSE) to CTE, as mediated by the school climate. The model is tested via a multilevel analysis with data from 70 Finnish schools and 767 educators. The analysis revealed that PSE is partially and indirectly related to CTE via the school climate at the school level. Based on these results, theoretical and practical implications for future research and teaching development efforts are discussed.

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Principal self-efficacy; school climate; collective teacher efficacy

Introduction

Globally and in Finland, educational organisations are surrounded by challenges that are difficult for their individual members to solve alone (Leithwood & Mascall, 2008). As the demands placed on students become increasingly diverse, the problems that educational organisations face are becoming more intricate and ambiguous (Fadel et al., 2015). In such situations, schools and educational professionals, including principals and teachers, are required to collectively tackle challenges. Although the Finnish education system has shown good academic results, there are continuing concerns with the social aspects of school communities, such as behaviour problems and bullying (Karhu et al., 2021). Moreover, the Teaching and Learning International Survey (TALIS) 2018 showed that collective educational endeavours, which emerge in practice as, for example, team teaching, leadership teams, teacher collaboration, and lesson study teaching, are not common practice in Finland (Organisation for Economic Co-operation and Development [OECD], 2019a). Researchers have explored the mechanisms by which educators effectively address these challenges and have found collective teacher efficacy to be a useful construct,

CONTACT Takumi Yada taktaktak1982@gmail.com

since CTE is strongly related to student achievement (Bandura, 1997; Goddard, LoGerfo, & Hoy, 2004). *Collective teacher efficacy* (CTE) refers to "the collective self-perception that teachers in a given school make an educational difference to their students over and above the educational impact of their homes and communities" (Tschannen-Moran & Barr, 2004, p. 190). Researchers have argued that since the choices of educational professionals are not entirely independent of the school context or the beliefs, desires, and expected reactions of their colleagues and educational leaders (Goddard, Hoy, & Hoy, 2004), CTE plays a critical role in defining collective educational endeavours that strongly relate to student achievement in school (Bandura, 1997; Eells, 2011; Goddard, LoGerfo, & Hoy, 2004). Educational professionals are less likely to make efforts if they cannot believe that their efforts lead to their students' achievements; thus, CTE is associated with educational endeavours that require teachers' persistence and effort (Goddard, Hoy, & Hoy, 2004; Goddard, LoGerfo, & Hoy, 2004).

Researchers have argued that CTE can be an important predictor of student achievement. It can mediate the positive effect of teachers' collaborative networks on student achievement (Moolenaar et al., 2012) and can be linked to the reduction of the achievement gap between students from different social backgrounds (Goddard et al., 2000; Hoy et al., 2002). One meta-analysis study suggested that CTE might be a more influential predictor of student achievement than the socioeconomic status of students (Eells, 2011). CTE is important for determining the scope of collective educational endeavours, since it reflects a collective belief in the educators' conjoint capability to execute the course of action (Bandura, 1997), leading to actual behaviour. This argument is supported by findings that teachers' collective efficacy was higher in schools where teachers worked collaboratively, believed in shared goals, and experienced collegiality (MacKenzie, 2000). By exchanging ideas and sharing experiences with peers, teachers can solve problems collectively (Moolenaar et al., 2012). Success in such situations may build teachers' beliefs in their collective capability to promote student learning and handle difficult situations (Moolenaar et al., 2012). Scholars have further emphasised the importance of CTE by showing that schools are more likely to be successful when stakeholders believe in supporting student learning and development (Eells, 2011; Goddard, 2001; Klassen et al., 2010).

Since many studies have found that CTE plays a key role in enhancing school effectiveness (Donohoo et al., 2018; Eells, 2011; Goddard et al., 2017; Klassen et al., 2010), some researchers have focused on what enhances CTE (Adams & Forsyth, 2006; Goddard et al., 2000). CTE has been discussed as a construct that is unique to each school and, as such, varies between schools (Goddard, 2001; Tschannen-Moran & Barr, 2004). Therefore, it is assumed to be related to factors that differ between schools.

The belief-shaping sources of CTE are further related to leadership (Goddard et al., 2021; Hoogsteen, 2020). According to the known conceptual models in the field of school leadership (e.g., Hallinger & Heck, 1998, adapted from Pitner, 1988), principal self-efficacy (PSE), as one of the factors of school leadership, is associated with teachers' behaviour through school conditions such as the school climate. PSE refers to "a judgement of his or her [the principal's] capabilities to structure a particular course of action in order to produce desired outcomes in the school he or she leads" (Tschannen-Moran & Gareis, 2004, p. 573). Researchers support a direct relationship between PSE and CTE by claiming that a robust sense of PSE fosters leadership behaviour that provides teachers with learning opportunities, which improves their teaching, thereby developing CTE

(Goddard et al., 2021; Versland & Erickson, 2017). Existing research also suggests that a school climate that develops teachers' collaborative learning opportunities enhances CTE (Collie et al., 2012; Goddard et al., 2015; Lee et al., 2011; Loughland & Ryan, 2022; Voelkel & Chrispeels, 2017). The definition of *school climate* that this study uses is "the psycho-social context in which teachers work and teach" (Johnson et al., 2007, p. 834). Researchers have argued that principals play a key role in defining the school climate (Griffith, 1999; McCarley et al., 2013).

Goddard et al. (2021) pointed out that very little attention has been paid to the relationship between PSE and CTE, and the school climate may be a potential mediator of the two, as teachers experience both the school environment and leader behaviours. However, large-scale evidence of the relationships between PSE, the school climate, and CTE is still missing from literature. This study extends the current literature by investigating the extent to which PSE is related to CTE via the school climate, using survey data from Finnish schools. Thus, the purpose of this study is to examine whether PSE is related to CTE via school climate, considering school climate as a partial mediator in the relationship between PSE and CTE.

Collective teacher efficacy and its sources

While teachers who produce excellent results are likely to have a strong belief in their capabilities in their practice, schools that show high-quality results are characterised by stakeholders who believe in their collective capability to benefit students' growth (Klassen et al., 2010). The dynamics produced through the interaction and coordination of these group members form collective capabilities, on which the collective belief is centred (Bandura, 1997; Tschannen-Moran & Barr, 2004). Collective efficacy is a future-oriented belief about the collective capabilities that a group expects to exert in a particular context or situation (Bandura, 1997; Goddard et al., 2000; Tschannen-Moran & Barr, 2004). CTE differs from teachers' self-efficacy in that it is a school-level property or an attribute of the school community (Goddard et al., 2000; Tschannen-Moran & Barr, 2004). In other words, CTE represents social perceptions of the capabilities of the school organisation as a whole (Goddard et al., 2000).

Bandura (1997) advocated the social cognitive theory, which argues that efficacy beliefs are generated by social experience, which provides essential information that enables individuals to form perceptions about their capability to perform certain actions that lead to the achievement of desired outcomes. This theory suggests four sources of individual efficacy beliefs that may enhance or degrade them: mastery experience, vicarious experience, verbal and social persuasion, and psychological and affective states. Researchers have hypothesised that CTE also has these four sources, but that they operate at the collective level (Goddard, 2001; Goddard & Goddard, 2001). For example, Goddard and Goddard (2001) argued that CTE is strongly influenced by experience of mastery, which is a diagnostic perception of successful or unsuccessful performance at the school level. As with teachers' self-efficacy, mastery experience is a major predictor of CTE beliefs (Goddard, 2001; Goddard & Goddard, 2001).

School leadership researchers have shown interest in the relationship between leadership and CTE and have indicated that leadership plays an important role in strengthening CTE (Çalik et al., 2012; Goddard et al., 2000; Hallinger et al., 2018; Ross & Gray,

2006). This is because the principal's behaviour and the school environment create teacher experiences that shape their efficacy (Goddard et al., 2021). Principal behaviour provides opportunities for mastery and vicarious learning that are verbally and socially persuasive and psychologically supportive of teachers, thereby becoming sources of collective efficacy beliefs (Goddard et al., 2021). Hoogsteen's (2020) conceptual framework suggests that school processes, including leadership quality, are the most significant factors of student outcomes, influencing CTE in relation to the four sources of efficacy. This framework argues that CTE is reciprocally related to school achievement and claims that previous studies on CTE dealt with the four sources without acknowledging how CTE is associated with school processes. Hoogsteen posited that leadership in a school seems to be related to school processes, such as creating a shared understanding of school goals, supporting collaboration, and acknowledging the contributions of all involved parties through the four sources, thereby enhancing CTE. Principals have the capabilities to make a positive difference in student learning through various dimensions, including goal setting and support for collaboration (Leithwood & Jantzi, 2008; Leithwood et al., 2010; Ninković & Knežević Florić, 2018). Setting shared goals among teachers leads to meaningful communication, reduces fragmentation, and enhances cohesion (Leithwood et al., 2010; Robinson, 2011). Schools that track the steps they have taken towards their goals can recognise their progress as a mastery experience, thereby shaping collective beliefs to achieve further progress (Fullan, 2005; Hoogsteen, 2020).

Moreover, collaboration is an important factor that is related to CTE (Hoogsteen, 2020; Leithwood & Jantzi, 2008; Leithwood et al., 2010). Leithwood and Louis (2012) argued that one of the core aspects of leadership is refining and aligning the school organisation – for example, creating structures and opportunities for teachers to collaborate. Since these practices lead to the formation of common comprehensions of good practices and enhance collective support for students, they can develop CTE (Goddard et al., 2015). For example, a collaborative climate in a school promotes meaningful communication among teachers and innovative practices, such as seeking and offering help, tackling problems together, and experimenting with new instructional approaches (Ross et al., 2004). Frequent communication between teachers creates opportunities for them to receive feedback, functionally handle the pressures they face, and pursue successful collaborations. Thus, collaboration functions as vicarious experience, social persuasion, and affective states (Goddard, Hoy, & Hoy, 2004; Hoogsteen, 2020; Ross et al., 2004).

Finally, acknowledging the contributions of all involved parties impacts CTE (Hoogsteen, 2020). Escobedo (2012) argued that CTE is enhanced when teachers recognise and honour the professional achievements or accomplishments of other teachers. For example, in a positive school climate, the success of teachers and students is shared in staff meetings and school-wide assemblies, thereby promoting teachers' experience of making a difference in student learning and other outcomes (Hoogsteen, 2020; Yada & Jäppinen, 2022). Therefore, acknowledging and celebrating success work as a mastery experience and a vicarious source of CTE (Hoogsteen, 2020).

Thus, CTE is built as a product through dynamic interaction within the school. School-level information, such as through PSE and the school climate, may contribute to promoting CTE (Loughland & Ryan, 2022; Meyer et al., 2020; Ramos et al., 2014).

The role of principal self-efficacy

The self-efficacy of a leader has been identified as a strong antecedent of effective leadership (Hallinger et al., 2018; Leithwood & Jantzi, 2008). Researchers agree that PSE plays a key role in regulating functional leadership strategies, their tactical implementation, and the influence they exert on colleagues in dynamic environments (McCormick, 2001; Tschannen-Moran & Gareis, 2004; Versland & Erickson, 2017). Previous studies point out the potential of PSE to shape CTE and the organisational commitment of school staff (Hallinger et al., 2018; Ross & Gray, 2006; Tschannen-Moran & Gareis, 2004). According to Louis et al. (2010), high self-efficacy enables principals to be flexible and to embrace the pressures of school reform, which allow them to identify appropriate solutions. Thus, principals with higher self-efficacy are more likely to be determined to act when facing challenges to their school's improvement, thereby promoting CTE, which will be positively related to teaching and learning.

Although the importance of PSE is still an under-researched topic (Versland & Erickson, 2017), many empirical studies have suggested that determined leadership by the principal is related to CTE (Çalik et al., 2012; Meyer et al., 2020; Ross & Gray, 2006). For example, Goddard et al. (2021) found that PSE with a steadfast instructional focus encouraged CTE by creating opportunities for interaction and collaboration among education professionals. Their results are consistent with those of non-education studies that demonstrated a positive relationship between leaders' self-efficacy and members' collective efficacy (e.g., Chen & Bliese, 2002). School leadership researchers who acknowledge the importance of PSE maintain that efficacious leaders can enhance CTE by promoting school processes, including sharing goals, decision making, and collaboration (Jacob et al., 2015; Ross et al., 2004; Tschannen-Moran & Gareis, 2004).

Some studies have suggested that the principal plays the most decisive role in shaping the school climate (Leithwood et al., 2010; Moolenaar et al., 2010). Principals support teachers' collective efforts to tackle school issues and develop new teaching strategies, thereby fostering a positive school climate (Moolenaar et al., 2010, 2012). Thus, principals with stronger self-efficacy have a greater chance to form a positive school climate that improves the organisational commitment of teachers.

School climate

The school climate has drawn researchers' attention for many decades, as it is a strong factor that either fosters or diminishes the effectiveness of a school (Thapa et al., 2013). It is made up of norms, goals, beliefs, interpersonal interactions, teaching and learning activities, and organisational processes based on people's perceptions of school life (Cohen et al., 2009).

In a school climate where teachers accepted various teaching strategies and collaborated with their colleagues, students showed higher academic achievement (Silva et al., 2017). Since teachers can receive more support from leaders in such circumstances, they engage more actively in their work and are willing to help their colleagues (Billingsley et al., 1993; Silva et al., 2017).

The environment in which a given task is performed is also related to the overall sense of efficacy concerning that task (Bandura, 2012). Because CTE increases when teachers

engage in collaborative work, the school climate has been found to be associated with higher teacher efficacy (Collie et al., 2012; Lim & Eo, 2014; Ross et al., 2004). Teachers' sense of affiliation with their school and sense of mutual support from their colleagues is enhanced by a collaborative work environment that offers opportunities to improve educational practices by expanding the amount and quality of feedback available (Kruse & Louis, 1997).

Thus, a school climate that centralises teachers' attempts to improve student learning could enhance CTE, as teachers exchange experiences and learn from each other (Lim & Eo, 2014; Loughland & Ryan, 2022; Voelkel & Chrispeels, 2017).

The school climate varies between schools (Thapa et al., 2013). For example, in Finland, 10% of the variation in teachers' responses about collaborative activities is accounted for by differences between schools (OECD, 2019b), meaning that the variation in the school climate is not negligible. Principals are responsible for shaping the school climate and are recognised as such (Griffith, 1999; McCarley et al., 2013; Meyer et al., 2020; Price, 2012). A recent study showed that the principal's leadership, which developed the school climate, positively influenced the teachers' efficacy (Ma & Marion, 2021).

Research questions

Since it has been found that increased PSE improves school climates through better leadership practices (Jacob et al., 2015), it is suggested that PSE enhances CTE by improving the school climate (Goddard et al., 2021; Versland & Erickson, 2017). These notions point to the following research questions (RQs) and hypotheses. This study investigates how PSE, the school climate, and CTE are related when analysed as school-level phenomena.

(RQ1) Is PSE related to CTE?

(RQ2) Is the school climate related to CTE?

(RQ3) Is the effect of PSE on CTE partially mediated by the school climate?

Methods

Participants and procedure

The data in this study were drawn from research that began in 2013 in Eastern Finland. The research was cleared by the ethical board of the University of Eastern Finland. It was an intervention study, but the data in this paper were drawn from the baseline information from that research. All the educators, including the teachers and principals, from the schools that agreed to participate in the study were invited to answer the research questionnaire. The data were collected electronically. The educators received an email with a request to answer a survey, a description of the study's purpose, and a security statement that guaranteed the confidential treatment of their personal information and responses. An individualised web link to the survey was attached to the email. At the start of the survey, the purpose of the study was again presented, with the data management procedure.

A total of 70 schools participated in the study. Of the 767 educators who responded to the baseline measurement, 630 were from the 59 schools whose principals responded to

the questionnaire. The average age of the teachers was 43.80 years (*SD* = 9.38), and 78.7% of them were female. This gender distribution was similar to that in the national statistics, which indicates that 74.6% of teachers in Finnish compulsory schools are female (Kumpulainen, 2014). The response rate of the teachers in the baseline measurement was 81.9%. The average age of the principals was 48.68 years (*SD* = 6.94), and 44.1% (*N* = 26) of them were female, which was consistent with the 44.4% proportion of Finnish female principals in 2013 (Kumpulainen, 2014). Thus, the sample composition was broadly reflective of the principal population in the Finnish educational context. The number of participants from each school ranged from two to 38 (*M* = 11.00, *SD* = 8.00), which is again indicative of the significant variation in the school sizes in the geographical area of the sample, as there are still some very small schools in the rural areas.

Research instruments

The survey questionnaire had a section for the participants' demographic information and several scales related to the larger project, some of which were specifically targeted to be answered only by the principals. In this study, the following scales were used: the PSE, the teachers' perception of the school climate, and their CTE.

The PSE was measured using the Principal Sense of Efficacy Scale (Tschannen-Moran & Gareis, 2004), which was translated into Finnish ($\alpha = .93$). The measurement included 18 items that represented three dimensions: efficacy in management, instructional leadership, and moral leadership. Since the number of respondents in this study (*N* = 59) was relatively small and the overall reliability was very high, only the mean score of all the items was summed up and used in this study. The items followed the leading sentence: "In your current role as principal, to what extent can you […]". An example item is "promote the prevailing values of the community in your school?" The items were assessed on a 9-point Likert-type scale that ranged from 1 (*none at all*) to 9 (*a great deal*).

The school climate was measured using the Revised School Level Environment Questionnaire (R-SLEQ; Johnson et al., 2007), which was translated into Finnish ($\alpha = .81$). The measurement consisted of 17 items that covered four elements: collaboration, student relations, decision making, and instructional innovation. Although the original R-SLEQ measurement had a fifth element (school resources), this study did not include it because the variation in school resources in Finland is quite small (Malinen & Savolainen, 2016). Moreover, although there were four instead of five elements in the measurement, what they measured can be considered the general school climate, as the factor inter-correlations can be used to build a general second-order climate factor, as shown by a previous study (Malinen & Savolainen, 2016). The sum of the mean scores for all the items was used to measure the overall school climate, as the reliability of the scale was good in this study. A sample item is "There is good communication among teachers". The items were assessed on a 6-point Likert-type scale that ranged from 1 (*strongly disagree*) to 6 (*strongly agree*).

The CTE was measured using the Collective Teacher Beliefs Scale (Tschannen-Moran & Barr, 2004), which was translated into Finnish ($\alpha = .91$). The measurement consisted of 12 items on two elements: instructional strategies and student discipline. The sum of the mean scores for all the items was used in this study. A sample item is "How much can teachers in your school do to produce meaningful student learning?" The items were assessed on a 9-point Likert-type scale that ranged from 1 (*none at all*) to 9 (*a great deal*).

Data analysis

In the analyses, the following steps were taken. First, the intraclass correlations (ICCs) were estimated to determine if there was a meaningful variance at the between-school level. The PSE was considered a between-level (school-level) variable. The ICCs for the school climate and the CTE variables were calculated (.22 and .17, respectively). According to the criteria adopted in previous studies (e.g., Caprara et al., 2003; Hox, 2010), the ICCs of the variables indicated moderate grouping effects. This suggests that it would be inappropriate to ignore the hierarchical structure of the data. Therefore, although the individually measured school climate and CTE variables were gathered via self-reports, two-level modelling was conducted (Heck & Thomas, 2009). The model was a random intercept model where the means of the teacher ratings of the collective efficacy and the school climate were not estimated at the within (teacher) level but were allowed to randomly vary between schools. Thereafter, a path model between the covariances at the between level was built in accordance with the analytical model to test the interrelationships of the between-school variables.

Next, estimates of the analytical model, presented in Figure 1, were calculated. In the figure, the between-level (school-level) relationships are shown above the dashed line, and the within-level (teacher-level) relationships are presented below the dashed line. The school climate and CTE variables, which were collected at the within-level (from the teachers), were allowed to randomly vary between the schools. The bullets in the school climate and CTE variables at the within-level represent random intercepts of the variables, which are shown as large circles at the between-level and are continuous latent variables that vary between the schools.

The analyses were implemented in Mplus Version 8 (Muthén & Muthén, 1998–2017). A missing-at-random approach (covariance coverage: 80.6%–98.6%) was applied. Since the full information maximum likelihood utilises all available information without imputing the missing values, the full-information-maximum-likelihood estimation was used to provide unbiased parameter estimates and standard errors. All the calculated models were saturated models, and, thus, the goodness-of-fit indices were not calculated.

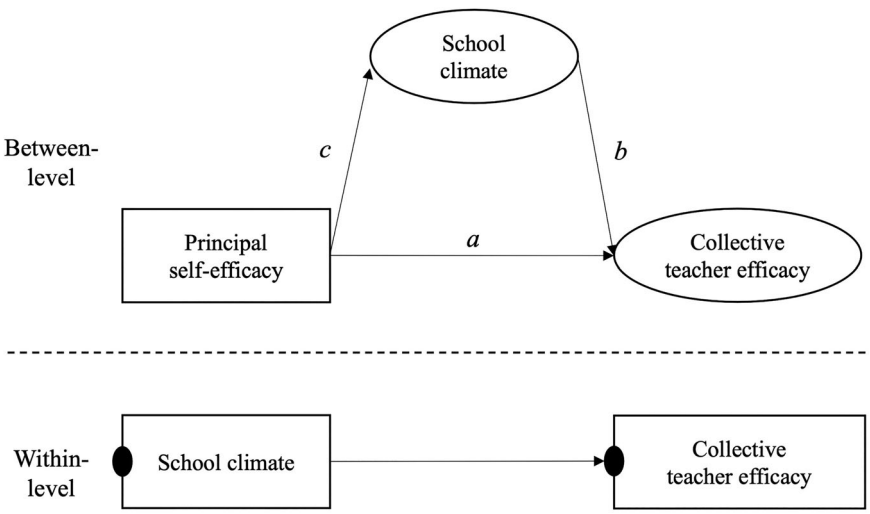

Figure 1. Analytical model of this study.

Table 1. Descriptive statistics of principal self-efficacy, school climate, and collective teacher efficacy.

	N	Min	Max	*M*	*SD*
Principal self-efficacy	59	3.56	8.56	6.70	1.08
School climate	695	2.35	5.71	4.43	0.56
Collective teacher efficacy	756	3.67	9.00	6.77	0.85

Results

Descriptive results and school homogeneity

The descriptive statistics of the variables are shown in Table 1. The results of the correlation analysis showed that there were strong positive correlations among the PSE, the school climate, and the CTE at the within-level. At the between-level, a strong positive correlation was found between self-efficacy and CTE. The correlations and variances of the study variables are shown in Table 2. The numbers above the diagonal are the between-level values, and the numbers below the diagonal are the within-level values.

Two-level path model

A two-level path model was estimated to examine the conceptual model suggested in Figure 1. Since the model was saturated, fit indices were not produced. Figure 2 depicts the model built in this study. All the paths were statistically significant. At the within-level, the teachers' individual perceptions of a positive school climate were associated with their individual perceptions of CTE; the more the teachers recognised a positive school climate, the more they perceived that they had good CTE. At the between-level, the PSE was positively associated with the school climate, which was further related to the CTE. The higher the level of PSE in a school was, the more positive the school climate was, which, in turn, contributed to the level of the CTE. The mediating effect of the PSE on the CTE via the school climate was statistically significant. The direct, indirect, and total effects of the PSE on the CTE via the school climate were, respectively, $ß = .44$, $p < .001$; $ß = .29$, $p < .01$; and $ß = .72$, $p < .001$. Thus, the PSE was directly associated with the CTE, and its impact was partially mediated via the school climate at the between-level.

Discussion

This study is one of the first attempts to examine with two-level modelling how the PSE and the school climate are related to the CTE at the school level. Regarding *RQ1*, the PSE was found to have been positively related to the variation in the CTE between the schools.

Table 2. Correlations, variances, and standard error of the study variables (between-level coefficients indicated above the diagonal, within-level coefficients indicated below the diagonal).

	$N_{Between}$	SC	CTE	$Var_{Between}$	*SE*
Principal self-efficacy (PS)	59	.55***	.88***	1.17	.14
School climate (SC)	70	–	.70***	.08	.04
Collective teacher efficacy (CTE)	70	.53***	–	.11	.05
Var_{Within}		.31	.73		
SE		.02	.03		

***$p < 0.001$ (2-tailed).

Previous studies have shown that leadership in schools contributes to CTE, since it sets the direction for the school, provides support for teacher collaboration, and creates supportive environments and conditions (Goddard et al., 2015; Loughland & Ryan, 2022; Meyer et al., 2020; Ninković & Knežević Florić, 2018; Ross & Gray, 2006). This study showed that developing CTE is related to one aspect of leadership: PSE. Our findings are supported by the qualitative findings of Versland and Erickson (2017) that teachers have CTE when their principals lead by example, believe that the teachers are capable of focusing on instruction at school, and develop the teachers' capacity, thereby creating collaborative teaching opportunities.

This study has also corroborated the positive link between the school climate and CTE at the school level, which answers *RQ2*. This finding is in line with recent studies that indicated that a positive school climate improves teachers' expertise by enabling mutual learning and support, such as exchange of feedback, thereby enhancing teachers' confidence in their collective capability (Loughland & Ryan, 2022; Voelkel & Chrispeels, 2017). Apart from principal leadership, this study has shown that CTE also depends on the context to which the teachers belong. For this reason, this study used the school climate as a mediating variable between PSE and CTE.

Concerning *RQ3*, the results of this study confirmed that the relationship between PSE and CTE is partially mediated by the school climate. These results are further supported by Hoogsteen's (2020) model, which states that when principals develop leadership in the school to improve learning and teaching for their students, educators create a school climate in which collaboration, goal sharing, and positive and supportive interaction among them are encouraged. This leads teachers to believe in their collective capabilities to enhance student learning. These findings emphasise that teachers are a collective community, not only individual educators in a school, and are inevitably influenced by their working context (Collie et al., 2012).

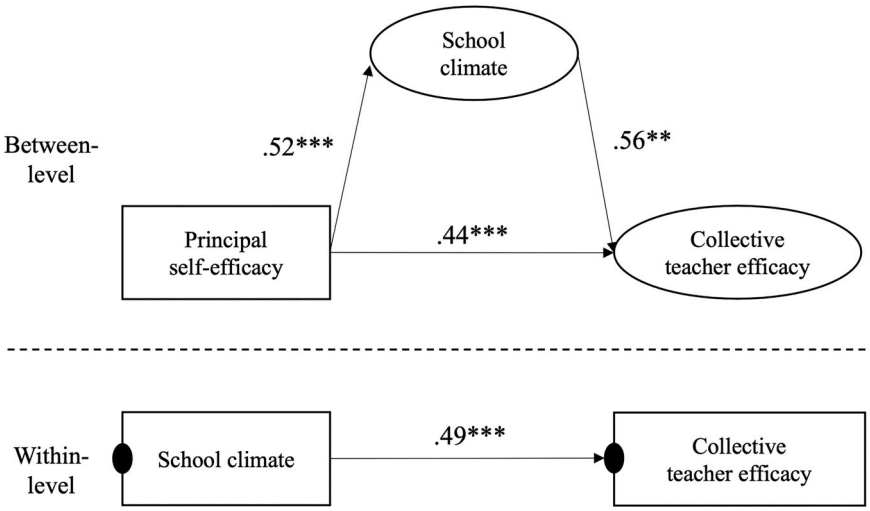

Figure 2. Two-level model of the relationships between principal self-efficacy, school climate, and collective teacher efficacy.
***$p < 0.001$. **$p < 0.01$.

This study adds to the growing body of research on school leadership and school improvement in three ways. First, its results have built on existing research concerning how CTE is enhanced (Bandura, 1997; Hoogsteen, 2020) by introducing PSE and the school climate as school-level factors. These school-level results have reinforced the findings from previous studies, which have not confirmed the relationships between PSE, the school climate, and CTE at the school level (Malinen & Savolainen, 2016; Versland & Erickson, 2017). Second, while previous studies have focused on the effects of principals' leadership (Goddard et al., 2015; Meyer et al., 2020; Ross & Gray, 2006), this study assessed the effects of principals' belief in their capability to improve schools via CTE, introducing the school climate as a mediator. The results of this study confirmed those of previous studies that principals with strong self-efficacy will shape the collective efficacy of the school staff (Goddard et al., 2021; Versland & Erickson, 2017). The results of this study further support the finding of a previous review study that principals build CTE by cultivating school climate (Grissom et al., 2021), at the between-level.

Third, the findings of this study on the effects of PSE on CTE via the school climate provided deeper insight into research on mediators between school leadership and teacher efficacy. The results broadly support the idea that school leadership has both direct and indirect effects on teacher efficacy (Ma & Marion, 2021). In this study, the school climate was found to have mediated the relationship between PSE and CTE.

The results of this study also have important implications for teacher development efforts. Principals seem to play an important role in building a positive school climate – nurturing the idea of a collaborative work environment in which teachers can learn from each other, create innovative instructions, and be involved in decision making, thereby contributing to their belief in their collective efficacy. Principals can also enhance cooperative student relationships that strengthen the social ties of all school stakeholders. In addition, to support principals' work, education policymakers should provide not only leadership actions and strategies but also opportunities to enhance principals' confidence in their practice. For example, providing guided mastery and cognitive modelling opportunities could be useful. Guided mastery opportunities include instructive modelling to obtain a skill or competency, honing that skill with guidance, and application of that skill in actual practice. Cognitive modelling helps leaders learn by following the decision-making and reasoning tactics used by effective role models (Tschannen-Moran & Gareis, 2004). Moreover, leadership development programmes should focus on how principals can believe in their capability to enhance the quality of teaching and learning in schools (Hallinger et al., 2018). Since schools are currently surrounded by challenges that require collective actions of teachers and educational staff, the required role of principals has changed (Moolenaar et al., 2010). Current leadership preparation programmes tend to aim at developing cognitive models and acquiring leadership skills, including setting shared goals and mentoring and coaching teachers (Hallinger et al., 2018). However, our results elucidated the importance of principals inspiring the future and strengthening their belief in their capabilities to make a positive difference. Thus, in future leadership development programmes, it is crucial to create opportunities for principals to reflect on their own capabilities to accomplish what they want to so as to shape their self-efficacy, such as through peer networks and mentoring groups (Southworth, 1995; Tahir et al., 2016).

The generalisability of the results of this study is subject to certain limitations. First, the results showed that the school climate partially mediates the effects of PSE on CTE. This fact is plausible because PSE does not exclusively influence CTE; that is, the relationship between PSE and CTE may be mediated by other school-level constructs, such as collaboration, trust, and teacher autonomy (Skaalvik & Skaalvik, 2007; Tschannen-Moran, 2001). Teachers' belief in their collective capability to educate students is crucial to meeting the demands of student learning with tenacity and diligence (Goddard, LoGerfo, & Hoy, 2004) and is a crucial factor for improving student achievement (Donohoo et al., 2018; Eells, 2011; Goddard et al., 2017; Klassen et al., 2010). Therefore, further research on other school-level constructs must be conducted to explore the mediating effects of PSE on CTE and to search for factors that may lie behind improving student achievement in schools. Second, all the examined constructs were treated as unidimensional in our analysis to answer the research questions. Future studies should look at more detailed mechanisms such as by using factor models of the subdimensions of the constructs used here. Third, the data sampling in this study was cross-sectional. It limited the potential for causal inferences between the variables. Although the results are aligned with sound theories and the results of previous studies on the topic (Hoogsteen, 2020; Versland & Erickson, 2017; Voelkel & Chrispeels, 2017), reverse associations may exist. For example, principals may feel confident when they notice that their teachers are working together to give their students a successful education and may realise their capabilities. In addition, the data sampling was conducted mostly in the eastern parts of Finland and not randomly. Thus, the conclusion and implications might not be appropriate for other contexts. Thus, for future research, a cross-lagged longitudinal design with random sampling methods in other educational contexts is recommended to examine, in more detail and with greater generalisability, how PSE affects the school climate and CTE. Finally, although the path analysis in this study showed directional relationships between the variables, we must interpret them with caution, and the relationships cannot be considered conclusive evidence of causal relationships.

In summary, this study demonstrated that PSE is related to teachers' belief in their collective capability to change what is expected of them as teachers by creating a more positive educational environment in the school. This study also suggested several promising research topics for further study, thereby enriching the knowledge base concerning this topic.

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Notes on contributors

Takumi Yada (PhD, education) is a postdoctoral researcher at the Finnish Institute for Educational Research, University of Jyväskylä. His research topics are shared leadership, prosociality, teacher efficacy, and collaboration among educational professionals. He is currently involved in many

international and national (Finnish and Japanese) research projects on how teachers collaborate with each other in multidisciplinary education.

Hannu Savolainen (PhD, education) is a professor in special education in the School of Educational Sciences and Psychology at the University of Eastern Finland, and an extraordinary professor in the Optentia research unit in North-West University, South Africa. His major research interests are school wide positive behaviour supports interventions and international comparative education research especially on teachers' attitudes and their self-efficacy in implementing inclusive education.

ORCID

Takumi Yada http://orcid.org/0000-0001-9953-7972
Hannu Savolainen http://orcid.org/0000-0002-1264-3746

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