



Review of research on teacher emotion during 1985–2019: a descriptive quantitative analysis of knowledge production trends

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Abstract

This current review of research tells a richly detailed story of the evolving intellectual structure of teacher emotion research during 35 years starting from 1985 until 2019, through identifying 812 articles and using a descriptive quantitative analysis approach. The developmental trend reveals a substantial change in the volume of publications recently, although the overall volume of research is still relatively low. Findings identify that, although quantitative methods were the most commonly used, qualitative and mixed methods of research have undergone a marked increase in the past ten years. However, as the majority of articles have been exploratory-oriented, intervention and experimental studies are largely lacking, resulting in the “so-what” story being missing. A functionalist perspective suggests that knowledge production in teacher emotion research is either at a late first stage or an emerging second stage. This effort lays a foundation on which to interpret the evolution of the teacher emotion literature.

Keywords Teacher emotion · Review of research · Descriptive quantitative analysis · Comparative perspective

Introduction

Given the close attachment of emotion to teaching and learning, rationality should be joined by emotionality to become the “two wings” of teachers in teacher development initiatives for promoting teacher effectiveness. However, the current scholarship on teacher development is still heavily dominated by the cognitive-rational approach which underplays the emotive

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aspect (Sutton and Wheatley 2003; Uitto et al. 2015). Consequently, it has been claimed that many teachers are ill-prepared and insufficiently supported by initial teacher education and professional training to cope with the emotional demands of their career (Darling-Hammond 2001; Hoy 2013). Thus, extant research on teacher emotion needs to be evaluated primarily in terms of its ability and rigour to inform practice, policy, and research in teacher development and effectiveness with regard to teacher emotion.

Emotions have been notoriously difficult to define as there has been little agreement on theoretical viewpoints across disciplines (e.g. physiology, philosophy, history, sociology, psychology) on how to conceptualise and map this elusive concept (Fried et al. 2015; Oatley 2000). Although there is no consensus on the definition of emotion, many scholars in educational settings tend to adopt Schutz et al.'s (2006) definition, referring to emotion as “socially constructed, personally enacted ways of being that emerge from conscious and/or unconscious judgements regarding perceived successes at attaining goals or maintaining standards or beliefs during transactions as part of social-historical contexts” (p. 344). Based on this definition, Farouk (2012) defined teacher emotions as “internalised sensations that remain inert within the confines of their bodies but are integral to the ways in which they relate to and interact with their students, colleagues and parents” (p. 491). This definition is the only attempt to define teacher emotion, which not only integrates the internal variations of human emotions but also focuses on the interactions of external emotional experiences, which well captures the features of teacher emotions in the context.

Teaching is a high-risk profession (Capone and Petrillo 2018). Teachers are the frontline agents for implementing change in schools (Lucas et al. 2020). Emotions hover like a shadow over the lives and work of teachers. The multiple demands which flow almost endlessly into their workplaces touch every aspect of their lives (Chen 2020a). This is particularly so as school teachers struggle to deal with the pandemic and impact of the coronavirus. Changes in teaching modes and school organisation mean teachers' professional lives have altered dramatically. The environmental turbulence accompanying these new circumstances pressures teachers to focus not only on the well-being of their students and staff but also on caring for themselves, which makes teachers even more vulnerable (OECD 2020). Hence, there is a need to trace the development of teacher emotion literature in order to provide proven implications to enable scholars, policymakers, and practitioners to make teaching profession better. Existing literature on teacher emotion has identified the significances of teacher emotion on aspects of themselves such as pedagogical adoptions (Chen 2020b), mental health (Burić et al. 2019), and teaching effectiveness, but also on their students such as the student-teacher relationship (Taxer et al. 2019), student well-being (Frenzel et al. 2018), and learning (Burić 2019).

It is encouraging to see that teacher emotion research has been steadily gaining increasing recognition and has blossomed. Indeed, the existing set of research literature on teacher emotion has reached a “critical mass” sufficient for conducting a quality systematic review (Fried et al. 2015; Chen 2019a). A broader-based effort is to build a “global knowledge base” regarding teacher emotion and it is claimed that research reviews can play a critical role in the knowledge development of a field (Hallinger and Chen 2015). Such a knowledge base would provide signposts on the path of intellectual accumulation, but also offer a more fine-grained understanding of how individual teachers handle emotional challenges so that teachers can “thrive rather than just survive” in their professional life (Mansfield et al. 2012, p. 53). There are four systematic narrative reviews on teacher emotion in the existing literature (Fried et al. 2015; Šarić 2015; Sutton and Wheatley 2003; Uitto et al. 2015). However, no reviews focus on the developmental trends of the literature on teacher emotion. Furthermore, it has been

suggested that systematic reviews in the social sciences should be updated every 3 to 4 years (Campbell Collaboration Steering Group 2014). Hence, there is an urgent need for systematic reviews of research. Further, there is a need for a new review to take a different perspective. Encouraged by four previous reviews of teacher emotion studies, the current review seeks to understand patterns of knowledge production in teacher emotion, particularly the research foci and methodological trend, during 35 years starting from 1985 until 2019. This effort provides a “high ground” view of changes in the field and lays the foundation for employing a “comparative perspective” to interpret the evolution of the teacher emotion literature (Hallinger and Chen 2015) from a far larger corpus of publications than those in previous reviews. Note that the current review does not focus on the contents of the reviewed articles, but limits its focus to developmental trends and particularly to the method trend in teacher emotion research.

Historical overview of knowledge production in teacher emotion

Prior to examining scholarship on teacher emotion, a historical overview of the development of this field since its inception in the 1980s as a major research focus was undertaken. This was done by highlighting findings from a series of previous high-quality reviews on teacher emotion.

It is noted that the emergence of teacher emotion research occurred later than teacher cognition research. The research on teacher cognitions first aroused attention around the early 1970s (Calderhead 1996) while the burgeoning of psychological research on emotions only occurred in the early 1980s (Lewis and Haviland 1993). Attention to teacher emotion research started even later. Based on the publication record, teacher emotion first emerged as a field of formal inquiry in the USA during the 1980s (Bhagat and Allie 1989; Hart and Brassard 1987). However, it was not until the late 1990s that this topic gained some attention in teacher education—with a special issue of *The Cambridge Journal of Education* edited by Nias (1996) and several articles by canonical scholars in teacher education (Hargreaves 1998, 2001; Lasky 2000). The development trend of teacher emotion research seems not to have gained as much importance as expected from this early call.

Despite the observed scarcity of research on teacher emotion at that period of time, some scholars recognised the essential role of emotions in understanding teachers and teaching along with the rising status of emotion in the social science field (Sutton and Wheatley 2003). Indeed, the emerging literature on teacher emotion is embedded in broad sociological and psychological contexts (Hargreaves 1998; Little 1996; Woods and Jeffrey 1996) and is often conceptualised as a dichotomy of positive and negative stands (Sutton and Wheatley 2003). Scholars tend to investigate teacher emotions during changes in their professional lives. Impressively, Sutton and Wheatley’s review proposed four areas of research for future studies in relation to teacher emotion, namely management and discipline, adopting and using new teaching strategies, learning to teach, and teacher motivation.

Since Sutton and Wheatley’s review (2003), teacher emotion research has been steadily gaining prominence. After one decade, three qualitative reviews on teacher emotion emerged. Uitto et al. (2015) conducted one by reviewing 70 articles published in *Teaching and Teacher Education* from 1985 to 2014. Going a step further, this review especially focuses on an understanding of research foci. Seven major themes on teacher emotion were identified, namely teacher professional learning, emotional exhaustion, teacher emotions and

relationships, teacher emotions in context, teacher emotions' impacts, emotion intelligence, and emotion regulation.

Motivated by the lack of conceptual clarity, Fried et al. (2015) reviewed 82 publications regarding teacher emotion published between 2004 and 2013. The major aim of the review was to identify how teacher emotion was conceptualised in the literature and to develop a conceptual model. This conceptual model built on the work of the appraisal process and the impacts of teacher emotion in Sutton and Wheatley's review and brought influential factors of teacher emotion in. This conceptual model has made a great contribution by providing a conceptual framework for future teacher emotion studies.

The fourth review was conducted by Šarić in 2015. This review claimed to clarify the definition of teacher emotion from a psychological perspective and examined the methodological issues. The review outlined that the prevalent conceptualisation of emotion from a psychological perspective takes a multi-componential perspective (Sutton and Wheatley 2003). Social psychological theories offer an important way of defining emotions, namely, that emotions cannot be properly understood without understanding the social context in which emotions emerge (Boiger and Mesquita 2012). Despite not being systematic, Šarić's review was timely in pointing out the clarification of defining emotion in educational research. However, this review did not provide a definition of teacher emotion.

The previous reviews also summarised the methodology used in teacher emotion research. The literature adopted a variety of traditional research approaches, ranging from in-depth interviews to large-scale surveys. The most commonly used qualitative methods were first-person self-report interviews (Bahia et al. 2013; Cross and Hong 2012) and diary studies (Coleman 1994). These approaches were used to explore teachers' *subjective* emotional experiences and lives such as "emotional incidents" (Erb 2002), "significant emotional episodes" (Hargreaves 2001), or "key events that left a particularly strong emotional impact" (Lasky 2000). Moreover, observation was used to study teachers' *expressive* emotions although that method was not widespread (Prosen et al. 2011; Ramvi 2017). Quantitative research designs involving questionnaires were also used. They focused on exploring teacher action tendencies and relational matters.

To sum up, these reviews together with other relevant literature not only encouraged researchers to apply theoretical constructs from psychology and sociology to the education field but also encouraged them to employ more varied and systematic research designs and methods. The contributions are notable for an understanding of the concepts of teacher emotion and research foci on teacher emotion, and for identifying the methodology use. The reviews provide signposts for emotion definitions, research foci, and for a teacher emotion conceptual framework. However, the path of the intellectual development of teacher emotion studies, particularly regarding the development of research foci and research methodologies over time, is less understood. Several scholars have outlined the reasons for the current methodological dilemma in teacher emotion research (e.g. Fried et al. 2015; Šarić 2015). First, given their conceptual ambiguity and their elusive nature, teacher emotions are very difficult to measure (Fried et al. 2015). Second, measuring individual components of emotions in the classroom is highly complex. Third, the widespread use of self-report measures is also problematic because of the accuracy of reported emotions (e.g. emotions can be conscious or unconscious; participants' memory can be faulty) and because of the use of different terms for emotion (emotion, feel, mood, etc.) (Šarić 2015). Fourth, in the parallel systematic reviews, the unfolding methodological dynamics of the field of teacher emotion over time have left unexamined such areas as the developmental trends of methodology over time. Therefore, to

develop a knowledge base and make recommendations for quality future research, a comprehensive review of knowledge production trends is needed (Chen 2017). The current review will build on previous work and illustrate the development trends particularly the methodological trend in the field of teacher emotion. The following three research questions are proposed:

1. To what extent has the volume of scholarship on teacher emotion developed and in which ways has it developed in terms of rate of publication, research location, and research topics over the period 1985 to 2019?
2. To what extent has the distribution of research types (such as empirical, theoretical, and review) developed, and in which ways has it developed in the period 1985 to 2019?
3. To what extent have research methods (such as quantitative, qualitative, and mixed) that scholars used in studying teacher emotion developed, and in which ways have they developed in publications from 1985 to 2019?

Method

Following the review article by Berkovich and Eyal (2017), a functionalist perspective is utilised to illustrate the knowledge production of teacher emotion. A functionalist perspective on the production of scientific knowledge is a modernist perception of progress that includes moving in stages toward more positivist forms of inquiry (Edmondson and McManus 2007). Three broad stages describe the knowledge production trend. First, the emerging stage of a research field generally focuses on open-ended inquiry, which adopts a qualitative method design and collection techniques and seeks to develop new constructs or present a typology. Second, the intermediate stage of a research field generally focuses on hybrid relations that combine new and established constructs and adopt both qualitative and quantitative techniques in order to formulate new constructs and exploratory propositions. Third, a mature field of research can be viewed as generally focused on testing hypotheses relating to existing constructs, adopting more quantitative methods, and supporting formal hypotheses by statistical inference. The nature of a functionalist approach can better fit the aims of this review which are to capture the dynamic trends of teacher emotion literature and interpret the developmental results (Berkovich and Eyal 2017; Edmondson and McManus 2007).

Inclusion and exclusion criteria

To ensure retrieved articles were relevant to the stated aims, inclusion criteria were established prior to conducting a systematic search. First, the articles had to be peer-reviewed journal articles. Second, the articles had to be published between 1985 and 2019. Online articles first published in 2019 were included. The rationale for choosing this time period was for historical as well as pragmatic reasons. As previously mentioned, emotion research conducted in organisations in the past shifted from an approach in which emotional issues were disregarded to an approach in the late 1980s and early 1990s that regarded mood and affect to be variables of interest (Ashkanasy et al. 2002) though, in educational settings, the revival of teacher emotion research somewhat lagged behind. Furthermore, the four previously conducted reviews ascertained that the earliest mass of relevant articles published on teacher emotions appeared during the early 1990s. Consequently, given also that our initial search found that the

earliest article with a research focus on teacher emotions was Hart and Brassard (1987), we decided that the years from 1985 to 2019 could be the timeline period for locating and reviewing published articles. Third, the research topics needed to be relevant, focusing on emotions, emotional experience, and/or emotion-related constructs of teachers. Fourth, the articles had to be published in English and the articles had to have a full abstract available online. Fifth, the article types had to be either empirical articles, review articles, or conceptual/commentary articles. Note that this review only included commentaries based on empirical works in order to ensure the quality of the articles selected.

Retrieved articles were excluded using the following criteria. First, books, book chapters, and dissertations were excluded. Second, as books were excluded, so short and book commentary articles, even though published in peer-reviewed articles, were also excluded. Third, articles which had an English title and abstract but the main text written in another language were excluded. Fourth, articles with uncertain or insufficient information regarding theories, methods employed, and results gained were excluded. Fifth, if teacher emotions only played a marginal role, such articles were excluded.

Literature search and study identification

The current review aimed to include all eligible peer-refereed articles published between 1985 and 2019 pertaining to teacher emotion. It began with a systematic search in early 2020 of eight widely used electronic databases in the social sciences for abstracts of potentially relevant studies. The databases were Scopus, ERIC, PsycArticles, SAGE, ScienceDirect, PsycINFO, Web of Science, and ProQuest. The literature search was conducted using the following keywords, which matched the databases' subject headings and occurred as keywords in the title, keywords, or abstract: *teach* AND emotion* OR feeling* OR affective* OR mood**. As a result, 29,283 articles were retrieved at this stage.

Data screen and extraction

The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines were adhered to in the current review (Moher et al. 2009; Polanin et al. 2017). To assess the suitability of retrieved articles against the stated inclusion and exclusion criteria, the next stage was to screen the articles' abstracts (Moher et al. 2009) using four steps. The first step was *identification*. One researcher read all abstracts to ensure the eligibility of the articles. Particular attention was given to duplication, relevance of the topics, book chapters or commentaries, and whether the entire article was in English. Where the abstract provided insufficient information to determine the inclusion or exclusion of the article, the full article was scanned by one researcher. During this procedure, 28,402 articles were excluded and 881 were retained. The second step was *screening*. If the article appeared to be eligible, or if there was any question as to the appropriateness of the report at this stage, the full document was obtained and independently screened by two researchers to determine inclusion. The third step was *inclusion*. Attention was paid to the quality of the articles and the role of teacher emotion in the articles and whether or not it was discussing teachers. Once all 881 articles were retrieved, the same researcher read the full articles. At this stage, five articles were excluded due to poor quality, such as written very briefly, giving only vague information about research aims, samples (if any), research methods, results, and/or other major contents. Another 64 articles were dropped due to the

marginal role of teacher emotions. As a result, 812 articles were retained for further analysis (see Fig. 1 for the flowchart).

Data analysis

A descriptive quantitative analysis approach was chosen as appropriate for reporting patterns in this body of knowledge (Sandelowski 2010), as it can identify the general development patterns and variations in teacher emotion research over the past 35 years (Polanin et al. 2017). Articles that met the inclusion criteria were first coded using a self-developed data extraction instrument in Microsoft Excel created for the research team's previous review project (Hallinger and Chen 2015) and Nvivo for research foci. The data extraction instrument was comprised of the following sections: publication time, data location, topic foci, research type, and research method. Note that analysis of methodological trends was a primary target of the analysis in this review in order to address methodological concerns. The data extraction instrument, available from the authors, was pilot tested on five of the selected articles by two researchers and adjustments to the coding form were made.

Results

The results of examining the 812 articles on teacher emotion published worldwide in 1985–2019 are presented here in terms of publication year, data location, research foci, research type,

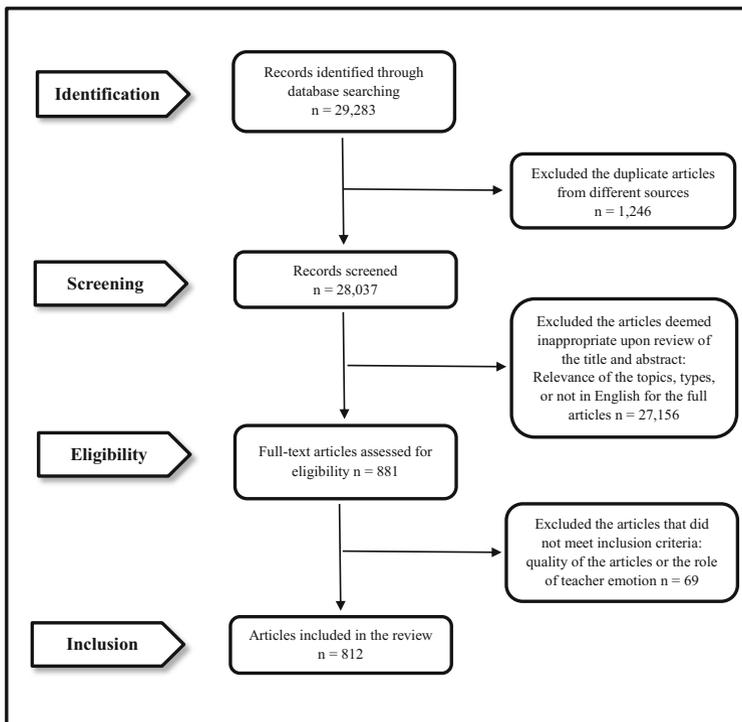


Fig. 1 Flow chart of search and screening process

and research method used. There were 718 (88.42%) empirical articles, 77 (9.48%) conceptual/commentary articles, and 17 (2.10%) review articles. Note that only empirical articles were included in the calculations of data location and research method.

Publication year

Generally, analysis of change in the quantity of the journal articles showed a continuous increase over time (Fig. 2). The 35-year span of the review was divided into seven 5-year intervals. Publications in the final interval (2015–2019) (497, 61.21%) comprised the largest portion of the total article corpus, followed consecutively by the other intervals in descending order. There was a remarkably rapid growth from the fifth interval (2005–2009) to the sixth interval (2010–2014), as publications almost tripled from 69 (8.50%) to 189 (23.28%). Likewise, the number almost tripled between the last two intervals, from 189 (23.28%) to 497 (61.21%). In the final interval (2015–2019), the number of articles (164, 20.20%) reached a peak in 2019. We conclude that, in the first four 5-year intervals, there were relatively few studies regarding teacher emotion, while the number has increased remarkably over the last 15 years.

Data location

Data locations were calculated for 718 empirical articles out of 812, across 71 countries and regions. As review and conceptual/commentary papers did not specify a data location, only 718 empirical articles had the information needed for this analysis. A majority of articles (701, 86.33%) explicitly indicated the data location. The top ten data locations were the USA (146, 20.33% out of 718 empirical articles), followed by Australia (50, 6.96%), Germany (47, 6.55%), China and Turkey (35, 4.87%), the UK (32, 4.46%), Spain (29, 4.04%), Iran (28, 3.90%), and Israel and Finland (24, 3.34%). These 10 countries accounted for over half of the published research (450, 62.67%). The rest 61 other regions (268, 37.33%) made substantial contributions to the total worldwide research output. For example, Hong Kong (18, 2.51%), India (16, 2.23%), Canada (15, 2.09%), the Netherlands (14, 1.95%), Italy (11, 1.53%), Belgium, Greece, and Malaysia (10, 1.39%), and Croatia (7, 0.97%). Table 1 shows the trend

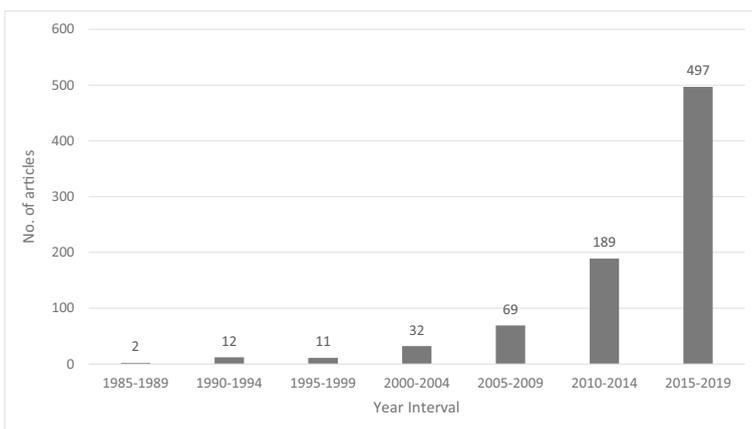


Fig. 2 Trend of publication volume by the 5-year interval during 1985–2019 ($N = 812$)

Table 1 Trend of data location by the 5-year interval during 1985–2019

Year interval	USA	Australia	Germany	China	Turkey	UK	Spain	Iran	Israel	Finland
1985–1989	1	0	0	0	0	1	0	0	0	0
1990–1994	5	0	0	0	0	1	0	0	1	0
1995–1999	2	0	0	0	0	1	0	0	1	0
2000–2004	7	0	0	0	0	2	0	0	0	1
2005–2009	17	5	4	1	2	7	0	0	1	2
2010–2014	35	17	5	7	11	7	6	7	3	4
2015–2019	79	28	38	27	22	13	23	21	18	17
Total	146	50	47	35	35	32	29	28		24

$n = 812$

in the top 10 data location regions in 5-year intervals from 1985 and 2019. Stable growth can be found in terms of the number of articles produced in each region over time. The proportion in the USA remained the largest in each 5-year interval, far greater than for other countries. Thus, while the density of research capacity and empirical knowledge in teacher emotion varied across different countries, production in the USA was dominant in each 5-year interval.

Research foci

Based on the major constructs in the articles, the researchers coded research foci into two levels (Table 2). Three major research topics at the first level were identified: the nature of teacher emotion (220, 27.09% out of 812 articles), antecedents of teacher emotion (477, 58.74%), and effects of teacher emotion (453, 55.79%) (Table 2). The first theme—nature of teacher emotion—had five second-level categories: theories of teacher emotion (58, 26.36% out of 220 articles focusing on the theme of nature of teacher emotion) (e.g. social constructionist theory by Hong et al. 2016), definitions of emotion and teacher emotion (41, 18.64%) (e.g. teacher emotion by Farouk 2012), content of teacher emotion (90, 40.91%) (e.g. enjoyment by Becker et al. 2015), measures of teacher emotion (10, 4.55%) (the Teacher Emotion Inventory by Chen 2016), and theoretical models of teacher emotion (21, 9.55%). The second first-level theme—antecedents of teacher emotion—had four second-level categories, namely malleable factors (142, 29.77%), unmalleable factors (85, 17.82%) (e.g. teacher gender by Barutcu and Serinkan 2013 and teacher knowledge by Dicke et al. 2015), contextual factors (86, 18.03%) (e.g. sociocultural factors by Bang and Montgomery 2010), and emotional capacity (164, 34.38%) (e.g. emotional labour by Lee and Van Vlack 2017). The third first-level theme—effects of teacher emotion—had five second-level categories; effects on teachers themselves (186, 41.06%) (e.g. teacher well-being by Burić et al. 2019), on stakeholders (126, 27.81%) (e.g. student motivation by Aldrup et al. 2017), on teaching (76, 16.78%) (e.g. teaching practice by Chen 2020c), on learning (57, 12.58%) (e.g. learning outcomes by Klusmann et al. 2016), and on environment (8, 1.77%) (e.g. collegial collaboration by Chen 2019b). Figure 3 shows the trend of the three themes in 5-year intervals during the past 35 years. Though there was no research about the nature of teacher emotion in the first period, a slow but steady growth subsequently occurred. The number in the seventh interval (2015–2019) (86, 10.59%) was more than three times that in the sixth interval (2010–2014) (25, 3.08%). This reflects the growth in volume in the final two intervals. Likewise, the similar trends in the other two themes were identified.

Table 2 Volume of publications by topic during 1985–2019

Nature	No. and %	Antecedent	No. and %	Effect	No. and %
Theory	58 (26.36)	Malleable	142 (29.77)	Teachers	186 (41.06)
Definition	41 (18.64)	Unmalleable	85 (17.82)	Stakeholders	126 (27.81)
Content	90 (40.91)	Contextual	86 (18.03)	Teaching	76 (16.78)
Measures	10 (4.55)	Emotional Capacity	164 (34.38)	Learning	57 (12.58)
Model	21 (9.55)	–	–	Environment	8 (1.77)
Total	220 (27.09)	–	477 (58.74)	–	453 (55.79)

$n = 812$; n (nature) = 220; n (antecedent) = 477; n (effect) = 453

Research type

Three classifications of article type were applied: empirical articles, review articles, and conceptual/commentary articles. Figure 4 demonstrates that the 718 (88.42%) empirical studies represented a substantial majority of the international knowledge base of teacher emotion in the past 35 years, followed by 77 (9.48%) conceptual/commentary papers and 17 (2.09%) review studies. Obviously, empirical studies have been a dominant preference over time when scholars research teacher emotion. Although there were relatively few empirical studies in the first four 5-year intervals, the number of articles in the sixth period, 173 (21.31%), was more than three times as large as in the fifth, 55 (6.77%). This number almost tripled in the last period, rising to 448 (55.17%). Likewise, conceptual/commentary papers did not occur in relatively large numbers until the fifth 5-year interval (2005–2009) (12, 1.48%). Afterwards, this number remained stable in the sixth period (15, 1.85%), then increased sharply to 37 (4.56%) in the last. Review studies only appeared in large numbers in the last interval (2015–2019) (12, 1.48%).

Research method

We constructed separate follow-up analyses for each method. First, we classified empirical papers according to their use of qualitative, quantitative, or mixed methods. Second, we drilled down into five different levels of statistical methods used that relied on quantitative or mixed

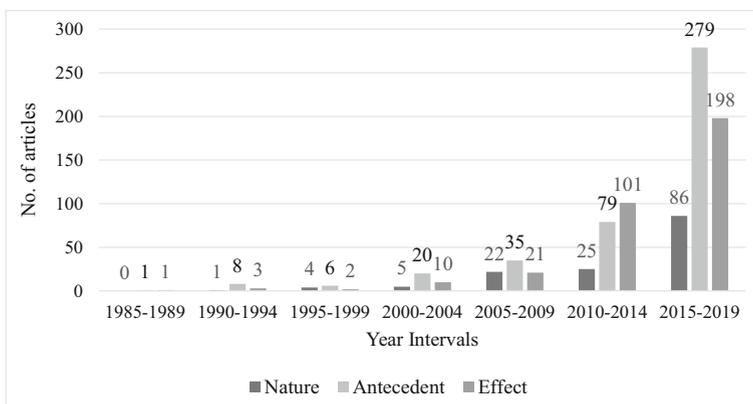


Fig. 3 Trend of research foci by the 5-year interval during 1985–2017 ($N = 812$)

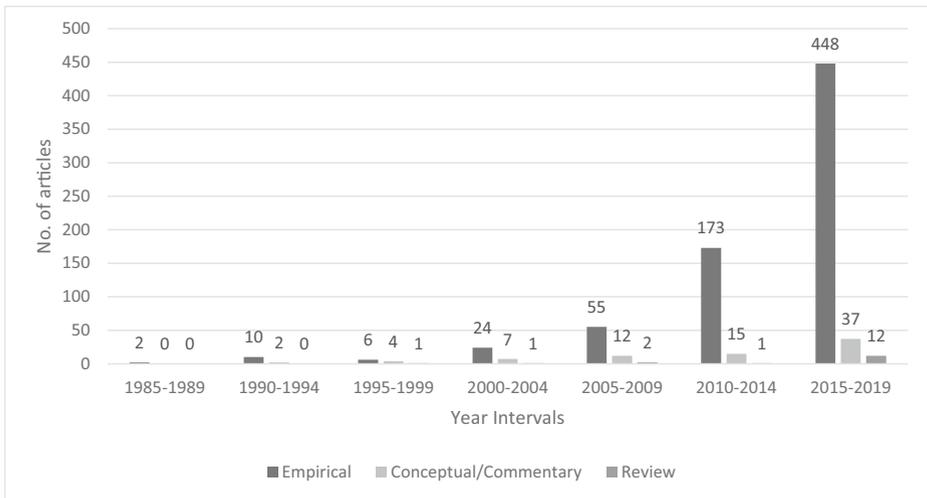


Fig. 4 Trend of article type by the 5-year interval during 1985–2019 ($N = 812$)

methods. Third, we examined the number of qualitative data collection techniques used that relied on qualitative and mixed methods.

First, empirical papers were classified as using qualitative, quantitative, or mixed methods of research. Overall, scholars studying teacher emotion worldwide demonstrated a strong preference for quantitative methods. Among the 718 empirical studies, 439 (61.14%) used quantitative methods, followed by 232 (32.31%) using qualitative methods, and 47 (6.55%) using mixed methods. Figure 5 illustrates the development trends of these three types of research methods at 5-year intervals over the past 35 years. There has been a stable growth in studies of teacher emotion that use quantitative methods. A remarkably sharp rise appeared with 26 studies (3.62%) in the fifth interval (2005–2009) to 108 (15.04%) in the sixth interval (2010–2014). This number then almost tripled in the last 5 years, growing to 314 (43.73%). Articles based on qualitative design began to appear in the second period, and experienced continuous growth throughout the following intervals. The number of such articles reached a peak in the last interval (2015–2019), 134 (18.66%). Mixed methodological design in studying teacher emotion did not appear until the fifth interval (2005–2009) and then increased, from 13 studies in the sixth 5-year interval (2010–2014) to 30 articles in the last interval, though it is still a small proportion of the whole corpus at present. It is also worth noting that 603 studies (83.98%) used first-person data (for example, teachers' responses), 46 (6.41%) utilised experimental research design, and 36 (5.01%) were intervention studies.

Second, we drilled down into the subset of quantitative publications to understand the kinds of statistical methods in use. To facilitate this analysis, the data were coded into five different levels of statistical methods, following a modified version of the classification scheme in Hallinger (2011), as follows:

Level 1: Descriptive. The use of numbers to represent central tendencies and/or variability of scores.

Level 2: Single causal factor–correlational. The examination of the relationship or association between two variables, one of which presumably co-varies with or influences the other.

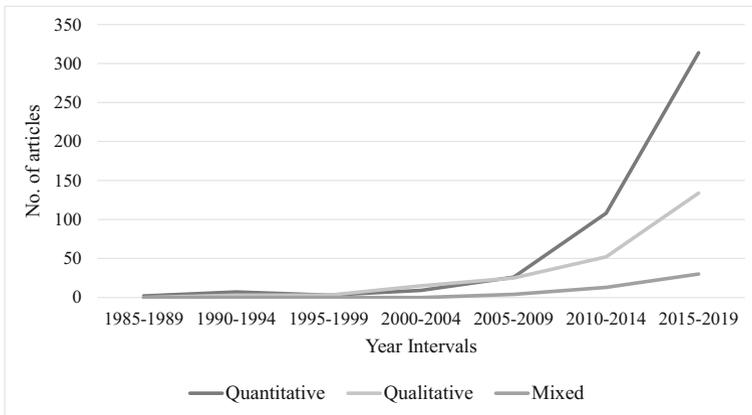


Fig. 5 Trend of research methods by the 5-year interval during 1985–2019 ($N = 718$)

Level 3: Single causal factor–correlational with controls. The examination of the relationship between two variables while controlling for the influence of one or more other variables.

Level 4: Multiple factors. This involves probing the differential effects of multiple sources of influence on a particular variable.

Level 5: Advanced modelling. This comprises tests that explore relationships among multiple independent and dependent variables in a manner that allows for the examination of moderating and/or mediating effects.

Figure 6 indicates a steady rise in the number of studies at each level of statistical analysis in each 5-year interval. Surprisingly, among 486 (59.85%) empirical publications that used either quantitative or mixed methods, Level 1 statistics (436, 89.71% out of the number of 486 articles) ranked highest in frequency of use, followed by Level 2 (368, 75.72%), Level 5 (204, 41.98%), Level 4 (123, 25.31%), and Level 3 (102, 20.99%). It is noted that only two research studies used Level 1 statistics in the first 5-year interval (1985-1989). After some slight fluctuations in the following three periods, the number of such articles rose dramatically in the last three periods. Similar trends were shared by the other three levels. Coincidentally, there were also quite a few papers using Level 5 statistics to analyse data in the first 5-year intervals, but the number grew vigorously to 41 (8.44%) in the sixth period and 142 (29.22%) in the seventh. Note that cross-sectional design was and remains characteristic of quantitative studies. Among 486 quantitative or mixed method articles, 405 (83.33%) used a cross-sectional methodological design and 81 (16.67%) used longitudinal design.

Third, we examined the use of qualitative data collection techniques in the qualitative (232, 32.31%) and mixed method studies (47, 6.55%). Table 3 shows the use of qualitative data collection techniques by 5-year intervals over time. Generally, interviews and case studies were the dominant collection techniques throughout the period, while more various techniques have been adopted in qualitative studies in the past decade. There was no qualitative research in the first 5-year interval (1985-1989). In the second, only three (1.08% out of the number of 279 articles) articles applied qualitative method to collect data, one (0.36%) using interview and two (0.72%) adopting a case study methodology. After that, two (0.36%) papers used

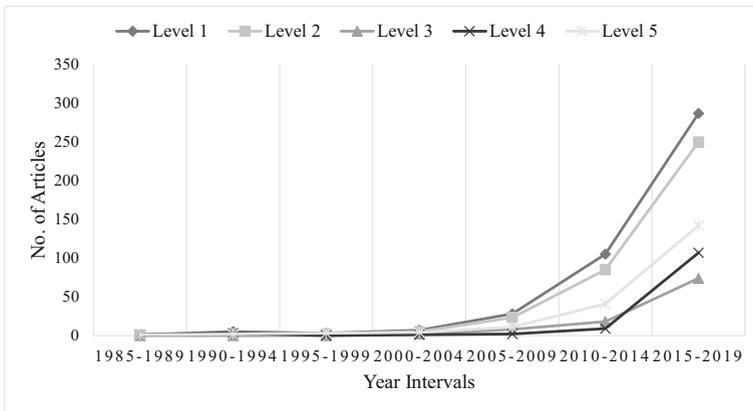


Fig. 6 Trend of statistical level by the 5-year interval during 1985–2019 ($N = 486$)

interviews and one (0.72%) case study. In the fourth period, more diversity is evident in qualitative methods, which included interviews (7, 2.51%), case studies (6, 2.15%), document analysis (2, 0.72%), observation (1, 0.36%), life experience (1, 0.36%) and focus groups (1, 0.36%). This trend seems to have continued. In the final two intervals, a sharp rise can also be found in the total numbers of qualitative studies and individual qualitative methods, which may reflect the increasing size of the corpus.

Discussion

We firstly interpret the major findings and summarise their implications and evaluate teacher emotion knowledge production from a functionalist perspective.

Interpretation and implications of major findings

First, the number of articles on teacher emotion has increased remarkably in the last 15 years, commencing in 2005 and reaching a peak in 2019. The volume of 812 articles, although not impressive, has reached the “critical mass” needed for conducting the symmetric review in this study (Hallinger and Chen 2015). Before the 2000s, only a handful of articles on teacher emotion was published. Since Sutton and Wheatley’s first systematic review in 2003, in which they called for more studies of teacher emotion, the number of publications has ballooned. This review is expected to increase scholars’ attention to teacher emotion. As noted, 92.98% of the reviewed articles have been published in the past 15 years and 61.21% have been published in the past 5 years. This trend represents a substantial change in the field. Projecting ahead, the trends documented in this review portend a far more balanced intellectual framework for teacher emotion research in the coming years (Hallinger 2019).

Second, although the volume of articles in teacher emotion research varied across different societies in the world, the USA consistently ranked first, producing the largest portion (17.60%) of the total knowledge corpus, far more than those in other societies over time. This result aligns with reviews on school leadership in which the USA also leads that research field (Hallinger and Chen 2015). This may be caused by the contextual advancement of the USA as we acknowledge that knowledge production depends on scientific description. This must be

Table 3 Use of qualitative data collection techniques by the 5-year interval during 1985–2019

Qualitative data collection type										
Period	Interview	Case study	Document analysis	Observation	Focus group	Qualitative survey	Life experience	Action research	Online platform	Phenomenological method
1985–1989										
1990–1994	1	2								
1995–1999	2	1								
2000–2004	7	6	2	1	1		1			
2005–2009	15	10	2	1		3	2		1	
2010–2014	42	16	8	10	2	2	1			
2015–2019	93	27	21	16	13	10	7	4	2	3
Raw total	160	62	33	28	16	15	11	4	3	3
% of total	57.35	22.22	11.83	10.04	5.73	5.38	3.94	1.43	1.08	1.08

n = 279

both broad and deep in coverage from the perspective of different societies and regions because the political, economic, social, and cultural diversity of societies mitigates against broad generalisations (Hallinger 2011). It is especially true for the teacher emotion field which largely attaches to contextual environment (Fried et al. 2015). In addition, substantial inter-regional variation was observed. The teacher emotion literature is highly skewed by contributions from a small number of academically active societies (i.e. USA, Australia, and Germany) that share similarities but also large differences. The inter-landscape variation also existed between many less academically active societies (i.e. Brazil, Singapore, and Sweden) and many areas provided no voice. These trends limit any characterisation of a worldwide intellectual structure since our knowledge base remains highly constrained by its geographic scope (Hallinger and Chen 2015). We do not know the specific reasons resulting in this phenomenon. Political, economic, social, and cultural diversities may be the cause. One possible way to fill the challenge of inter-society variation in the coming years is to build collaborative research capacity among scholars across many societies and regions. The good news is that the data reported in this review affirm a positive scholarship trajectory on teacher emotion in a number of academically active societies broadly identified. This implies that research capacity exists in such societies which can be leveraged with those in other contrasting societies through cooperative ventures (Hallinger 2019).

Third, topic themes were dominated by the effects and antecedents of teacher emotion over time. Nevertheless, interest in the nature of teacher emotion seems to have been increasing in the past 5 years, although it was the least attractive topic theme. Compared with the findings of previous reviews (Fried et al. 2015; Šarić 2015; Sutton and Wheatley 2003; Uitto et al. 2015), the research topic coverage identified in this review seems to be both convergent and divergent. From the convergent perspective, the studies examined in this review tend to focus on three major themes: the antecedents, nature, and effects of teacher emotion. These provide signposts for understanding the intellectual structure of teacher emotion. From the divergent perspective, the teacher emotion field contains more diverse topics than the studies' research interests, such as teachers' unmalleable and malleable factors, contextual factors, elements and measurements of teacher emotion, and effects on teachers, students, other stakeholders, and the environment. Although we acknowledge the importance of prioritising the research agenda, we also acknowledge the desirability of broad and balanced coverage in the selection of research topics (Hallinger and Chen 2015). Past experience further supports the need for programmatic research for the understudied topics, namely, teachers' unmalleable and malleable factors, contextual antecedents, theoretical model of teacher emotion, and effects of teacher emotion in a wider context. For example, the influential drivers of teacher emotions especially need to be widely investigated as this area of research would provide informative implications on improving teacher emotions (Chen et al. 2020). In addition, the theoretical perspective of teacher emotion should draw more attention as there is lack of theoretical and conceptual frameworks in the teacher emotion field (Fried et al. 2015). Progress in addressing important problems requires sustained focus on these concerns and research gaps, which is also reprised by other scholars in future research (Uitto et al. 2015).

Fourth, empirical articles not only represented the largest portion of the literature in this period, but also accounted for much of the increased volume of publications during the past ten years, though since 2000 there has been greater diversification of research type. Although the distribution of empirical, conceptual, and review articles favours empirical research, this distribution does not seem out of balance to us. Given the stage of evolution of scholarship worldwide, focusing production on empirical research seems quite appropriate. Indeed, it has

been argued that a sound knowledge base must be built upon a substantial set of high-quality empirical studies (Hallinger and Chen 2015). Furthermore, few systematic efforts to empirically document teacher emotion research have been made. It has been suggested that systematic reviews in the social sciences be updated every three to four years (Campbell Collaboration Steering Group 2014). Hence, there is an urgent need for systematic reviews of research. It is also worth noting that the majority of articles used first-person responses (for example, teacher responses) and only 4.4% (36) of studies utilised intervention in experimental research. Several recommendations can be made. Firstly, more systematic reviews should be conducted. Referring back to our discussion of different types of reviews, a descriptive and quantitative review is especially needed for the next research agenda. Secondly, more high-quality theoretical/commentary publications are needed to rectify the lack of conceptual clarity (Fried et al. 2015). Thirdly, there is a need for more varied research design (such as intervention and more authentic experimental design) studies to bring teacher emotion research to maturity. Finally, the existing methods are dominated by first-person responses (for example, teacher responses), so future studies should involve 360° data collection from different stakeholders such as students, colleagues, and school managers. Such multi-source feedback typically entails more robust self-evaluation and parallel evaluations from subordinates, peers, and superiors (Goldring et al. 2015).

Fifth, quantitative method designs dominated during 1985 and 1989, increased remarkably over the last 15 years, and maintained serious dominance (439, 54.06%) over time. Although quantitative methods were most commonly used, the findings reveal a more balanced distribution since 1995, and the use of qualitative and mixed methods evinced a marked increase in the past ten years. Looking at the different levels of quantitative statistical techniques, simple quantitative techniques (such as descriptive analysis in 436, 89.71%, and correlation analysis in 368, 75.72%) were initially prevalent and remained dominant over time, but the use of advanced modelling techniques grew vigorously (204, 41.98%) after 2010. When examined closely, most models were cross-sectional models, rather than iterative or reciprocal models. This could reflect a growing capacity for conducting quantitative research, especially using advanced modelling methods. This finding echoes Uitto et al. (2015), who identified the relationships between method design and topic focus in their review. However, the findings in this review are inconsistent with Šarić (2015), who found qualitative designs to be more popular than quantitative designs in teacher emotion research. Data also show there is an even more severe lack of articles with longitudinal research design (148, 18.23%). These findings further refine our picture of the research context as broadly immature but showing emerging capacity and pockets of research excellence. Addressing these concerns requires a sustained focus. Two major recommendations are made. Firstly, it is noted the trends in research methods parallel the development of research topics. Either the prevalence of investigation of the relationships between teacher emotions and other antecedents and effects since 2005 has nourished quantitative methods, or vice versa. Using the mixed-method approach should be encouraged in the future to increase the variation and credibility of findings (Creswell and Clark 2017), but also to balance the development of research foci. Secondly, although research methods seem to be balanced in terms of diversification, more studies using longitudinal design and reciprocal modelling design should be included in the next research agenda. This will strengthen scholars' research capacity regarding research methods to build the teacher emotion knowledge base.

Sixth, examination of the use of qualitative data collection shows that interviews and case studies were initially prevalent and dominated over time. A greater diversification of

qualitative collection techniques has been observed since 2005 and the trend seems to be continuing. As with the findings from previous reviews, interviews dominated in teacher emotion research (Bahia et al. 2013; Šarić 2015), but this review also identified that case studies were used comparatively broadly. More qualitative data collection techniques are being used either in a single way or multiple ways, and data analysis methods have also expanded. Encouragingly, the use of qualitative collection techniques has developed in a healthy way. However, there is a lack of innovative qualitative techniques, such as measuring teachers' finger temperature, heart rate, blood pressure, and skin conductance level; this lack has also been pointed out by other scholars (Šarić 2015; Uitto et al. 2015). Two major recommendations are proposed. First, more high-quality qualitative search designs are needed, which will lead to more research into the nature of teacher emotion, and the development of a conceptual model. These types of topics are currently underdeveloped. Second, the most widespread qualitative data collection techniques are mainly retrospective and reflective (such as interviews, life experience accounts, group discussions), which may not be sufficiently accurate because they depend on the accuracy and vividness of human memory (Phelps and Sharot 2008). Hence, methods (such as observation and machine monitors) that can collect first-hand, immediate emotional experience in authentic situations are encouraged.

Evaluation of teacher emotion knowledge production from a functionalist perspective

The functionalist approach offers a modernist structural explanation to capture the developmental trend of scientific knowledge production in the teacher emotion field (Edmondson and McManus 2007). From the methodological evidence in this review, it could be concluded that “teacher emotion knowledge production” is at the second maturity stage, in which both quantitative and qualitative methods are adopted to evaluate new and established constructs. However, a significant lack of longitudinal and experimental research designs in the corpus of this review constrains our understanding of how teacher emotion can affect and be affected by related constructs (Berkovich and Eyal 2017). This may indicate that current knowledge production may be only emerging at the second stage. This assertion is supported by the lack of experimental and intervention studies in more authentic situations, because the current research designs are dominated by retrospective and reflexive methods.

Interestingly, according to mature knowledge productions and the functionalist perspective, the first stage should favour the use of general qualitative research design (Edmondson and McManus 2007). However, this was not found true regarding the intellectual structure of teacher emotion research, as the evidence showed that quantitative research designs were initially prevalent and this trend continues. It is possible that this phenomenon has arisen because clear definitions of emotion and teacher emotion and a conceptual framework are largely missing. The majority of these conceptions are borrowed from the sociological and psychological fields (Little 1996; Sutton and Wheatley 2003) and do not necessarily suit an educational context (Fried et al. 2015). Thus, research on teacher emotion so far lacks a solid foundation, indicating an immature stage of knowledge production. In addition, the distribution of knowledge production has been very uneven across societies (with a strong bias toward the USA) and research topics. Altogether, the functionalist perspective suggests that knowledge production in teacher emotion research is either at the late first stage or the emerging second stage.

Conclusion

Although its contributions regarding the current situation of teacher emotion research are significant, there are a couple of limitations to this review which need to be addressed. First, the review focused on “the patterns of knowledge production” rather than “the content of research findings” embedded in this corpus of articles. We did not attempt to characterise what has been learned from the findings of the studies reviewed. Instead, the current effort described the formal patterns and trends of the knowledge base to meet the stated objectives of this review. A more in-depth analysis that critically examines substantive findings, especially topic themes and content, can be found in our parallel qualitative systematic review. Second, we made a conscious decision to limit our exploration of teacher emotion publications to peer-reviewed journal articles only. One might argue that we missed out on a larger range of findings available in book chapters, books, research reports, and dissertations. This might make the findings different. Third, as there were many levels of research foci, we did foci coding in Nvivo and coded others in Excel sheet. This approach makes further analyses such as research foci and research design by country impossible, which may limit yielding other interesting findings. One possible solution to avoid this is to do all coding in one file so that more complex analysis can follow. Fourth, we only included articles written in English, which excludes any “national literature” published in native languages. These frame an important caveat for the review. We also acknowledge that the patterns and trends might look different if we had included this varied set of publications. However, such a scope is hard to achieve. One possible way to compensate is to encourage scholars to do a ‘national review’ of publications using their native languages so that the findings could be merged to unveil the entire picture of teacher emotion knowledge production.

In conclusion, by describing and evaluating patterns and trends in teacher emotion research, this review opens our eyes to the challenges that remain ahead. We have observed the rapid expansion of the volume of teacher emotion research worldwide, which promises the development of a corpus of knowledge that will help scholars, practitioners, and policy-makers to frame their research and practice, and will contribute to a mature global understanding of teacher emotion. However, the results of this study also suggest that the developing international literature on teacher emotion remains at either the late emerging stage or emerging intermediate stage, with imbalanced features in terms of location, topic, research type, method, and data collection and analysis techniques. Therefore, the research capacity to meet these challenges in the coming years needs to be strengthened.

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Current themes of research:

Teachers' emotions and wellbeing and school leaders' emotions and well-being.

Most relevant publications in the field of Psychology of Education:

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Current Themes of Research:

Sociology of education, educational policy, teacher professionalisation, and rituals in schooling.

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