



Unpacking collective teacher efficacy in primary schools: student achievement and professional development

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Abstract

Little is known about how teacher professional development helps enhance collective teacher efficacy so as to improve student performance. The present systematic review addresses two research questions, first by identifying 583 studies that may contribute pertinent information and then by performing in-depth analysis to eliminate those that did not meet our inclusion and quality criteria. After analyzing 18 studies, the results of this review confirm the impact of collective efficacy on student performance and highlight the importance of the role of principals in fostering a culture of trust and collaboration among school administrators and teaching staff.

Keywords Collective teacher efficacy · Professional development · Student achievement · Systematic review · Educational leadership

1 Introduction

For many years educators have operated under the premise that professional development is good by definition and, therefore, more is always better (Guskey & Sparks, 2002, p. 1). However, research has shown the ineffectiveness of numerous teacher training programs; thus, multiple studies have tried to define features of effective professional development (Bill & Melinda Gates Foundation, 2014; Clarke & Hollingsworth, 2002; Darling-Hammond et al., 2017; Desimone, 2009; Foundation, 2014; Guskey, 2003). Interest in this subject is mainly due to the positive impact that teacher professional development may have on both teacher performance and student learning (Clarke & Hollingsworth, 2002; Darling-Hammond et al., 2009; Guskey, 1986; William, 2016).

It is striking, then, that despite growing interest in the subject there have been few rigorous studies that examine the impact of teacher training on student performance—most studies in this area focus on its effect on teacher learning and practice (Yoon et al., 2007). Hence, the present systematic review aims to address this gap by focusing on (a) how

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professional development helps build collective teacher efficacy, and (b) how teachers' collective efficacy beliefs impact student performance.

The interest in collective teacher efficacy is due to the fact that these teacher-shared capacity beliefs have been closely linked to an improvement in teaching practice (Donohoo, 2018; Skaalvik & Skaalvik, 2019) and student performance (Eells, 2011; Holanda Ramos et al., 2014; Hoy, 2012). Thus, it could be said that the present review seeks to know whether collective teacher efficacy plays a potential mediating role between teachers' professional development and students' performance.

1.1 Professional development

Teacher professional development is defined 'as those processes and activities designed to enhance the professional knowledge, skills, and attitudes of educators so that they might, in turn, improve the learning of students (Guskey, 2000, p. 16).' Therefore, for professional development to be effective, it needs to be focused on the interests and needs of teachers. Further to this, Guskey (1985, 2002) maintains that the strongest motivator for learning in teachers is the potential for it to contribute to the growth and development of their students.

There are currently a variety of teacher training programs available, and these programs vary in their content and methodology. The aim of some of them is to improve and update the knowledge of teachers (Heller et al., 2012; Polly et al., 2015), others focus on the development of new skills and professional competencies (Baumfield, 2006), while others focus on an accompaniment and a reflection of the teaching practice (Cordingley et al., 2007; Girardet, 2017; Major & Watson, 2018). There is no doubt that the task of teaching is a continuous process of training others as well as training oneself, but how can teacher training be improved so as to contribute to the development and learning of both teachers and students? What factors contribute to the success of teacher professional development?

This last question has been the driving force of extant research, including the work of Darling-Hammond et al. (2017), Guskey and Yoon (2009), and Timperley et al. (2007). These studies have uncovered a number of factors related to high-quality professional development programs and to the improvement of student achievement. Specifically, Darling-Hammond et al. (2017) highlighted seven traits of effective teacher training. They emphasized the effectiveness of teacher training programs that (a) focus on content, which promotes teacher participation through (b) active learning and (c) collaboration for the sharing of ideas and learning together. Programs characterized by (d) the use of models of effective practices, (e) coaching and support from an expert, and those that leave (f) time for feedback and reflection are, in turn, associated with improved student performance. Finally, they highlighted the success of training programs with a (g) sustained duration that allows teachers to learn, put into practice, and reflect on their new knowledge and skills.

For his part, Guskey (1985, 2002) argues that for teacher learning to be successful, it should have an impact on students and offer practical and concrete ideas that contribute to teacher performance. The importance of having an impact on students is also related to the work of Hattie (2015), who, through a synthesis of 1200 meta-analyses, examined the impact of more than 200 factors on student achievement. An updated version of this work (Hattie, 2016) revealed that the factor with the greatest impact on student learning is collective teacher efficacy (CTE)—that is, 'the judgment of teachers in a school that the faculty as a whole can organize and execute the courses of action required to have a positive effect on students' (Goddard et al., 2004, p. 4). This factor had an effect size

of 1.57 on student performance and was gathered from the meta-analysis conducted by Eells (2011) on 26 studies that focused on CTE and its impact on student performance. But what is CTE?

1.2 Efficacy beliefs

CTE is a fairly recent concept, the origins of which are based on Bandura's social cognitive theory (1986). He defined self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391). These beliefs guide one's behavior by influencing their choices, as well as the effort and persistence given to actions (Bandura, 1997). Thus, the higher the perceived self-efficacy, the greater the effort invested, the level of persistence, and the willingness to take risks.

These beliefs are shaped by four sources of efficacy. The first, mastery experiences, are the most powerful source of information about one's own efficacy because they are based on direct experience and on how successes and failures are interpreted (Bandura, 1997). In other words, evidence of one's ability to perform successfully, or not, in the future is acquired through one's actions in the present. The second, vicarious experience, refers to the learning that takes place through observation of the actions and behaviors of others in various situations. Therefore, people refer to others as models of behavior and learn by comparing themselves to others (Bandura, 1977). The third, social persuasion, comprises feedback received from others regarding one's own performance. In this case, however, the only instances in which social persuasion has an effect on self-efficacy are when the comments are realistic and relevant to the action taken and when they come from people who are valued by the subject (Bandura, 1986, 1997). Finally, an individual's affective state can also affect self-efficacy beliefs, since, depending on the situation, one's physiological and emotional state contributes to one's perception of personal competence (Bandura, 1977). Therefore, it is important to consider the intensity of an individual's physiological and emotional reactions, as well as how a subject might perceive and interpret them (Bandura, 1997).

The value and interpretation of the information received from these sources of self-efficacy depend on personal, social, and temporal factors related to each individual and circumstance (Bandura, 1977). Therefore, it could be said that self-efficacy beliefs work as mediators between knowledge and action (Goddard et al., 2004; Tschannen-Moran et al., 1998). The way we perceive our abilities affects our choices and behaviors, and if the results of these choices and behaviors correspond with our expectations, our self-efficacy beliefs will be maintained and we will continue to behave similarly in the future.

Teacher self-efficacy is defined as the belief that teachers hold with regard to their ability to produce change and influence the performance of their students (Donohoo, 2017a). According to Gibson and Dembo (1984), teachers' beliefs with regard to their teaching abilities produce differences in their levels of effectiveness. Bandura (1993) states that teachers with high efficacy beliefs create richer and more complex learning experiences, while also promoting the self-efficacy of their students. Likewise, Guskey (1987) argues that self-effective teachers take responsibility for the achievements of their students, while those with low self-efficacy attribute student results to external factors.

1.3 Collective teacher efficacy

The teaching–learning process occurs within a context in which many agents participate and interrelate. Teachers act both in isolation and together, as all of them work toward the common goal of contributing to the learning and development of each and every student. In fact, the values and beliefs held by teachers can enhance or harm the functioning of a school as a whole (Bandura, 1993). Therefore, the concept of self-efficacy must be studied at the group level; this is known as CTE, which is defined as the perceptions and judgments shared by teachers regarding their ability to positively impact their students' performance (Donohoo, 2017b).

According to Bandura (1997), collective efficacy is formed through the same sources of efficacy that are described above; the processes involved at the individual level can be applied at the group level, and in the case of teachers, at the school level. Studies such as that of Usher and Pajares (2008) and Morris et al. (2017) have confirmed the importance of the four sources of information in the shaping of teacher efficacy beliefs. In addition, the importance of how teachers interpret the information from these sources and put it in context with respect to their own teaching reality has also been emphasized.

To this regard, Goddard et al. (2004) presented a model of CTE that focuses on the process carried out by teachers when they analyze, attribute, and interpret teaching tasks and the general competence of the teaching staff. Thus, the information received from one's own actions through the four sources of self-efficacy is analyzed and interpreted in relation to the level of difficulty of the teaching task and with one's perception of the competence of the group of teachers to which one belongs (Goddard et al., 2000, 2004).

Moreover, beliefs regarding collective and personal self-efficacy are reinforced through the obtained results. Therefore, if teachers perceive an improvement in the performance of their students and attribute this improvement to their own work as teachers, they will continue to act in the same ways in order to maintain this perceived impact on their students (Goddard et al., 2004). Hence, the formation of collective efficacy beliefs can be represented as a modifiable and continuous feedback process between each of its components.

The interest in collective efficacy arose from a study carried out by Bandura (1993) in which it was shown that CTE had a greater impact on student achievement than did students' socioeconomic status. From then on, the theory took on more strength and different researchers began to take more of an interest. In this sense, Goddard et al. (2000, 2004) developed not only the theoretical model presented above but also an instrument called the Collective Teacher Efficacy Scale. This instrument consists of 21 items that reflect four dimensions, two of which are positive and two of which are negative, on the analysis of teaching tasks and teaching competence at the group level. While the task analysis uses teachers' assessments of the challenges of being a teacher in a particular school and takes into account aspects including school resources and materials and student motivation and capability, teacher competence uses teachers' assessments of the teaching ability of their colleagues and takes into account the analysis of the tasks to be carried out (Goddard et al., 2000). Therefore, CTE can be understood as the assessment of teaching competence within a given context (McCoach & Colbert, 2010).

However, due to a disproportion in the items presented in this first instrument—thirteen items evaluate teaching competence, while only eight measure teaching tasks—Goddard (2002) refined and improved the scale by developing a new one composed of just 12 items: the Collective Efficacy Scale. Furthermore, Tschannen-Moran and Barr (2004) developed a different scale, called the Collective Teacher Belief Scale, which is composed of 12 items

divided into two subscales, one for instructional strategies and the other for student discipline. These three scales have been validated and are the ones that are most often used to evaluate teachers' collective efficacy beliefs (Eells, 2011; Salas-Rodríguez & Lara, 2020).

Finally, despite the fact that since Bandura's (1993) work, several studies have focused on the relationship between CTE and student achievement (Goddard et al., 2000, 2004; Moolenaar et al., 2012; Tschannen-Moran & Barr, 2004), few studies have investigated how teachers' collective efficacy beliefs are formed or the role that teacher professional development plays in this process.

1.4 The present study

With this in mind, the present systematic review arises from an interest in unpacking CTE, with a focus on its relationship to teacher professional development and student performance. Thus, this research finds its justification in the scarcity of systematic reviews that address the relationship between these variables at the primary school level (Donohoo, 2017b). Furthermore, the study of CTE is of special interest because it is a 'contribution that comes from the school—not the home and not the students themselves' (Donohoo, 2017a, p. 5). Considering the strong influence it exerts on student performance (Bandura, 1993; Goddard et al., 2000, 2004; Hattie, 2016), CTE deserves greater in-depth study and understanding.

In short, this study will examine how teacher beliefs and training relate to each other and how they impact student learning and development. The questions that will be addressed by this research are as follows:

- (a) How does professional development contribute to the building of CTE?
- (b) How do CTE beliefs impact student performance?

2 Method

The procedure used in this review is based on the approach most commonly used to perform systematic reviews (Gough et al., 2013; Harden & Thomas, 2005; Xiao & Watson, 2017). First, the research questions were established, then the terms to be used in the literature searches were determined, and the databases to be consulted were chosen. The inclusion and exclusion search criteria were then established. During the searches, samples of the literature were selected, the information was extracted, and the quality was evaluated. Finally, the data were analyzed and conclusions were drawn through consideration of the two research questions presented above.

2.1 Literature Search

The studies included in this investigation were selected during the months of May and June of 2020 from the Scopus, Social Science Citation Index (Web of Science), ERIC, and ProQuest databases. In addition to these databases, other studies were obtained using the 'snowball' technique, in which the literature cited in the studies that are included in an initial review is also consulted by the researchers for the possibility that they, too, might be included.

The keywords used in the database searches were derived from the two research questions, which were broken down according to the concepts presented within them, as follows:

- (1) 'professional development,' 'teacher learning,' 'collective teacher efficacy,' 'collective efficacy'
- (2) 'collective teacher efficacy,' 'collective efficacy,' 'impact,' 'student achievement,' 'student outcomes.'

2.2 Inclusion and exclusion criteria

In order to ensure the relevance of the studies, inclusion and exclusion criteria were established before carrying out the literature searches. Thus, those studies (research papers, book chapters, and/or doctoral dissertations) that were (a) published between 2000 and 2020,¹ (b) were in English, and that (c) focused on teachers or students between first and sixth grades (primary school level), regardless of the subject taught, were included. Studies conducted with K–12 and/or first–ninth-grade teachers or students were also included in the review, but only the information pertaining to the primary grade levels was taken into account.

Furthermore, studies that dealt with (a) the training of pre-service teachers; (b) the concept of efficacy centered on the principal or the students; (c) the concept of self-efficacy without consideration of CTE; and (d) research conducted only at the levels of kindergarten, middle school, high school, and/or university were excluded. Additionally, literature reviews and meta-analyses were excluded since they are considered to be secondary sources rather than the primary literature.

2.3 Quality criteria

Once the literature searches were carried out and the studies to be analyzed in-depth were selected, some initial data were extracted, including the author, title, year of publication, country, journal, research objective, sample, type of design, methodology, grade level, measurement instrument, and results.

After analyzing the studies and extracting the information, the quality of the studies was reviewed with the aim of avoiding possible biases. The criteria used to determine quality was drawn from Peticrew and Roberts (2006) and Caldwell et al. (2005). Each criterion was evaluated on a scale of three points (0, 1, or 2 points), and in order to be included in the review, the study needed to have an average of at least seven points out of a total of 14 (see Table 1).

¹ We only included studies between 2000 and 2020 for two reasons: to focus on the most recent studies, and because a systematic mapping published in 2020 (Salas-Rodríguez & Lara, 2020) found that the first record with the term 'collective teacher efficacy' in the most popular databases (Web of Sciences and Scopus) was published in 2000 by Goddard, Hoy & Woolfolk-Hoy.

Table 1 Quality criteria

Quality criteria	Rating
1. The aim of the research and the question(s) or hypotheses has been clearly stated	0 = no; 1 = partially; 2 = yes
2. The methodology has been mentioned and is suitable for the research question	0 = no; 1 = partially; 2 = yes
3. It is clearly indicated how the sample was obtained and its main characteristics are mentioned	0 = no; 1 = partially; 2 = yes
4. The data are analyzed adequately and accurately	0 = no; 1 = partially; 2 = yes
5. The findings and conclusions are clear and the author unites them with the research aims previously presented	0 = no; 1 = partially; 2 = yes
6. The research question is answered using empirical evidence	0 = no; 1 = partially; 2 = yes
7. The author identifies and describes the strengths and limitations of the study (i.e., its utility)	0 = no; 1 = partially; 2 = yes

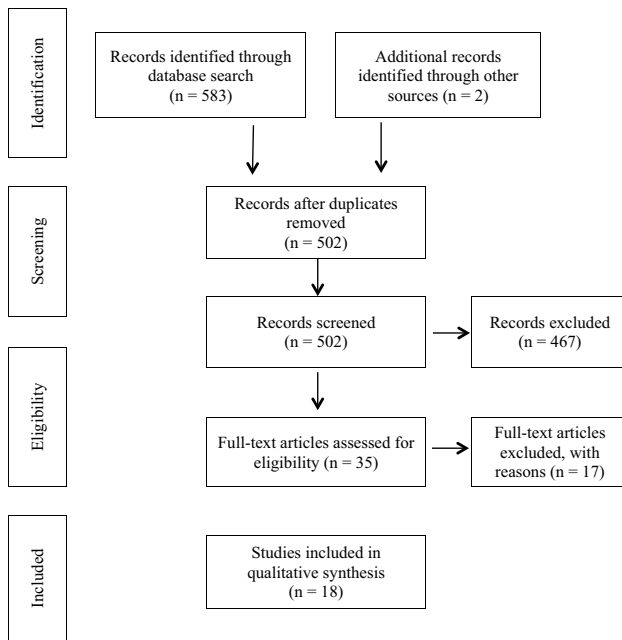


Fig. 1 PRISMA diagram

2.4 Screening and literature selection

The literature searches revealed a total of 583 studies related to the search terms. Eighty-one repeat results were eliminated, then the abstracts of the remaining 502 studies were reviewed and only those that met the inclusion criteria were included. Subsequently, reviewers carefully read each of the selected studies (35) and eliminated those that did not meet the pre-established quality criteria (19). At the end of this process, a total of 16 studies were included in the systematic review, with the addition of two other documents that

were found using the snowball technique, bringing the final total of studies analyzed and included to 18.

Figure 1 presents the PRISMA flow diagram (Moher et al., 2009) that shows the general process of resource selection and lends greater clarity to the narrated process. This diagram presents the number of identified records, screened texts, excluded records, and included studies, allowing us to keep track of the reasons for exclusion at each stage.

3 Results

This section presents the findings from the review of the 18 articles included in the present study. The data displayed in Table 2 show the characteristics of the studies included in this systematic review.

3.1 How does professional development contribute to the building of collective teacher efficacy?

A total of nine studies were found that addressed the first research question, which looked at how professional development helps build CTE (see Table 3). Three of the studies dealt with professional learning communities (PLC) as a means to teacher education (Lee et al., 2011; Voelkel & Chrispeels, 2017; Zonoubi et al., 2017), and two others focused on collaboration between schools and universities (Carpenter & Sherretz, 2012; Vernon-Dotson & Floyd, 2012). One looked at a specific program for solving math problems (Zambo & Zambo, 2008), another examined language coaching (Cantrell & Hughes, 2008), and the final one focused on teacher training in general and its relationship with CTE beliefs (Durksen et al., 2017; Moon, 2012). All of these studies mentioned the importance of collaboration among teachers in the development of trust and commitment.

Indeed, Durksen et al. (2017) found that collaboration with other teachers had the greatest influence on the beliefs of self- and collective teacher efficacy in comparison with other types of teacher training, as it promotes the most sources of efficacy. Furthermore, PLCs stood out as a type of professional development that promotes collaborative reflection, learning through observation and peer feedback, and giving teachers the opportunity to learn through vicarious experience and social persuasion, all of which increase both their self- and collective efficacy (Zonoubi et al., 2017).

Voelkel and Chrispeels (2017) found that the presence of certain characteristics in PLCs predicts higher levels of CTE. They noted that schools that had a high value in the dimension of shared values and vision also showed high levels in the assessment of group competence and in the analysis of tasks, which, in turn, indicates that they demonstrated high levels of CTE. Similarly, Lee et al. (2011) found that collective learning ($\beta=0.49$, $p<0.001$) and trust among teachers ($\beta=0.76$, $p<0.001$) predict the variance of CTE at the school level with respect to instructional strategies. These three investigations showed a strong relationship between the characteristics of a learning community and high levels of collective efficacy; demonstrating that the correct implementation of a PLC leads to the constant promotion of the four sources of efficacy and to the increased commitment of teachers with respect to their common goals.

Another type of professional development was presented by Carpenter and Sherretz (2012) and Vernon-Dotson and Floyd (2012), who studied leadership teams made up of school teachers and university researchers. The goal of these teams was to strengthen the

Table 2 Characteristics of studies included in systematic review

Description	Count	Percentage
Source		
Articles	16	89
Doctoral theses	2	11
Year of publication		
2000	1	5.5
2001	1	5.5
2002	–	–
2003	–	–
2004	1	5.5
2005	1	5.5
2006	–	–
2007	–	–
2008	2	11
2009	–	–
2010	1	5.5
2011	2	11
2012	4	22
2013	–	–
2014	1	5.5
2015	–	–
2016	–	–
2017	4	22
2018	–	–
2019	–	–
2020	–	–
Country of study		
Canada	1	5.5
Hong Kong	1	5.5
Iran	1	5.5
The Netherlands	1	5.5
Norway	1	5.5
USA	13	72.5
Methodology		
Quantitative	10	55.5
Qualitative	3	16.5
Mixed methods	5	28
Studies per question		
Question 1	9	50
Question 2	9	50

leadership of teachers by fostering the sharing of their concerns, goals, values, and interests. Through the sharing of leadership, a sense of community is formed and the commitment of its member's increases (Vernon-Dotson & Floyd, 2012). In a similar way, the value and trust school principals place in their teachers plays a key role in the promotion

Table 3 Overview of studies included in Question 1

References	Design	Participants	Country	Grade level	Professional development	Duration of the program	Statistical analysis	Findings
Cantrell and Hughes (2008)	Mixed methods longitudinal	22 teachers	USA	6th and 9th	Literacy coaching	1 year	Correlation; <i>t</i> test	Self-efficacy ($r = -4.23^{***}$) CTE ($r = -2.051^*$)
Zambo and Zambo (2008)	Mixed methods longitudinal	63 teachers	USA	4th–10th	Summer math workshops	2 weeks	<i>t</i> test	Low-performing schools Self-efficacy ($r = 4.88^{**}$) CTE ($r = 2.76^{**}$) High-performing schools Self-efficacy ($r = 3.24^{**}$)
Lee et al. (2011)	Quantitative cross-sectional	480 teachers	Hong Kong	4th–9th	PLC	NS	Correlation; HLM	Collective learning and application on CTE ($r = 0.49^{***}$) Faculty trust on CTE ($r = 0.76^{***}$)
Carpenter and Sherretz (2012)	Qualitative longitudinal	NS	USA	1st–6th	Professional development school partnerships	NS	–	–
Moon (2012)	Quantitative cross-sectional	38,240 teachers	USA	1st–9th	NS	NS	Correlation; linear regression	PD and CTE Content focus ($r = 0.042^{**}$) Reading ($r = 0.042^{**}$)
Vernon-Dotson and Floyd (2012)	Qualitative NS	31 members of the project	USA	K–12	Professional development school partnerships	18 to 30 months	–	–

Table 3 (continued)

References	Design	Participants	Country	Grade level	Professional development	Duration of the program	Statistical analysis	Findings
Durksen et al. (2017)	Mixed methods cross-sectional	253 teachers	Canada	1st–9th	NS	2 years	Correlation; SEM	Collaborative professional learning on CTE ($\beta=0.44$) Self-efficacy ($\beta=0.66$) Sources of efficacy ($\beta=0.81$)
Voelkel and Chrispeels (2017)	Mixed methods cross-sectional	310 teachers and principals	USA	1st–6th	PLC	5 years as a PLC	Correlation; SEM	PLC and CTE ($r=0.518^{**}$)
Zonoubi et al. (2017)	Qualitative longitudinal	10 teachers	Iran	NS	PLC	6 months	–	–

NS = not specified; PLC = professional learning community; HLM = hierarchical linear modeling; SEM = structural equation modeling; CTE = collective teacher efficacy; PD = professional development; t = student's t distribution; r = correlation coefficient; β = standardized beta coefficient
 * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

of teacher empowerment and in the likelihood that principals will listen to the opinions of teachers (Carpenter & Sherretz, 2012). Teachers in both studies mentioned an increase in professional responsibilities, which led to an increase in CTE beliefs, as the teachers felt more valued and involved in their educational practice.

Likewise, Cantrell and Hughes (2008) studied the impact of a coaching program on literature teachers. The goal of the program was to help teachers use literary skills and facilitate student learning. After 1 year, there was an increase in self-efficacy beliefs ($t(21) = -4.236$, $p < 0.001$), CTE ($t(21) = -2.051$; $p < 0.05$) and in the teachers' use of literary techniques ($t(21) = -2.093$; $p < 0.05$). The teachers who participated in this study reported that coaching was a great benefit when it came to the implementation of new techniques, as it provided the opportunity to learn through modeling and receive continuous feedback from their peers and coach.

Zambo and Zambo (2008) studied the effects of summer workshops for mathematics teachers from high- and low-performing schools. Their results showed that teachers from low-performing schools had improved levels of self-efficacy ($t(30) = 4.88$; $p < 0.01$) and CTE ($t(30) = 2.76$; $p < 0.01$), while teachers from high-performing schools only showed an increase in their self-efficacy levels ($t(31) = 3.24$; $p < 0.01$). These results reveal that improving teachers' teaching competence and content knowledge has the effect of increasing their efficacy beliefs.

All in all, the studies included in this first research question focused on one or the other of two types of professional development programs: those that focused on developing collaboration and trust (Durksen et al., 2017; Lee et al., 2011; Voelkel & Chrispeels, 2017; Zonoubi et al., 2017), and those that sought to improve content knowledge and professional competence (Cantrell & Hughes, 2008; Zambo & Zambo, 2008).

3.2 How do collective teacher efficacy beliefs impact student performance?

The results for our second research question allowed us to deepen on how CTE impacts student performance (see Table 4). Of the nine studies that addressed this question, eight of them used a quantitative methodology, while only one used mixed methods. The instruments used in these studies to assess teachers' collective efficacy beliefs were the CTE Scale (Goddard et al., 2000) and the Collective Efficacy Scale (Goddard, 2002). It is interesting to note that only the studies by Goddard et al. (2000) and Goddard (2001) corroborated Bandura's (1993) findings that CTE is a significant predictor of student performance in subjects such as reading and mathematics to the extent that it overcomes the magnitude of the impact of socioeconomic status. Instead, studies like those carried out by Cybulski et al. (2005), McCoach and Colbert (2010), Moolenaar et al. (2012), and Richardson (2014) found that CTE has a significant relationship with student performance but the impact of socioeconomic level is usually stronger.

Tarter and Hoy (2004) also found a high and significant correlation between student performance in reading ($r = 0.74$, $p < 0.01$) and mathematics ($r = 0.72$, $p < 0.01$) with CTE levels. Similarly, Moolenaar et al. (2012) concluded that increasing CTE beliefs also increased student performance in language, finding a positive and significant correlation between both ($r(773) = 0.48$, $p < 0.01$). Furthermore, Richardson (2014) studied collective efficacy in high- and low-performing schools, and the results showed that high-performance schools scored higher on CTE than low-performance schools, obtaining a moderate but significant correlation coefficient ($r(183) = 0.40$, $p < 0.001$) between the type of school and collective efficacy. With regard to non-academic performance, and with the use

Table 4 Overview of studies included in Question 2

References	Design	Participants	Country	Grade level	Measurement instrument	Subject	Statistical analysis	Findings
Goddard et al. (2000)	Quantitative cross-sectional	452 teachers and 7016 students	USA	1st–6th	CTE Scale (Goddard et al., 2000)	Math and Reading	Correlation; HLM	Higher CTE Reading ($\beta = 8.49^{***}$) Math ($\beta = 8.62^{***}$)
Goddard (2001)	Quantitative cross-sectional	452 teachers and 2536 students	USA	1st–6th	CTE Scale (Goddard et al., 2000)	Math and Reading	Correlation; HLM	Higher CTE Reading ($\beta = 3.74^{**}$) Math ($\beta = 4.82^{**}$)
Tarter and Hoy (2004)	Quantitative cross-sectional	145 schools	USA	1st–6th	Collective Efficacy Scale (Goddard, 2002)	Math and Reading	Correlation; multiple regression	CTE and student achievement English ($r = 0.74^{**}$) Math ($r = 0.72^{**}$)
Cybulski et al. (2005)	Quantitative cross-sectional	146 schools	USA	1st–6th	Collective Efficacy Scale (Goddard, 2002)	Math and Reading	Correlation; SEM	CTE and student achievement Reading ($r = 0.754^{**}$) Math ($r = 0.723^{**}$)
McCoach and Colbert (2010)	Quantitative cross-sectional	1077 teachers	USA	NS	CTE Scale (Goddard et al., 2000)	Math, Reading, and Writing	Correlation	CTE factors and student achievement Task analysis ($r = 0.72$) Teaching competence ($r = 0.49$)
Sørbye and Torshelm (2011)	Quantitative longitudinal	1100 teachers	Norway	1st–6th	Collective Efficacy Scale (Goddard, 2002)	NS	Correlation; multilevel regression	Higher CTE, lower problem behavior School level ($b = -0.43^*$) Class level ($b = -0.36^*$)

Table 4 (continued)

References	Design	Participants	Country	Grade level	Measurement instrument	Subject	Statistical analysis	Findings
Moolenaar et al. (2012)	Quantitative cross-sectional	775 teachers and principals	The Netherlands	1st–6th	Collective Efficacy Scale (Goddard, 2002)	Math and language	Correlation; multiple regression	CTE and student achievement English Math ($r=0.48^{**}$) Math ($r=0.29^*$)
Richardson (2014)	Quantitative cross-sectional	185 teachers	USA	1st–6th	Collective Sense of Efficacy Scale	NS	Correlation; ANOVA	CTE and type of school (high- or low-performing); ($r=0.40^{***}$)
Goddard et al. (2017)	Mixed methods cross-sectional	2041 teachers 13,472 students	USA	1st–9th	Collective Efficacy Scale (Goddard, 2002)	Math	HLM	CTE as a predictor of variation in mathematics achievement ($\beta=0.095^*$)

NS = not specified; HLM = hierarchical linear modeling; SEM = structural equation modeling; CTE = collective teacher efficacy; ANOVA = analysis of variance; β = standardized beta coefficient; r = correlation coefficient; b = unstandardized regression coefficient

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

of variables of a more social and behavioral type, Sørлие and Torsheim (2011) showed that an increase in CTE was correlated with a decrease in student behavioral problems (school level: $b = -0.43$, $p < 0.05$; classroom level: $b = -0.36$, $p < 0.05$).

It was also found that students' previous performance is related to teachers' perceptions of collective efficacy. In fact, Goddard (2001) holds that students' previous performance acts as a source of information regarding efficacy since it can be considered, by the teacher, as an experience of success or failure. Accordingly, Goddard (2001) found that the previous performance of students has a greater predictive value than the students' socioeconomic level or race when studying the differences in CTE between schools. Therefore, the existence of a reciprocal relationship between student performance and CTE is supported in the literature (Goddard, 2001; Tschannen-Moran & Barr, 2004). Nonetheless, special care has to be paid since no causal relations can be drawn from correlational analysis and/or cross sectional studies. To this respect, the only longitudinal study included in this second research question was that of Sørлие and Torsheim (2011). With this in mind, and taking into account the characteristics of our nine included studies, CTE and student achievement seem to be positively related between them.

4 Discussion

The teaching profession is characterized by a constant need for training in order to respond to the different challenges that arise on a daily basis. In this sense, the teaching task is oriented to achieve the development and learning of each and every one of the students. Nonetheless, in order to achieve this goal, teachers need to share the beliefs that they, as faculty, have what it takes to produce meaningful student learning. In this regard, teacher professional development plays a key role in these two tasks: updating teachers' knowledge and providing them with the necessary tools so that together they can achieve the desired impact on students.

With this in mind, the present systematic review is based on the search for answers to the following questions:

- (a) How does professional development contribute to the building of CTE?
- (b) How do CTE beliefs impact student performance?

These research questions are interrelated and complement each other, and therefore, based on the data and the results obtained from the 18 included studies, different ideas can be explored and connected.

First of all, and because CTE is a term common to both questions, it will be helpful to recall that CTE is the belief shared by teachers about their ability to make an impact on students (Bandura, 1977, 1997; Donohoo, 2017a). In this sense, as it is a shared belief, it implies an assessment of the group to which one belongs and an analysis of the difficulty of the tasks that are performed (Goddard et al., 2000, 2004). Hence, as seen in the results, the higher the density of relationships among teachers, the higher the levels of collective efficacy (Moolenaar et al., 2012).

In this line, all the studies that were included in the first research question agreed on the importance of collaboration for the development of CTE regardless of the type of professional development program. Through collaboration, teachers can establish relationships (Moolenaar, et al., 2012), promote trust (Lee et al., 2011; Vernon-Dotson &

Floyd, 2012), open their teaching practice, and create a supportive climate (Carpenter & Sherretz, 2012). This supportive climate is essential for teachers to feel and know that, together, they are capable of reaching each and every student.

But, what would be the best way for teachers to collaborate? There is probably no right answer to this question. However, regarding the studies found, it has been seen that the PLCs are the model that currently prevails. Perhaps this is due to the fact that their own characteristics are what encourage the development of CTE by promoting the pursuit of common goals and, therefore, of shared responsibilities (Lee et al., 2011; Voelkel & Chrispeels, 2017).

Nonetheless, the simple act of implementing a PLC does not ensure its success, or the improvement in the students' performance. In this sense, trust plays an essential role so that people feel safe to take risks and make mistakes, knowing that they are supported and valued by their peers as well as by the school administration (Lee et al., 2011). Hence, the collaboration and relations between the different professionals increase the levels of trust and, in turn, the PLCs raise the collective efficacy of teachers.

Another aspect of professional development that can assist in the development of CTE beliefs is coaching. This more personal accompaniment is a good tool to reinforce teachers' mastery experiences and provide feedback regarding their performance. According to a meta-analysis conducted by Kraft et al. (2018) the quality and focus of the coaching, as well as the school's culture help facilitate the openness and confidence of the teachers with their coach. Consequently, we should further explore how coaching is implemented as it has been seen that the success of coaching is accompanied by a culture of support from the principal and the school administration (Carlisle & Berebitsky, 2011; Kraft et al., 2018; Panfilio-Padden, 2014).

Finally, professional development programs focused on improving teachers' content knowledge and teaching competence can help teachers feel more comfortable with their teaching tasks. The results of this first research question make clear the need to take care of both the content and the type of teacher professional development programs. These two aspects are the key to improving the two factors of CTE: group competence and task analysis.

On the other hand, the studies that addressed the second research question argue that when levels of CTE are high, student performance increases (Goddard et al., 2017; McCoach & Colbert, 2010; Richardson, 2014). In fact, Goddard et al. (2000) sustain that the beliefs shared by the teachers shape their actions and the culture of the school. Therefore, in a school where teachers share high levels of collective efficacy, higher expectations are promoted and a constant effort is made to continue achieving common goals (Goddard et al., 2017). Hence, Bandura's (1993) findings were confirmed by some studies that found that CTE has a greater impact on student performance than the student's socioeconomic level, which shows that CTE can help to counteract the effects of contextual variables on student performance (Goddard, 2001; Goddard et al., 2000).

Another interesting finding regarding this second question was that CTE is not only a predictor of student performance, but performance also seems to predict and affect teachers' efficacy beliefs (Goddard, 2001; Tschannen-Moran & Barr, 2004). To this regard, Goddard et al. (2000) affirm that teacher efficacy has a cyclical nature, since the previous performance of the student can be considered as a success or a failure on the part of the teacher, while the beliefs shared by teachers about their own ability to impact learners help teachers to be more committed to their teaching and to all students, even those who show low performance (Tschannen-Moran & Barr, 2004). Therefore, some authors claim that collective efficacy beliefs and student performance feedback on each

other and exhibit reciprocal causality (Goddard, 2001; Goddard et al., 2000; Moolenaar et al., 2012).

Finally, if we look at the results of both research questions, a common aspect that stands out is the importance of school climate and culture. On the one hand, the school climate seems to be essential for the correct implementation of the various teacher training programs, being the foundation for collaboration, trust, and teacher efficacy beliefs. On the other hand, school climate and culture seem to be permeated by teachers' efficacy beliefs, affecting in turn the expectations and behaviors of teachers.

4.1 Implications for further research

Throughout this review numerous questions and new interests have emerged. First of all, it seems that teachers' collective efficacy beliefs could indeed be a mediator between the teacher training they have received and their students' performance. In this sense, it would be interesting to conduct a study that would make it possible to confirm this relationship in the practice. Additionally, it would be valuable for future research to further investigate the role of school principals in the formation of CTE and student performance. Some studies (Goddard et al., 2015, 2017, 2020) emphasize the importance of the principal and the administration in creating opportunities for the development of collective efficacy.

One aspect to be taken into account in the study of teacher efficacy beliefs is that some claims are made in theory but are not tested in practice. An example of this is the causal relationships that have been established between CTE and student learning, or between CTE and teacher self-efficacy. The reality of education is very complex and there are many agents and factors that affect it, which makes it very difficult to establish causal relationships. Longitudinal studies with large and representative samples would make it possible to carry out causality analyses and to respect the different levels of analysis of the variables. Likewise, mixed studies would be of great interest to try to better understand the complex educational reality and to gain in-depth knowledge of teachers' perceptions of their professional development and efficacy beliefs.

We further encouraged future studies to investigate more about the tools for assessing CTE. In our small systematic review—and with respect to the second research question—seven of the eight included studies used the tools developed by Goddard (Goddard, 2002; Goddard et al., 2000). Despite their widespread use, previous studies have criticized both tools for explicitly measuring task difficulty, thus affecting CTE scores in schools with a more challenging environment (Eells, 2011; Tschannen-Moran & Barr, 2004). Hence, it would be interesting to explore more studies that have used other tools to assess CTE beliefs. Or perhaps future studies could evaluate CTE using two different tools in order to see whether or not there are differences between the obtained results.

In this respect, McCoach and Colbert (2010) pointed out the need to improve the tools used to assess CTE. With regard to the CTE Scale (Goddard et al., 2000), which measures task analysis and teaching competence within a single factor, McCoach and Colbert (2010) proposed a two-factor model that can distinguish both variables with the aim of looking more deeply at the collective efficacy beliefs held by teachers. For example, teachers who face a relatively straightforward task (i.e., an external factor) but do not believe that it can be accomplished by their teaching staff (i.e., internal factor) would benefit from training that focuses on collaboration, trust, and dialogue. Therefore, through the measurement of both factors, more accurate interventions could be implemented that are tailored to the needs of each particular teacher and school.

4.2 Implications for practice

Regarding practice, it is necessary to develop training that is directed at school principals and administrative staff in order to ensure that they are aware of the impact of their actions on school culture and the promotion of CTE beliefs through the facilitation of opportunities.

Also, the contributions of McCoach and Colbert (2010) that were alluded to in the previous subsection suggest that it is important to review the instruments used to evaluate CTE in order to make pertinent improvements and allow more light to be shed on teacher professional development. With regard to this, CTE should be an essential part of any training program, and it should be included not only in the design of such programs but must also be measured after their implementation so as to discover the effectiveness of the intervention (Donohoo, 2017b). If the impact of training on CTE is considered, the impact of this training on student performance could be better predicted.

Another factor that must be considered is the importance of listening to the opinions of teachers regarding their training, needs, and concerns. Not only will listening to teachers improve professional development programs, but it will allow for more coherence between what is offered by the administration and what teachers experience on a daily basis. In short, there is an opportunity to enrich the practice of teaching with what is found in the theory.

4.3 Limitations of the current review

The present systematic review aimed to deepen current knowledge and understanding of the subject of professional development and teachers' efficacy beliefs; however, like any other study, there were some limitations with respect to its realization. As there were not many rigorous studies that examined the topic of CTE that met the inclusion criteria, very few studies were found and included in the review. Furthermore, although the database searches were exhaustive, only four databases were consulted; the low number of studies that were found that addressed the research questions may have been partly due to this reason. Another reason for the low number of studies found that met the criteria may be the fact that only studies that focused on the primary levels were included.

5 Conclusion

The present systematic review explored how CTE can be promoted in teacher professional development programs in order to achieve a greater impact on student learning and development. For this purpose, two questions were posed and 18 studies were analyzed following quality and inclusion/exclusion criteria.

The results for the first question showed that training programs that foster teacher collaboration and the development of a supportive school climate are more likely to be associated with an increase in collective efficacy beliefs. PLCs appear to be an excellent means of promoting these characteristics and fostering the development of teacher efficacy information sources.

For their part, the studies found for the second question support the positive and significant relationship between CTE and student performance. However, most of the studies

included are based only on correlations and data collected cross-sectionally, so longitudinal studies would be helpful to further explore the possible reciprocal relationship between these two variables. Implications for research and practice are offered in order to further develop these promising concepts.

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Declarations

Conflict of interest The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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