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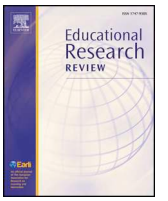

Teacher leadership: A systematic review, methodological quality assessment and conceptual framework

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ABSTRACT

This article systematically reviews 93 theoretical and empirical articles and books on the topic of teacher leadership. The included studies are analyzed on the basis of the following themes: (1) definitions of teacher leadership, (2) antecedents of teacher leadership, (3) outcomes of teacher leadership, and (4) methodological quality of studies on teacher leadership. Based on our analysis we develop a conceptual framework unifying the current knowledge about teacher leadership, its definitions, and its antecedents and outcomes at different levels of analysis. We highlight the current methodological limitations of the included studies and point out avenues for further development of the field of teacher leadership. In particular, we call for more (1) conceptual clarity, (2) cross-country research designs, (3) research designs eliminating endogeneity problems, and (4) attention for the potential 'dark sides' of teacher leadership.

1. Introduction

The concept of "teacher leadership" has enjoyed an ubiquitous presence throughout the academic and practical world. For practitioners, the concept is of high interest because it plays a role in many facets of working life, such as teacher evaluations and teachers' professional development. Next to this, it is employed in the context of even grander issues, such as school reforms and teacher attrition reduction (Wenner & Campbell, 2017). Scholars have made great strides in identifying a variety of antecedents of teacher leadership, such as school climate, structure, and personal characteristics, but they have also managed to identify multiple outcomes over the years, such as improved relationships with peers (e.g., Wenner & Campbell, 2017; York-Barr & Duke, 2004).

However, a recent review (Wenner & Campbell, 2017) found that the need for more high-quality research into teacher leadership is still pressing. This echoes the call of York-Barr and Duke (2004), who argued for higher quality studies on sound design and analysis.

In addition to this, Wenner and Campbell (2017) noted that clear definitions of teacher leadership are imperative for future research. In turn, this aligns with the critique York-Barr and Duke's voiced as early as 2004, stating that literature on teacher leadership is "largely atheoretical" (p. 291). On basis of their literature review, Wenner and Campbell (2017) conclude that only 35% of the studies published between 2004 and 2013 explicitly describe how they define the concept of teacher leadership for the purpose of their study. About 20% of the studies published in this period use insights from distributed leadership theory to inform their studies while focusing on different elements of teacher leadership (including its antecedents, outcomes, and structure), thereby preventing the field from moving forward in a unified way.

York-Barr and Duke (2004) took an integrative approach towards the concept of teacher leadership. They developed a "theory of action for teacher leadership" (p. 289), by identifying the concepts' antecedents and outcomes within one conceptual model. This

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framework is valuable, as it serves as guideline for present and future research.

At the same time, both previous reviews on teacher leadership have some drawbacks. Firstly, they lack a systematic approach towards reviewing the literature in the sense that they are not transparent nor replicable, which would be the case with a standardized and thorough approach like 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses' (PRISMA) (Moher, Liberati, Tetzlaff, & Altman, 2009). In addition, the criticized methodological quality of included studies is not systematically checked, so claims into the quality of studies remain somewhat faint.

In this article, we aim to contribute to literature on teacher leadership in three ways. First, we present a systematic review of the literature on teacher leadership. We follow the PRISMA approach developed by Moher et al. (2009). A systematic review differs from other reviews in that it is replicable and transparent, involving several rigorous steps such as a standardized way to identify all relevant key publications and thorough reporting of all review steps (for instance De Vries, Bekkers, & Tummers, 2016; Nagtegaal, Tummers, Noordegraaf, & Bekkers, 2019).

Second, we provide an update of the previously published literature reviews. The most recent review of the literature on teacher leadership, published by Wenner and Campbell (2017), covers the period from January 2004 through December 2013. In this article, we review the articles that have been published between January 2014 and July 2018. Following York-Barr and Duke (2004) in their integrative approach towards teacher leadership, our study particularly focuses on specific elements of teacher leadership research, namely definitions, antecedents, and outcomes. This allows us to present a redeveloped conceptual framework that can function as a guideline to a way forward in teacher leadership research.

Third, we assess the literature on methodological quality using standard quality assessment criteria for evaluating empirical studies (Kmet, Cook, & Lee, 2004). Assessing research quality following standardized criteria allows us to analyze earlier critiques on lack of methodological quality and to specify what methodological elements need most attention.

Put more precisely, we aim to answer the following research questions for the studies on teacher leadership published in the period January 2014–December 2018:

1. How do the studies define teacher leadership?
2. Which antecedents of teacher leadership are studied and by which actors?
3. Which outcomes of teacher leadership are studied and on which level?
4. What methodological quality do the studies on teacher leadership portray?

The remainder of the paper is structured as follows: First, we describe the methodological approach used to conduct the review. Second, we present the results of the of the review and provide answers to the research questions presented above. Third, based on the results we draw conclusions and develop a research agenda on teacher leadership.

2. Methods

2.1. Literature search

To identify eligible studies, we used four strategies. First, we performed an electronic search in the two databases *ISI Web of Science* and *Scopus*. Using the search parameter "teacher leader*"and "instructional leader*" in any field and restricting the search to the period of January 2014 to December 2018, this generated 957 results.[1] The final search was performed in January 2019.

Second, we conducted an additional search for articles in four top journals in the field of education (*Research Synthesis Methods*, *Review of Educational Research*, *Educational Researcher*, *Learning and Instruction*), as we wanted to ensure that we included all high-quality studies on this topic. This search resulted in 6 additional possible studies for inclusion.

Third, we searched for articles that cited the literature reviews on teacher leadership conducted by Wenner and Campbell in 2017 and by York-Barr and Duke in 2004. The search generated 165 articles for possible inclusion for the period January 2014 to December 2018.

Fourth, we reached out to six international experts in the field of teacher leadership to ask them to check our list of eligible publications and to point out studies that we had missed. This final search strategy yielded one additional study to be included. The experts were contacted in July 2019.

The use of these different strategies helped us to ensure that we included many potentially eligible studies on the topic of teacher leadership. However, we must acknowledge that we may have missed studies on teacher leadership that used a different terminology such as 'faculty leadership' or 'school leadership'. Although adding these terms is potentially worthwhile, we decided to limit ourselves to the search parameter "teacher leader*"and "instructional leader*" as the search terms faculty leadership and school leadership are strongly associated with the leadership of principals and not with the leadership of "regular" teachers whose primary tasks are classroom responsibilities. Next to this, by limiting the search to teacher leadership and derivates hereof we use the same

[1] For Scopus the search term was as followed: (TITLE-ABS-KEY ("teacher leader*") OR TITLE-ABS-KEY ("instructional leader*")) AND PUBYEAR > 2013 AND PUBYEAR < 2019 AND (EXCLUDE (DOCTYPE, "no") OR EXCLUDE (DOCTYPE, "cp") OR EXCLUDE (DOCTYPE, "ed") OR EXCLUDE (DOCTYPE, "sh") OR EXCLUDE (DOCTYPE, "cr") OR EXCLUDE (DOCTYPE, "er")) AND (LIMIT-TO (LANGUAGE, "English")) AND (EXCLUDE (DOCTYPE, "re"))). For Web of Science the following search term was use: TOPIC: ("teacher leader*") OR TOPIC: ("instructional leader*") Refined by: [excluding] DOCUMENT TYPES: (EDITORIAL MATERIAL OR MEETING ABSTRACT OR CORRECTION OR REVIEW OR BIOGRAPHICAL ITEM OR BOOK REVIEW) AND LANGUAGES: (ENGLISH) Timespan: 2014–2018. Indexes: SCI-EXPANDED, SSCI, A&HCI, ESCI.

search parameters as Wenner and Campbell in their review of the period January 2004 through December 2013. This increases the possibilities to compare research findings and identify developments over time.

2.2. Criteria for inclusion/exclusion in the literature review

Before we started to review articles for possible inclusion in our systematic literature review, we identified six inclusion criteria, which will be discussed below. These criteria were inspired by previously conducted systematic literature reviews (De Vries et al., 2016; Tummers, Bekkers, Vink, & Musheno, 2015) and previous reviews on teacher leadership (Wenner & Campbell, 2017; York-Barr & Duke, 2004):

1. *Centrality of topic*: Teacher leadership should be the focus of the article, meaning that we excluded articles in which teacher leadership was only peripherally included;
2. *Respondents:* The subjects of the study needed to be teachers with a focus on classroom responsibilities. This means we excluded studies in which participants do not/no longer have or only have very limited teaching responsibilities, such as coaches, district specialists, and school principals. We only included studies on K-12 teachers[2] and vocational teachers because of their strong focus on classroom responsibilities;
3. *Study design:* We included both empirical as well as theoretical studies, because we were interested in the ratio between empirical and theoretical work and the question how the concept is defined in both types of research. All research designs (case studies, experiments, etc.) were allowable. In order to avoid including studies twice, reviews on teacher leadership as well as introductions to symposia were excluded;
4. *Year of publication:* We included all studies that were published in the period from January 2014 to December 2018, because the most recent literature review on teacher leadership only includes studies published prior to 2014 (Wenner & Campbell, 2017);
5. *Language:* we only included studies that were written in English;
6. *Publication status:* In order to ensure that we uncover high-quality research on teacher leadership, the publication status of the included selected papers needed to be 'peer-reviewed'.

Importantly, Wenner and Campbell (2017) excluded articles that used self-reported or un-triangulated data (p.156) or studies with a sample size lower than 5 (p.143). We did not use these exclusion criteria. Instead, we systematically assessed the methodological quality – or evidence base – of the included studies using standard quality assessment criteria (Kmet et al., 2004). Put differently, we performed a quality assessment in order to discover whether the methods and, consequently, the results of the included studies are valid, without excluding articles beforehand based on methodological characteristics (Booth, Sutton, & Papaioannou, 2016).

2.3. Selection process for including articles

We systematically screened 1128 studies, which were identified using the four search strategies described above. Based on the inclusion/exclusion criteria, we eventually included 93 studies in our final analysis. The selection process is depicted in Fig. 1.

First, we removed all duplicates (n = 450). Second, the first author screened all 678 titles and abstracts, still blinded to authors and journal titles, using an Excel workbook designed specifically for screening (VonVille, 2015). We checked if all eligibility criteria were met and removed all studies that did not meet these criteria (n = 378). Third, we screened the studies by reading the full text. In this step, we excluded additional articles (n = 208) mainly because the concept of teacher leadership was only peripherally addressed, because the study focuses on principals rather than "regular" teachers, because the journal articles were not published in peer-reviewed journals, or because the record was not available.

2.4. Coding process

For the coding of the selected articles we created an Excel-format that allowed us to organize our findings in a systematic way. We coded text fragments based on our research questions. For instance, we coded items regarding design and methods, research aims, definitions of teacher leadership, as well as antecedents and outcomes of teacher leadership on several levels.

Next, we assessed the methodological quality of all included studies. Research on teacher leadership is both qualitative and quantitative. We therefore selected the criteria developed by Kmet et al. (2004), because the authors differentiate between quality criteria for qualitative and quality criteria for quantitative studies. Although different, both types of criteria have one common aim: assessing the "internal validity of the studies, or the extent to which the design conduct and analyses minimized errors and biases" (p.2). This differentiation is in line with the discussion of quality standards in qualitative research, which has evolved from proposing rigid standards replicating positivistic criteria to considering criteria that are more in line with epistemological and methodologic assumptions of qualitative research (such as credibility) (Ospina, Esteve, & Lee, 2018).

For the *quantitative studies*, 14 criteria were scored (see Table 1) depending on if the specific criteria were met or not (0 = "no" and 2 = "yes")[3]. Items not applicable to a particular study design were labeled NA ("not applicable"). The global quality score was

[2] K-12 is a short form for the school grades prior to college. These grades are kindergarten (K) and the 1st through the 12th grade (1 – 12).

[3] Please note, Kmet et al. (2004) coded the criteria as 0 = "no", 1 = partial, 2 = "yes". We did not include "partial" as coding category in order to be as objective as possible and minimize biases. The middle-category "partial" leaves unwanted leeway for interpretation.

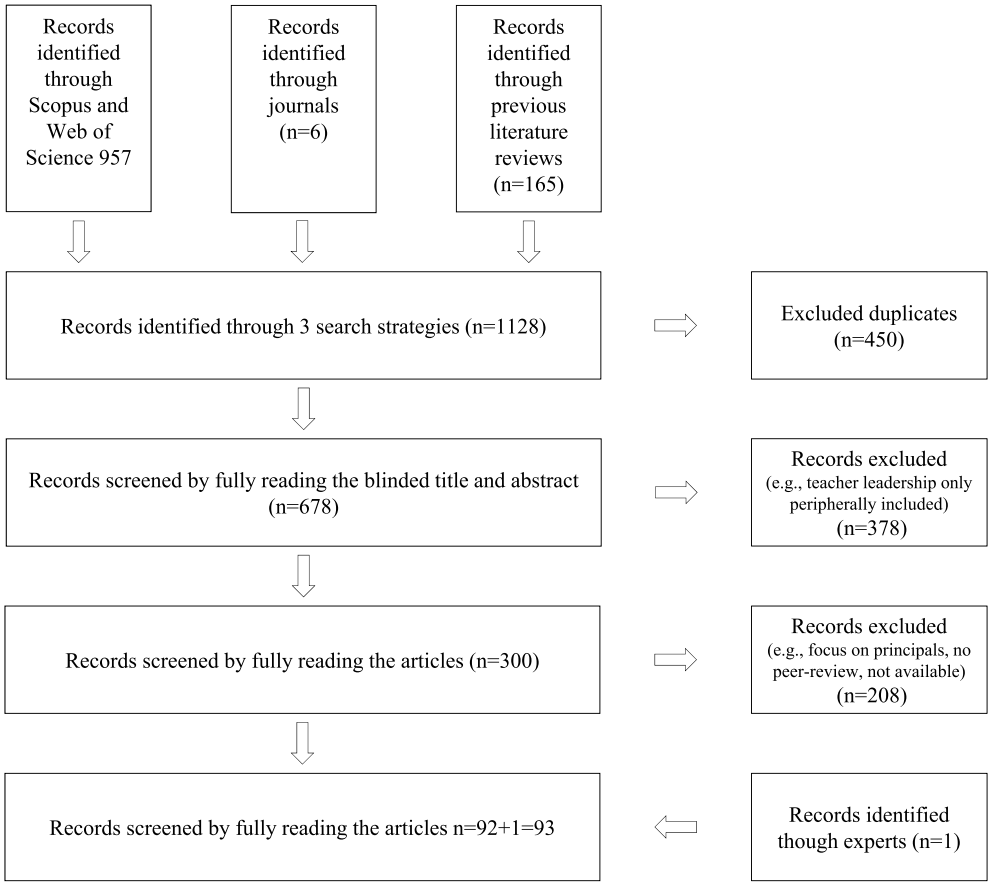

Fig. 1. PRISMA flowchart.

then calculated for each study by adding the scores obtained across all relevant items and dividing the sum by the maximum possible score. For *qualitative studies*, the global quality score was calculated in a similar way. Because all criteria were relevant for all qualitative studies, the global quality score was calculated by adding the scores obtained on the basis of the 10 qualitative quality criteria summarized in Table 2 and dividing this sum by 20 (the total possible score). For mixed-method studies we calculated two global quality scores. One for the quantitative part of the study and one for the qualitative part.

A global quality score of 0.55 can be seen as a lenient minimum quality standard and a score of 0.75 as a strict minimum standard that both qualitative and quantitative studies should have (Kmet et al., 2004).

As coding is a subjective process, we took measures to deal with the associated risks. Each author of this article coded several of the original articles, and the first two authors assessed the methodological quality together with a student assistant. If one of the

Table 1
Standard quality assessment criteria for quantitative studies (Kmet et al., 2004).

Nr.	Criteria
1	Question/objective sufficiently described?
2	Study design evident and appropriate?
3	Method of subject/comparison group selection *or* source of information/input variables described and appropriate?
4	Subject (and comparison group, if applicable) characteristics sufficiently described?
5	If interventional and random allocation was possible, was it described?
6	If interventional and blinding of investigators was possible, was it reported?
7	If interventional and blinding of subjects was possible, was it reported?
8	Outcome and (if applicable) exposure measure(s) well defined and robust to measurement/misclassification bias? Means of assessment reported?
9	Sample size appropriate?
10	Analytic methods described/justified and appropriate?
11	Some estimate of variance is reported for the main results?
12	Controlled for confounding?
13	Results reported in sufficient detail?
14	Conclusions supported by the results?

Table 2
Standard quality assessment criteria for qualitative studies (Kmet et al., 2004).

Nr.	Criteria
1	Question/objective sufficiently described?
2	Study design evident and appropriate?
3	Context for the study clear?
4	Connection to a theoretical framework/wider body of knowledge?
5	Sampling strategy described, relevant and justified?
6	Data collection methods clearly described and systematic?
7	Data analysis clearly described and systematic?
8	Use of verification procedure(s) to establish credibility?
9	Conclusions supported by the results?
10	Reflexivity of the account?

authors was not 100 percent sure about how to code a specific text fragment or assess the methodological quality of a specific element, she or he discussed it with one of the co-authors. In addition, the authors performed random checks on each other's coded text fragments and methodological quality assessments to safeguard the quality of the review. In the following section, we will present the results of our systematic review of the literature. The data on which these results are based can be found open access online: https://osf.io/xpkrc/?view_only=ef42279d766249ab888ecc45eee21848.

3. Results

In this section we provide our findings based on 93 studies. Most studies were journal articles (n = 91). Next to this, this literature review includes two book chapters.

3.1. Journals and countries

The articles included in the systematic review were published in 53 different journals. The journals in which most articles were published (n > 5) were *Educational Management Administration and Leadership, International Journal of Leadership in Education, School Leadership and Management,* and *Teaching and Teacher Education.* Most journals are general and multidisciplinary educational journals. However, our review also includes journals focusing on more specific aspects of education, such as *Early Child Development and Care* and *The Journal of Mathematical Behavior.*

The empirical studies were conducted in 29 different countries. Most of these studies were conducted in the United States (34%, n = 32). This suggests that the American perspective is leading when studying teacher leadership, which may have implications in terms of country bias. Next to this, it was noticeable that many studies were conducted in Asian countries such as China (13% n = 12), Taiwan (2%, n = 2) and Malaysia (2%, n = 2). Only three studies employed a cross-country comparative design (Poekert, Alexandrou, & Shannon, 2016; O'Meara, Whiting, and Steele-Maley, 2015; Menlo, 2015, pp. 279–287).

3.2. Research design, settings and participants

Out of 93 studies, 9 studies were identified to solely have theoretical content. The remaining 84 articles contained empirical elements. Out of 84 empirical studies, 59 articles (70%) presented only qualitative methods. Mostly, these were interviews (e.g., Chukowry, 2018; Hite & Milbourne, 2018), and in some cases document analysis was used (e.g., Lowery-Moore, Latimer and Villate, 2016). To a lesser extent, observations and focus groups were employed (e.g., Jacobs & Crowell, 2018). Other methods included diaries, field notes, reflections and open-ended surveys. 12 articles (14%) were solely quantitative. They used mostly surveys (e.g., Li, 2015; Menlo, 2015, pp. 279–287). Finally, 13 articles (15%) had mixed-methods (e.g., Boyce and Browers, 2018; Tsai, 2017). Again, mostly surveys and interviews were used. Besides, observations, focus groups and open-ended questions were employed. Table 3 compares the designs of the studies included in this and earlier reviews, which shows qualitative studies to be the most frequently conducted type of study in teacher leadership. This is quite stable across the years. In appendix A we present a table that reports the study designs (qualitative, quantitative, mixed-methods, theoretical) and method(s), (e.g., interviews, survey, reflections, network analysis) for each study included in this review.

3.3. How is teacher leadership defined?

As noted in the introduction, teacher leadership has been described in various forms, but scholars often fail to provide an explicit definition of the concept (Wenner & Campbell, 2017; York-Barr & Duke, 2004). A positive exception is the review by Wenner and Campbell (2017), in which teacher leaders are described as “teachers who maintain K-12 classroom-based teaching responsibilities, while also taking on leadership responsibilities outside of the classroom” (p. 5). Katzenmeyer and Moller (2009:6) defined teacher leaders as teachers who “lead within and beyond the classroom; identify with and contribute to a community of teacher learners and leaders; influence others toward improved educational practice; and accept responsibility for achieving the outcomes of that leadership”.

Table 3
Comparison of research designs.

	York-Barr & Duke, 2004 [a]	Wenner and Campbell (2017)	This review
Qualitative	56% (19)	74% (60)	70% (59)
Quantitative	23% (8)	6% (3)	14% (12)
Mixed	21% (7)	20% (20)	16% (13)
Total	**100% (34)**	**100% (83)**	**100% (84)**

[a] The numbers presented of the York-Barr and Duke (2004) review are based on our own analysis of their review. The authors do not mention these numbers themselves.

In line with the findings by Wenner and Campbell (2017), we noticed that the number of authors who provide a clear definition of teacher leadership is still limited. This holds true for both the theoretical and the empirical studies. 39 studies (42%) of the studies included in this review do not provide a definition of teacher leadership.

However, we also identify some common trends in the way teacher leadership is defined in the literature. Eight studies (9%) provide a list of aspects to define teacher leadership. For example, Criswell et al. (2018:5) synthesized the ideas of Katzenmeyer and Moller (2009), Loucks-Horsley, Stiles, Mundry, Love, and Hewson (2010) Donaldson's (2007) and came up with the following elaborate definition of teacher leadership:

"(1) An individual gains a deep understanding of educational practice, and of her/himself in relation to that practice and to the system (both locally and more broadly) within which s/he operates. (2) Through those understandings, the individual can work with others to develop a vision for producing innovation in the system, which, within school systems, means improving the practice of teaching and learning. (3) As part of realizing of that vision, the individual is able to empower others to promote change and is able to modify and marshal available resources in a manner that ensures that this change is both productive and sustainable" (Criswell et al., 2018, p. 5).

What is noticeable about such an approaches to define teacher leadership is that it goes beyond simply defining what teacher leadership is. They provide explanations where the concepts of teacher leadership originate from and how it can be stimulated. Following the criteria for assessing concepts developed by Gerring (1999), we argue that this may be problematic, as the reach of a concepts should be accomplished with as few terms as possible. It should be as parsimonious as possible. By intermixing a concept of interest – teacher leadership – with its development, conceptual clarity is weakened.

Other studies include a more comprised definition of how the authors see the concept of teacher leadership in their study (47% percent). For example, Smith, Hayes, and Lyons (2017) defined teacher leadership "an influential, non-supervisory process focused on improving instructional practice, with student learning as the paramount goal" (p. 267). Similarly, the definition of Öqvist and Malmström (2016:156) posits teacher leadership as "a behaviour, a mobilisation of the available attributes of teachers to influence students at the ground level during their daily activities at school, within and outside the classroom, and beyond" (p. 156).

Others align their definition with the definitions of existing literature. Six scholars rely on the definition of York-Barr and Duke (2004), also mentioned in the introduction of this article, and view teacher leadership an "the process by which teachers, individually and collectively, influence their colleagues, principals, and other members of school communities to improve teaching and learning practices with the aim of increased student learning and achievement" (pp. 287–288) (e.g., Snoek, Enthoven, Kessels, & Volman, 2017). Torrance (2015, p.488) relies on the work by Spillane and Coldren (2011) and defines teacher leadership as "a relationship of social influence, distinguishing expertise rather than formal position as the basis of authority". Lin, Lee, and Riordan (2018, p.535) argue that "teacher leadership can be perceived as a set of skills demonstrated by teachers who continue to teach students but also have an influence on improving the quality of teaching and learning beyond their own classrooms (Danielson, 2006)".

Although the above definitions vary, they a illustrate one general theme that seems to describe teacher leadership in the literature. Teacher leadership is described as a *process of influencing others* rather than a collection of characteristics or tasks of so-called teacher leaders. Regarding this, Cheng and Szeto (2016:141) state the following: "While there is no consensus on the definition of teacher leadership (Neumerski, 2013), the key idea of teacher leadership is grounded, regardless of formal or informal teacher leader roles, in teachers influencing others to contribute to school improvement or educational practice." This approach towards leadership stresses the importance of influence processes, which has also been recognized in general leadership studies (Antonakis and Day, 2017). This means that although we have no ultimate answer to the question "how is teacher leadership defined", we are less pessimistic than others who argue that the concept of teacher leadership "continues to be ill-defined in the research" (Hite & Milbourne, 2018, p. 2). We strongly encourage scholars to rely on the definition of York-Barr and Duke (2004), which does not only stress that teacher leadership is a process of influencing others, but also includes other important elements of teacher leadership, such as its independence of a formal position and development of students as a goal.

3.4. Which antecedents of teacher leadership are studied and by which actors?

The second research question focuses on the antecedents of teacher leadership. Many studies analyzed how teacher leadership can be stimulated (64%, n = 54).[4] Based on the literature, antecedents could be identified on three levels: teacher antecedents, school-level antecedents, and supra-school level antecedents. Multiple actors play a role in each of the levels. Appendix A present an overview of the antecedents per study and category. Table 4 presents an overview of the numbers and percentages of studies per antecedent level.

[4] Please note, all percentages are calculated on the number of empirical studies (N = 84).

First, *teacher antecedents* refer to the teacher (leader) him- or herself as actor (23%, n = 19). They refer to characteristics that could be trained, such as skills (Liljenberg, 2016) and expertise (Struyve et al., 2018). However, they also refer to personality (Ying & Ho, 2015) and gender (Searby, Browne-Ferrigno, & Wang, 2017). For example, Cheng and Szeto (2015) found that the interplay of teachers' awareness, willingness, and self-initiation are important sources for the development of teacher leadership. Kilinc, Cemalogli, and Savas (2015) focused on potential inhibitors of teacher leadership and found that perceived stress is significantly and negatively related with enacting teacher leadership.

Second, for *school level antecedents*, most articles study the role of the principal (38% n = 32). They show actions a principal can take, like identifying teacher leaders and facilitating teacher leadership transitions (Klar, Huggins, Hammonds, & Buskey, 2016), providing support (e.g. Jacobs, Beck, & Crowell, 2014; Stout, Cumming-Potvin, & Wildy, 2017), and involving teachers in decision making (Chukowry, 2018). They also mention the relationship between principal and teacher leader, which should, for instance, be cooperative (Zhang & Henderson, 2018). Other articles mention the role of peers (10%, n = 8), who act as role models (Sales, Moliner, & Francisco Amat, 2016) and mentors (e.g. Gilles, Wang, Fish, & Stegall, 2018; Stanulis & Bell, 2017), and provide collegiality (e.g. Jacobs et al., 2014; Leaf & Odhiambo, 2017). Additionally, antecedents regarding organizational context, culture, or structure are mentioned. For example, lack resources such as adequate funding and qualified teachers limit teacher leaders' influence (Cooper et al., 2016).

Third, *supra-school level antecedents* are mainly enacted by educators (e.g., trainers) (13%, n = 11), who, for example, deliver programs and trainings (e.g. Yow & Lotter, 2016; Al-Zboon, 2016) and the government (5%, n = 4), for example by providing certification (Good, Petty, & Handler, 2016) or by including teacher leadership in national educational inspection criteria (Supovitz, 2015). Also, some articles mention the role of networks, associations, or other contextual actors. For instance, teacher associations provide opportunities and can lobby against counteracting policy agendas (Osmond-Johnson, 2015).

3.5. Which outcomes of teacher leadership are studied and at which level?

After reviewing the antecedents of teacher leadership, we analyze the potential outcomes. This helps to justify (or nuance) the efforts to stimulate teacher leadership. About one third of the studies included in this literature review focused on the outcomes of teacher leadership (38%, n = 32). Outcomes of teacher leadership could be identified at four levels: (1) individual outcomes for the teacher leader (14%, n = 12), (2) school level outcomes (18%, n = 15), (3) supra-school level outcomes (8%, n = 7), and (4) student level outcomes (10%, n = 8). Most studies addressed the consequences of teacher leadership at the level of the school, followed by the individual level of the teacher, the student level, and, finally, at the level beyond the school. However, as will be discussed later, it is important to mention that most of studies fail in demonstrating causal relationships between teacher leadership and its outcomes. This will be discussed in detail when we analyze the methodological quality of the studies. Appendix A present an overview of the outcomes per study and category.

Several studies investigated the outcomes of teacher leadership at multiple levels. A striking study in this regard is the one by Sebastian, Huang and Allensworth (2017) who studied the outcomes of teacher leadership at all four levels of analysis. Combining large scale survey data with documented data they found that teacher leadership mediates the relationship between principal leadership and professional development (teacher level), learning climate (school level), teacher-parent trust (beyond school level), which ultimately lead to student achievement and growth (student level). Another example is the study of Lai and Cheung (2015), who illustrate that teacher leaders to not only engage in professional development (teacher level) but that they also contribute to teaching and learning practices and the effectiveness of school improvement efforts (school level).

Studies focusing on *teacher outcomes* for teacher leaders themselves often show that teacher leader invest more in their professional development (e.g. Osmond-Johnson. 2015; Hairon, Goh, & Chua, 2015; Wang, 2016). However, as with many outcomes reported, it is unclear what the causal direction is, and whether confounders (such as IQ or tenure) affect both variables. Other studies show that teacher leadership is associated with successful problem-solving strategies (Polizzi et al., 2018) more flexibility in terms of adopting new roles (Nguyen & Hunter, 2018), job satisfaction and reduced intentions to quit the job (Snoek & Volman, 2014).

Most frequently addressed *school level outcomes* are curriculum development and instructional improvement (e.g., Supovitz, 2018; Naicker, Grant, & Pillay, 2016; Szeto & Cheng, 2018). For example, Lai and Cheung (2015) concluded that "both adapting and capacitating teacher leaders showed a strong initiative to negotiate with the school contexts to provide facilitative school conditions for improving teaching and learning" (p. 689). Next to this, studies claimed that changes in the culture of the school are found to result from teacher leadership (e.g., King & Stevensen, 2017; Sebastian et al., 2017). For example, the study by Snoek et al. (2015) suggested that teacher leaders initiate changes at school level, such as improvements of the curriculum and contributions to an organizational culture of trust. Other outcomes at school level found in the studies included in this review are intensified support of colleagues and extra role behavior (e.g., Al-Zboon, 2016; Fairman and Mackenzie 2015; Naicker et al., 2016).

At the *supra-school level,* parental involvement and involvement in teacher networks and professional learning communities (e.g., Naicker et al., 2016; Vranješević & Frost, 2016; Lin et al., 2018) were found to be a consequence of teacher leadership. For example, Vranješević and Frost (2016) concluded that.

"a third significant breakthrough relates to the role that teachers can play in enabling parents to overcome 'learned helplessness', a term commonly used to refer to the lack of self-belief on the part of learners (Dweck, 1975; Seligman, 1990) but which can be applied to the situation where parents in minority groups feel alienated from the school and lack optimism about how to solve problems or have their needs met." (2016: 76).

Next to this, teacher leaders were associated with leading the profession (Liljenberg, 2016), actively voicing their opinion (Osmond-Johnson, 2015), educational equity (Jacobs et al., 2014), and even influencing policies (Poekert et al., 2016).

According to Wenner and Campbell (2017), there is still a lack of evidence of the effects of teacher leadership on student learning. Our results indicate that the recent studies aimed to change this. Based on the literature we categorized 26% of all studies on the outcomes of

Table 4
Overview of antecedents and outcomes at different levels of analysis.

	Number/percentage of studies	Example study
Teacher antecedents	19/23%	Liljenberg (2016)
School level antecedents	38/32%	Stout et al. (2017)
Supra-school level antecedents	13/15%	Yow and Lotter, 2014
Teacher outcomes	12/14%	Wang (2016)
School level outcomes	15/18%	King and Stevensen (2017)
Supra-school level outcomes	7/8%	Liljenberg (2016)
Student outcomes	8/10%	Avsec (2016)
Total	112/120%	

Note: The total equals more than the number of studies as various studies contain more than one antecedent and/or outcome, all percentages are calculated on the number of empirical studies (N = 84).

teacher leadership as '*outcome studies at the student level*'. Put differently, we identified eight studies that provided potential evidence of the beneficial effect of teacher leadership on student outcomes. Among these studies, most studies argue that student achievement increases as a result of teacher leadership (e.g., Avsec, 2016; Liu, Liu, & Xie, 2018; James, Huang, and Allensworth, 2017). Based on quantitative findings, for example, Cheung et al. (2019) claimed – based on cross-sectional questionnaire data – that "children's development and learning are enhanced through teacher leadership practices in schools" (p.1). Avsec (2016) notes that teacher leaders influence both students' engagement in inquiry-based learning and the development of students' technological literacy. Other reported a positive outcome of teacher leadership for students was educational motivation (Lu, Chen, Hong, & Yore, 2016; Öqvist & Malmström, 2018).

3.6. Summary: a conceptual framework of teacher leadership

Based on the findings of this systematic literature review, we present a multi-level conceptual framework for the concept of teacher leadership (Fig. 2). This means the conceptual framework is drawn from existing literature, and that the relationships are claimed by studies, but are not true by definition. It documents that teacher leadership is a process of influencing and suggests that potential antecedents and outcomes can be identified at different levels, thereby providing an a answer to the send and third research question. We want to highlight three observations: the antecedents of teacher leadership occur at three different levels. Multiple actors applying various actions play a role in each of these three levels (1); the effects of teacher leadership could occur at four different levels (2); and the outcomes of teacher leadership can be categorized by the literature to date as overly positive (3). Not only teachers themselves seem to benefit from teacher leadership, but also the employing school, students, and even actors beyond school level, such as parents and professional networks. This implies that research on teacher leadership made progress since the end of the year 2013, when Wenner and Campbell (2017) explicitly called for more research investigating "to what extent can the roles of teacher leaders be connected to improved teacher practice and increased student learning" (p.164). However, we also wonder about the methodological quality of the studies included. York-Barr and Duke (2004) argued the empirical body of literature has several major limitations" (p.257), especially lacking quantitative and/or large-scale studies. Thirteen years later, Wenner and Campbell (2017) noted not much had changed: research on teacher leadership was still largely qualitative and small-scale (p.156). We will provide an answer to our final sub-question – what methodological quality do the empirical studies on teacher leadership portray? – in the next sub-section.

3.6.1. The methodological quality of empirical studies on teacher leadership

The final step of our analysis focused on the methodological quality of the empirical studies included in this review. For each study the global quality (GQS) score can be found in appendix B. The mean GQS of all qualitative studies (solely qualitative studies plus qualitative parts of mixed-method studies) was .6. The mean GQS of all quantitative studies (solely quantitative studies plus quantitative parts of mixed-method studies) was 0.7. In Fig. 3 below the frequencies of all GQS's are summarized.

The methodological quality of more than one third of all studies (n = 35, 40%) is lower than the lenient minimum global quality standard of 0.55. This number is comparable for qualitative and qualitative studies (qualitative: n = 28, 39%, qualitative: n = 9, 36%). When applying the strict quality standard of 0.75, we find that only about one third of the studies reaches this standard (n = 31, 37%).

Interestingly, there are large differences between qualitative and quantitative studies regarding this strict standard. Among the qualitative studies, only 25% (n = 18) scores higher than 0.75. Among the quantitative studies, the number is twice as high (n = 12; 48%).

When looking at the level of the separate criteria, we see large differences regarding their mean scores. This is shown in Tables 5 and 6. Appendix B provides an overview of all scores per criteria and per study. We will discuss the striking scores of the quantitative, qualitative, and mixed method studies.

On the upside, the aims of the included studies and their research questions or objectives have been sufficiently described for all quantitative studies. In addition, the scores for criteria 13 ('Results') and 14 ('Conclusions') are high (1.83 for both criteria). This suggests most studies specifically address their primary and secondary outcomes, and that the conclusions drawn are well supported by the data. For example, Öqvist and Malmström (2018) conclude that a low degree of developmental leadership seems to "affect educational motivation negatively among students with high levels of self-efficacy and not among students with low levels of self-efficacy" (p. 168), although these non-intuitive results contradict their expectations. On the downside, we also observed low scores. In particular, the scores for criteriums 11 ('Estimates of variance' = 1.25) and 12 ('Confounders' = 0.44) are low. The very low score

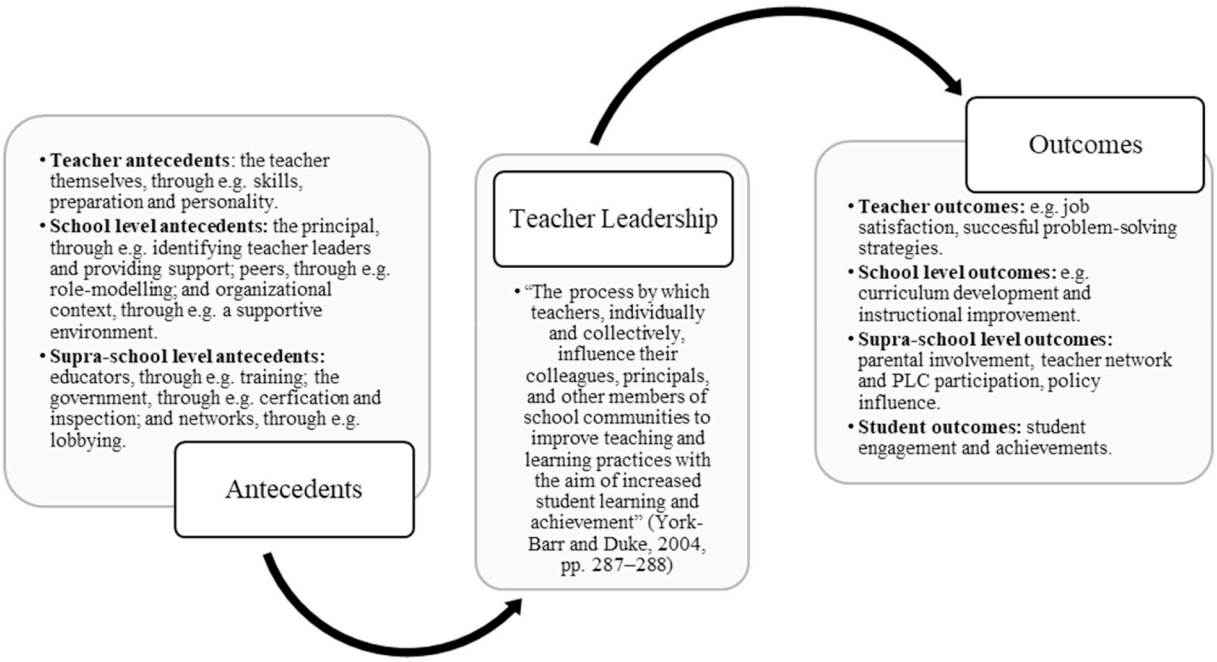

Fig. 2. Schematic overview including the definition of teacher leadership, and claimed antecedents and outcomes.

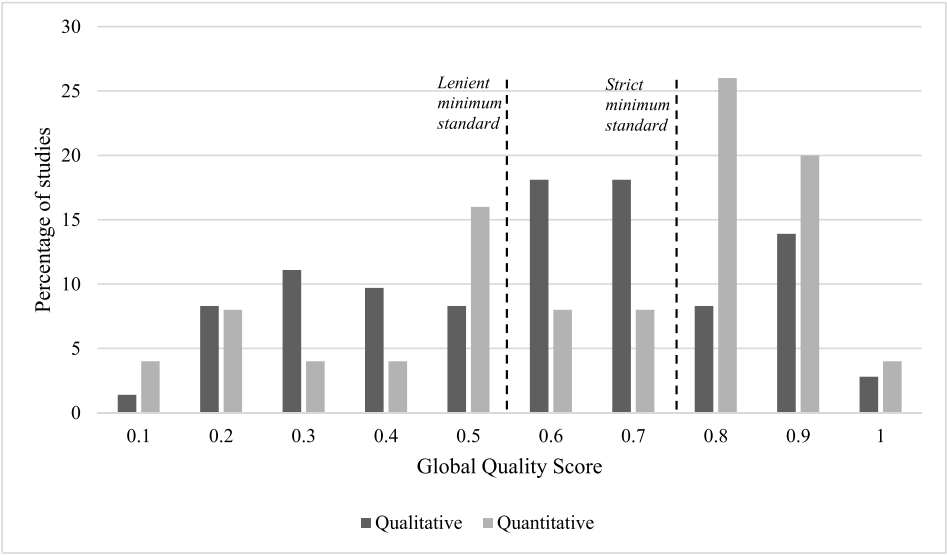

Fig. 3. Global Quality Score of teacher leadership studies.

of criterium 12 is due to the fact that researchers run regression analyses without controlling for confounding variables (e.g., Kilinc, Cemaloglu, and Savas, 2015). Others only present descriptive statistics (e.g., Timor, 2017) or correlation tables (e.g., Reeves & Lowenhaupt, 2016) or test differences between groups (e.g., Aliakbari & Sadeghi, 2014). The relatively low score of criterium 11 indicates that appropriate variance estimates, such as confidence intervals and standard errors, are missing (e.g., Kilinc, Cemaloglu, and Savas, 2015).

Like in their quantitative counterparts, most qualitative studies give a clear definition of the research question and the study's aim. In addition, the contexts of most studies are adequately described. However, other criteria present lower scores. The low scores of criterium 6 ('Data collection' = 0.68) and 7 ('Data analysis' = 0.91) suggest that the data collection procedures and approaches to data analysis are not always clearly described. For example, Cravens and Wang (2017) and Nguyen and Hunter (2018) report that (semi-)structured interviews were conducted, transcribed, and coded, but do not provide data analysis methods, transcripts, or interview protocols, leaving the reader wondering which questions have been asked and how the data was coded. In addition, the score for the criterium 'Reflexivity' is low (0.81). Many researchers do not explicitly discuss the potential impact of personal,

Table 5
Mean scores for each quantitative quality criteria.

	1. Research Question	2. Study design	3. Method appropriate	4. Subject	5. Random allocation	6. Blinding investigator	7. Blinding subjects	8. Outcomes	9. Sample size	10. Analysis ed	11. Estimates of Variance	12. Confounders	13. Results	14. Conclusion
Solely quant. (n = 12)	2.00	1.67	1.27	1.33	N/A	N/A	N/A	1.67	1.60	1.50	1.25	0.44	1.83	1.83
Mixed- method quant. (n = 13)	1.08	1.38	1.60	0.62	N/A	N/A	N/A	1.17	2.00	1.14	0.50	0.00	1.38	1.23

N/A: these criteria are not applicable because there are no randomized experiments included in the review.

Table 6
Mean for each qualitative quality criteria.

	1. Research Question	2. Study design	3. Context	4. Connection Theory	5. Sampling strategy	6. Data collection	7. Data analysis	8. Verification procedures	9. Conclusions	10. Reflectivity
Solely qual. (n = 59)	1.75	1.25	1.65	1.37	1.19	0.68	0.91	1.23	1.16	0.81
Mixed methods qual. (n = 13)	1.38	0.62	1.85	1.23	0.92	0.50	0.46	1.23	1.23	1.23

contextual, or methodological characteristics on the data obtained (e.g., Supovitz, 2018; Szeto & Cheng, 2018). For example, Zhang and Henderson (2018) conclude "teacher leaders can be viewed as resourceful and emotional facilitators and co-performers with principals during the current period of school-based curriculum reform in China" (p.621). As the study targeted participants (n = 10 teacher and n = 10 principals) from ten public primary schools of two large cities located in central Shandong, a coastal province in eastern China, the generalization to China as a country should be discussed.

When analyzing the quality criteria of qualitative and quantitative studies that are part of mixed-methods research designs, it is noticeable that scores of these criteria are lower compared to the criteria of solely qualitative or quantitative studies. It has been argued that "mixed-methods inquiry opens the door for combining the general and the particular, the universal and the context-dependent, and, ultimately, building both theoretical and practical knowledge" (Raimondo & Newcomer, 2017, p. 189). However, our observation suggests combining qualitative and quantitative methods may come at the cost of methodological rigor.

In sum, the critiques of York-Barr and Duke (2004) and Wenner and Campbell (2017) seem to be taken to heart only partly. The methodological quality of more than one third of all studies does not meet the *lenient* minimum global quality standard, and only one third exceeds the *strict* global quality standard developed by Kmet et al. (2004). Our systematic analysis of the different quality criteria of qualitative and quantitative studies allowed us to identify the "weak spots" of the studies. While limited reflectivity, unclear data collection, and data analysis procedures are common flaws among qualitative studies, quantitative studies structurally underreport confounding variables and estimates of variance. Consequentially, scholars cannot ascertain whether an effect is caused by the variable of interest. This is striking because authors tend to draw strong – sometimes even causal – conclusions (e.g., Aliakbari & Sadeghi, 2014; Zhang & Henderson, 2018).

At the same time, we also identified studies that showcase high quality research. These deliver more promising avenues for the field of teacher leadership research. For example, Avsec (2016) employed a field experiment to study the effect of teacher learning and leadership styles on students in Slovenia, making it possible to draw casual conclusions (Pearl, 2009). Next to this, Lin et al. (2018) used both social network analysis (SNA) as well as interviews (mixed methods) to propose four types of teacher leadership from a network perspective, showcasing good examples of sample size, transparency and measurements.

4. Discussion and conclusion

The goal of this article was to contribute to the study of teacher leadership by systematically reviewing the literature on teacher leadership for the period 2014–2018. Based on a review of the literature, we developed a conceptual framework and analyzed the methodological quality of the studies. We will summarize the most important findings of our review, and point to avenues for further development of the field of teacher leadership.

First of all, although the number of studies that provide a comprised definition the concept of teacher leadership has increased (51% in this review compared to 35% in the Wenner and Campbell (2017) review), we found that the concept of teacher leadership is still often undefined, or defined in divergent ways. To further the field of teacher leadership, we should elevate teacher leadership to a definitive concept (Blumer, 1954). Definitive concepts have a clear definition, and refer precisely to what teacher leadership does and does not entail. This contrasts sensitizing concepts, which provide scholars and practitioners with only a general sense of guidance. We encourage future studies to use the definition of York-Barr and Duke (2004:287–288), who view teacher leadership as "the process by which teachers, individually and collectively, influence their colleagues, principals, and other members of school communities to improve teaching and learning practices with the aim of increased student learning and achievement."

Another important observation from the review is that many studies were executed in a single country and used only one method. This is understandable given the importance of the local context in which these teacher leaders operate. However, conducting comparative studies that cut across various countries, sectors, or types of teacher leaders can show to what extent contextual factors influence antecedents, enactment, or outcomes of teacher leadership. Moreover, using and combining a wider range of methods can increase our understanding, as all methods have their strengths and weaknesses and combining them can present us with the best of both worlds (Cresswell & Clark, 2007). Furthermore, many quantitative studies draw on single surveys from a single source at a single point in time, thereby potentially suffering from common-source bias (Favero & Bullock, 2014). More generally, studies suffer from endogeneity problems (Antonakis, 2017). Future scholars are advised to take precautions to eliminate endogeneity, where the effect of the independent variable cannot be interpreted correct because it includes omitted variables. This can be done via field experiments, natural experiments, via instrumental variable approaches, or more generally via causal modeling (Pearl, 2009). Regarding both quantitative and qualitative studies, scholars are advised to be transparent in their data collection methods, their data analysis, and their results, open access publishing all data used whenever possible .

Furthermore, regarding theoretical venues it could also be interesting to look at a potential 'dark sides' of teacher leadership. All outcomes found in this review are positive. This may be too good to be true. We propose that future studies look into the potential negative consequences of teacher leadership. Potential negative effects for teachers themselves could include stress, role conflicts, burnout, and work-home interference. Additionally, negative effects for students, schools, and other actors are imaginable. Related to this, it would be interesting to analyze whether the relationship of teacher leadership to various outcomes is linear. It the management literature, there have been various examples of the so-called 'too much of a good thing effect' (Pierce & Aguinis, 2013). For instance, it would be interesting to analyze whether teacher leadership can backfire, for instance when teachers who already have a high workload are stimulated to portray teacher leadership.

In this article, we set out to perform a systematic literature review to answer questions about teacher leadership. We identified 93 articles, and the coverage of these in the various educational journal is evidence of its breath. Some limitations include that we could have missed articles, and we did not explicitly analyze publication bias. Teacher leadership research has a long history, and various

overview articles have been published. There is no shortage of empirical research progressing in this area. But while scholars frequently state how important teacher leadership is for students, teachers, and schools, the reality is that scientific knowledge advancement on teacher leadership is not up to speed. It is primarily based on qualitative studies, sometimes with unclear definitions, focusing overly on positive effects at other times, and altogether showing high variance in research quality. We hope that our critical review of the methods shows where progress can be made. One important step is to rely on one common definition to improve conceptual clarity. We encourage scholars interested in the concept of teacher leadership to rely on the definition of York-Barr and Duke (2004, p. 287–288), which does not only stress that teacher leadership is an active process of influencing others, but also includes other important elements of teacher leadership, such as its independence of a formal position and development of students as an ultimate goal. Furthermore, in this review we aimed to develop a conceptual model that can be used to analyze potential antecedents and outcomes of teacher leadership. In the end, these contributions will hopefully help the teacher leadership field reach maturity.

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Appendix A

Nr.	Year of publication	Author(s)	Design method*	Focus of study	
				Antecedents	
				Teacher	Organizational
1	2016	Eckert J.; Ulmer, J.; Khachatryan, E.; Ledesma, P.	Mixed S/I	Experiences, potential.	Peers: Shaping understanding
2	2017	King, F.; Stevenson, H.	Qual I		Principal: Interaction, distributed leadership
3	2017	Baker-Doyle, K.	Qual I/O		
4	2016	Klar, H.; Huggins, K.S.; Hammonds, H.L.; Buskey, F.C.	Qual I/DA		Principal: Identifying, facilitating role transition, providing support, creating opportunities
5	2016	Poekert, P.; Alexandrou, A.; Shannon, D.	Qual I/F/MC		Principal/Organization: Support, Professional development program, opportunities
6	2014	Law, E.H.F.; Lee, J.C.K.; Wan, S.W.Y.; Ko, J.; Hiruma, F.	Mixed VR		
7	2018	Heikka, J.; Halttunen, L.; Waniganayake, M.	Qual I		Principal: development days, team meetings, peer support structure
8	2016	Collins, C.	Qual Multiple		Principal/Culture: Focusing on teachers; Valuing teachers input; Accountability culture
9	2015	Osmond-Johnson, P.	Qual I		
10	2017	Supovitz, J.A.	Qual I/DA/F		Principal: authority influence on behavior and practice
11	2017	Szeto, E.; Yan-Ni Cheng, A.	Qual I/DA	Age	Principal: interaction effects, culture
12	2016	Naicker, I.; Grant, C.C.; Pillay, S.S.	Qual I/DA/O	Professional capital, strong social actor	Principal: agency
13	2017	Struyve, C.; Hannes, K.; Meredith, C.; Vandecandelaere, M.; Gielen, S.; De Fraine, B.	Qual I/O	Expertise	Peers/principal: recognition, surrounded by other teachers as first-line helpers, support by principal.
14	2016	Liljenberg, M.	Qual I/O	Skills and preparation, personal resources	Principal/culture: teacher culture, hierarchical positioning, preconditions
15	2018	Douglass, A.	Qual I/D		
16	2016	Vranješević, J.; Frost, D.	Qual AR		
17	2014	Hanuscin, D.; Cheng, Y-W.; Rebello, C.; Sinha, S.; Muslu, N.	Qual D	Blogging	
18	2014	Snoek, M.; Volman, M.	Qual I		Organization: context

19	2015	O'Meara, J.G.; Whiting, S.; Steele-Maley, T.	Qual ?		
20	2016	Ying, I.D.; Ho, D.	Qual I/D	Personal factors such as personality, motivation, belief, knowledge and skills	Principal/peers: Social factors
21	2017	Liu, P.; Liu, L.; Xie, L. .	Qual I		
22	2017	Cravens, X.; Wang, J.	Qual I/DA/O		
23	2015	Fairman, J.C.; Mackenzie, S.V.	Qual I		
24	2015	Snoek, M.; Enthoven, M.; Kessels, J.; Volman, M.	Qual I/F		
25	2016	Avsec, S.	Quan FE		
26	2015	Torrance, D.	Qual I/D/S		Principal: purposeful planning
27	2016	Hovardas, T.	Mixed I/S		Peers: informal teacher networks
28	2018	Criswell, G.T.; Rushton, G.T.; Nachtigall, D.; Staggs, S.; Alemadar, M.; Capelli, C.	Qual I/F/O		
29	2018	Palmer, D.K.	Qual I/R/A/FN		
30	2014	Jacobs, J.; Beck, B.; Crowell, L.	Qual I/R/A		Peers/principal: collegiality, principal support
31	2014	Yow, J.A.; Lotter, C.	Qual R		
32	2018	Cheung, A.C.K.; Keung, C.P.C.; Kwan, P.Y.K., Cheung, L.Y.S.	Quan S		
33	2017	Leaf, A.; Odhiambo, G.	Qual I/D		Peers/principal: collegial relationship, open communication, professional development, principal mentoring
34	2017	Sean Smith, P.; Hayes, M.L.; Lyons, K.M.	Qual I		Principal: influence of school administration, overlap teaching and leading
35	2014	Lee, Y.L.	Quan S		
36	2015	Menlo, A.	Quan S		Principal: satisfied support
37	2014	Kilinc, A.C.	Quan S		Culture: school climate
38	2014	Aliakbari, M.; Sadeghi, A.;	Quan S	Educational degree, teaching level	
39	2016	Al-Zboon, E.	Mixed I/S	Attitude, years of experience, educational level	Principal: training, communication, overload
40	2015	Hairon, S.; Goh, J.W.P; Chua, C.S.K.	Qual O/DA		
41	2016	Wang, T.	Qual I/DA		Principal: being lead learner, teacher empowerment
42	2016	Cheng, A.Y.N.; Szeto, E.	Qual I/DA	Teacher awareness, willingness and self-initiation	Principal/culture: delegation, facilitation and identification of potential talent, school culture
43	2016	Lu, Y. Y.; Chen H.T.; Hong, Z.R.; Yore, L.D.	Mixed I/S		
44	2016	Öqvist, A.; Malmström,.	Qual I		
45	2016	Reeves, T.D.; Lowenhaupt, R.J.	Mixed S		
46	2014	Botha, R.J.	Qual I		
47	2015	Kilinc, A.C.; Cemaloglu, N.; Savas, G.	Quan S	Teacher professio-nalism, perceived stress	
48	2017	Stout, R.M.; Cumming-Potvin, C.; Wildy, H.	Mixed S		Principal: support
49	2016	Greenier, V.T.; Whitehead, G.E.K.	Qual S		
50	2018	Öqvist, A.; Malmström, M.	Quan S		
51	2017	Boe, M.; Hognestad, K.	Qual I/DA/O/SH/FN/VR		
52	2016	Sales, A.; Moliner, L.; Amat, A.F.	Qual I/F/O		
53	2017	Sinha, S.; Hanuscin, D.L.		Teacher leadership identity	

			Qual I/D		Peers/principal: opportunities, encouragement from others, exposure to new perspectives on leadership, role models, reflection, feedback and recognition from others
54	2016	Yuet, F.K.C.; Yusof, H.; Mohamad, S.I.S.	Quan S		
55	2017	Javadi, V.; Bush, T.; Ng, A.	Qual I/DA/O		
56	2016	Huang, T.	Qual I/F	Teacher reflexivity	
57	2016	Good, A.J.; Petty, T.M.; Handler, L.K.	Qual S		
58	2018	Holloway, J.; Nielsen, A.; Saltmarsh, S.	Qual S/F		Principal: resources
59	2015	Supovitz, J.	Qual I		
60	2018	Woods, P.A.; Roberts, A.	Qual DA		
61	2017	Searby, L.; Browne-Ferrigno, T.; Wang, C.	Mixed S/F	Gender, Experiences, Tenure	Principal: teacher leadership activities, mentoring
62	2018	Alemar, M.; Capelli, C.J.; Criswell, A.; Rushton, G.T.	Qual I/F		
63	2015	Lai, E.; Cheung, D.	Qual F		
64	2016	Cooper, K.S.; Stanulis, R.N.; Brondyk, S.K.; Hamilton, E.R.; Macaluso, M.; Meijer, J.A.	Qual I/DA/VR	Personal orientation	Principal/context: orientation, leadership team, school context
65	2018	Nguyen, T.D.; Hunter, S.	Qual I/F		Culture: pre-existing conditions
66	2018	Polizzi, S.J.; Head, M.; Barret-Williams, D.; Ellis, J.; Roehrig, G.H.; Rushton, G.T.	Qual DA		
67	2017	Stanulis, R.N.; Bell, J.	Theor		Peers: mentor
68	2018	Smylie; Eckert	Theor		
69	2016	Rizvi. M.	Theor		
70	2018	Hamilton, G.; Forde, C.; McMohon, M.	Theor		
71	2018	De Nobile, J.	Theor		
72	2015	Torrance, D.; Humesem, W.	Theor		
73	2017	Castner, D. J.; Schneider, J. L.; Henderson J. G,	Theor		
74	2017	Grant, C.C.	Theor		
75	2017	James, S.; Huang, H.; Allensworth, E.	Quan S		Principal: leadership
76	2014	Reid, S.	Mixed S/I		
77	2018	Allen, L. Q.	Mixed DA/F/S		
78	2015	O'Donovan, M.	Qual I		Principal/culture: distributed leadership: making visible, explicitizing, negotiating on its meaning
79	2014	Collay, M.	Qual R/N	Critical reflection	
80	2016	Conway, J.M.; Andrews, D.	Mixed SD/DA/ O/I	Relationship with principal	Principal: relationship with teacher leaders
81	2018	Boyce, J.; Browers, A. J.	Quan S		
82	2018	Zhang, Y.; Henderson, D.	Qual I		Principal: cooperative relationship with teacher leaders, distribution of power and decision making
83	2018	Von Esch, K. S.;	Qual O/I		
84	2016	Jacobs, J.; Crowell, L.	Qual F	Reflection, developing a social justice and leadership lens	
85	2018	Chukowry, D.M.C.;	Qual I		Principal: involvement in decision making, vision for teacher leadership, less bureaucracy, encouragement, opportunities
86	2018	Gilles, C.; Wang, Y.; Fish, J.; Stegall, J.	Qual S		Principal: mentor
87	2018	Christensen, R.; Eichhorn, K.; Prestridge, S.; Petko, D.'	Theor		

		Sligte, H.; Baker, R.; Alayyar, G.; Knezek, G.			
88	2018	Lin, W.; Lee, M.; Riordan, G.	Mixed I/S		Structure: school policies and structures such as co-teaching and timetabling
Avse	2018	Hite, R.; Milbourne, J.	Qual DA		
90	2017	Timor, T.;	Mixed S		
91	2018	Biggs, E.E.; Gilson, C.B.; Carter, E.W.	Qual I	Knowledge of roles and backgrounds, skills, dispositions, personal development	Peers/principal: school support
92	2017	Tsai, K.C.	Quan S		
93	2017	Lowery-Moore, H.; Latimer R.M.; Villate, V.M	Qual DA		

Nr.	Focus of study				
	Antecedents	Outcomes			
	Supra-school	Individual	School	Supra-school	Student
1	Government: US Department of Education fellowship.	Extra responsibilities, new occupational roles			
2			Culture		
3	Network: Community organizations				
4					
5				Policies	
6					
7			Curriculum development, pedagogical leadership		
8					
9	Teacher association: providing growth and opportunities, countering neoliberal agenda	Professional development		Opinion voicing	
10			Instructional improvement		
11			Curriculum development, supporting colleagues		
12		Reflective practices	Curriculum development Instructional improvement, extra role behaviour	Parental involvement, teacher networks	
13					
14		Entrepreneurial activities, doctoral study		Leading the profession	
15					
16			Parental involvement		
17					
18	Educators: master program	Job satisfaction, reduced turnover intentions			
19	Educators/government: TEM, TACTICS				
20	Educators: Policy making, Curriculum design, resources allocation				
21					Achievement
22					
23			Influencing colleagues, shared responsibility		
24			Curriculum development, instructional development, supporting colleagues, sparring partner for principal, culture		
25					Achievement
26					
27					
28					
29	Universities/school districts: reflexive practice, identity exploration, professional communities and networks				
30				Educational equity	
31	Educators: leadership program				
32					Achievement
33					
34					
35					
36					

37					
38					
39	Educators/government: training, laws.		Supporting colleagues, extrarole behaviour		
40		Professional development	Curriculum development, instructional improvement, supporting colleagues		
41		Professional development			
42					
43					Attitude towards science, positive thinking
44					Learning
45					
46					
47					
48	Educators: professional development				
49					
50					Educational motivation
51					
52	Networks: Space for Collaborative Action and Reflection				
53					
54					
55					
56					
57	Government: National Board Certification				
58					
59	Government: National School Inspection				
60					
61					
62					
63		Professional development	Curriculum improvement, Instructional improvement, school improvement		
64	Context: local context				
65		Less trouble with new roles	Tensions between TL and teachers due to role transitioning?		
66		Problem solving strategies			
67					
68					
69	Educators: pre-service education				
70					
71					
72					
73					
74					
75		Professional development	Climate	Professional learning community, involving parents	Achievement
76			Knowledge creation, mobilizing processes		
77	Government: framework				
78					
79	Educators: Urban teacher leadership programme				
80					Achievement
81					
82					
83			Instructional improvements, equal opportunities for learning, shared vision		
84	Educators: MA teacher leadership				
85					
86	Educators: induction program				
87	Educators/network: formal programs, professional networks				
88				Professional learning community	
Avse					
90					

91	Educators: formal training		
92			
93		Increased confidence, ease in their role, desire to influence	

*Mixed = mixed methods; Qual = qualitative, Quan = quantitative, Theor = theoretical. S = survey, I = interviews (all types of individual interviews included, e.g. semi-structured, contextual, stimulated recall), DA = document analysis, O = observations, VR = video recording, MC = member checks, F = focus groups, SNA = social network analysis, AR = action research, D = diaries, R = reflection (multiple types), FE = field experiment, FN = fieldnotes, A = Assignments, SH = shadowing, N = Narratives, SD = Secondary data.

Appendix B. Standard Quality Scores for Qualitative Studies

Nr.	Year of publication	Author(s)	Design method*	1.Research Question	2.Study design	3.Context	4.Connection Theory
1	2016	Eckert J.; Ulmer, J.; Khachatryan, E.; Ledesma, P.	Mixed	2	0	2	2
2	2017	King, F.; Stevenson, H.	Qual	2	2	2	0
3	2017	Baker-Doyle, K.	Qual	2	0	2	2
4	2016	Klar, H.; Huggins, K.S.; Hammonds, H.L.; Buskey, F.C.	Qual	2	2	2	2
5	2016	Poekert, P.; Alexandrou, A.; Shannon, D.	Qual	0	2	2	2
6	2014	Law, E.H.F.; Lee, J.C.K.; Wan, S.W.Y.; Ko, J.; Hiruma, F.	Mixed	0	0	2	0
7	2018	Heikka, J.; Halttunen, L.; Waniganayake, M.	Qual	2	2	2	2
8	2016	Collins, C.	Qual	2	0	0	0
9	2015	Osmond-Johnson, P.	Qual	0	2	2	2
10	2017	Supovitz, J.A.	Qual	2	2	2	2
11	2017	Szeto, E.; Yan-Ni Cheng, A.	Qual	2	2	2	2
12	2016	Naicker, I.; Grant, C.C.; Pillay, S.S.	Qual	2	0	2	0
13	2017	Struyve, C.; Hannes, K.; Meredith, C.; Vandecandelaere, M.; Gielen, S.; De Fraine, B.	Qual	2	0	2	2
14	2016	Liljenberg, M.	Qual	2	2	2	2
15	2018	Douglass, A.	Qual	2	2	2	0
16	2016	Vranješević, J.; Frost, D.	Qual	0	2	2	0
17	2014	Hanuscin, D.; Cheng, Y-W.; Rebello, C.; Sinha, S.; Muslu, N.	Qual	2	2	2	2
18	2014	Snoek, M.; Volman, M.	Qual	2	2	2	2
19	2015	O'Meara, J.G.; Whiting, S.; Steele-Maley, T.	Qual	2	0	0	0
20	2016	Ying, I.D.; Ho, D.	Qual	2	0	2	2
21	2017	Liu, P.; Liu, L.; Xie, L.	Qual	2	2	0	2
22	2017	Cravens, X.; Wang, J.	Qual	2	2	2	0
23	2015	Fairman, J.C.; Mackenzie, S.V.	Qual	2	2	2	2
24	2015	Snoek, M.; Enthoven, M.; Kessels, J.; Volman, M.	Qual	2	2	2	0
25	2016	Avsec, S.	Quan	x	x	x	x
26	2015	Torrance, D.	Qual	2	0	2	2
27	2016	Hovardas, T.	Mixed	2	2	2	0
28	2018	Criswell, G.T.; Rushton, G.T.; Nachtigall, D.; Staggs, S.; Alemadar, M.; Capelli, C.	Qual	2	2	2	2
29	2018	Palmer, D.K.	Qual	2	0	2	2
30	2014	Jacobs, J.; Beck, B.; Crowell, L.	Qual	2	0	2	0
31	2014	Yow, J.A.; Lotter, C.	Qual	2	2	2	2
32	2018	Cheung, A.C.K.; Keung, C.P.C.; Kwan, P.Y.K., Cheung, L.Y.S.	Quan	x	x	x	x
33	2017	Leaf, A.; Odhiambo, G.	Qual	2	0	2	0
34	2017	Sean Smith, P.; Hayes, M.L.; Lyons, K.M.	Qual	2	0	2	0
35	2014	Lee, Y.L.	Quan	x	x	x	x
36	2015	Menlo, A.	Quan	x	x	x	x
37	2014	Kilinc, A.C.	Quan	x	x	x	x
38	2014	Aliakbari, M.; Sadeghi, A.;	Quan	x	x	x	x
39	2016	Al-Zboon, E.	Mixed	2	2	2	2
40	2015	Hairon, S.; Goh, J.W.P; Chua, C.S.K.	Qual	2	2	2	2
41	2016	Wang, T.	Qual	2	0	2	2
42	2016	Cheng, A.Y.N.; Szeto, E.	Qual	2	0	0	2
43	2016	Lu, Y. Y.; Chen H.T.; Hong, Z.R.; Yore, L.D.	Mixed	2	0	2	2
44	2016	Öqvist, A.; Malmström,.	Qual	2	2	0	2
45	2016	Reeves, T.D.; Lowenhaupt, R.J.	Mixed	2	0	0	2
46	2014	Botha, R.J.	Qual	0	0	0	2
47	2015	Kilinc, A.C.; Cemaloglu, N.; Savas, G.	Quan	x	x	x	x
48	2017	Stout, R.M.; Cumming-Potvin, C.; Wildy, H.	Mixed	2	0	2	0
49	2016	Greenier, V.T.; Whitehead, G.E.K.	Qual	0	2	0	2
50	2018	Öqvist, A.; Malmström, M.	Quan	x	x	x	x
51	2017	Boe, M.; Hognestad, K.	Qual	2	2	0	2
52	2016	Sales, A.; Moliner, L.; Amat,.F.	Qual	2	2	2	0
53	2017	Sinha, S.; Hanuscin, D.L.	Qual	2	0	2	2
54	2016	Yuet, F.K.C.; Yusof, H.; Mohamad, S.I.S.	Quan	x	x	x	x

55	2017	Javadi, V.; Bush, T.; Ng, A.	Qual	2	2	2	2
56	2016	Huang, T.	Qual	2	2	2	0
57	2016	Good, A.J.; Petty, T.M.; Handler, L.K.	Qual	2	0	2	2
58	2018	Holloway, J.; Nielsen, A.; Saltmarsh, S.	Qual	2	2	2	2
59	2015	Supovitz, J.	Qual	0	0	2	0
60	2018	Woods, P.A.; Roberts, A.	Qual	0	0	2	2
61	2017	Searby, L.; Browne-Ferrigno, T.; Wang, C.	Mixed	2	0	2	2
62	2018	Alemar, M.; Capelli, C.J.; Criswell, A.; Rushton, G.T.	Qual	2	2	2	2
63	2015	Lai, E.; Cheung, D.	Qual	0	0	0	2
64	2016	Cooper, K.S.; Stanulis, R.N.; Brondyk, S.K.; Hamilton, E.R.; Macaluso, M.; Meijer, J.A.	Qual	2	2	2	2
65	2018	Nguyen, T.D.; Hunter, S.	Qual	2	2	2	2
66	2018	Polizzi, S.J.; Head, M.; Barret-Williams, D.; Ellis, J.; Roehrig, G.H.; Rushton, G.T.	Qual	2	0	2	0
75	2017	James, S.; Huang, H.; Allensworth, E.	Quan	x	x	x	x
76	2018	Reid, S.	Mixed	0	2	2	0
77	2016	Allen, L. Q.	Mixed	0	0	2	0
78	2018	O'Donovan, M.	Qual	2	2	0	0
79	2018	Collay, M.	Qual	2	2	2	0
80	2015	Conway, J.M.; Andrews, D.	Mixed	0	0	2	2
81	2017	Boyce, J.; Browers, A. J.	Quan	x	x	x	x
82	2017	Zhang, Y.; Henderson, D.	Qual	2	2	2	2
83	2017	Von Esch, K. S.;	Qual	2	2	2	2
84	2014	Jacobs, J.; Crowell, L.	Qual	2	2	2	2
85	2018	Chukowry, D.M.C.;	Qual	2	0	2	2
86	2015	Gilles, C.; Wang, Y.; Fish, J.; Stegall, J.	Qual	2	0	2	2
88	2014	Lin, W.; Lee, M.; Riordan, G.	Mixed	2	0	2	2
89	2016	Hite, R.; Milbourne, J.	Qual	2	2	2	2
90	2018	Timor, T.	Mixed	2	2	2	2
91	2018	Biggs, E.E.; Gilson, C.B.; Carter, E.W.	Qual	2	2	2	0
92	2018	Tsai, K.C.	Quan	x	x	x	x
93	2016	Lowery-Moore, H.; Latimer, R.M.; Villate, V.M	Qual	2	2	2	2

Nr.	5.Sampling strategy	6.Data collection	7.Data analysis	8.Verification procedures	9.Conclusions	10.Reflectivity	**Global Quality Score**
1	2	0	0	2	0	2	**0,6**
2	2	0	0	0	2	2	**0,6**
3	2	0	0	2	2	0	**0,6**
4	2	2	0	2	2	2	**0,9**
5	2	0	0	2	2	0	**0,6**
6	2	0	0	2	2	0	**0,4**
7	2	0	0	0	0	0	**0,5**
8	0	2	0	0	2	0	**0,3**
9	2	0	0	2	2	0	**0,6**
10	2	2	2	2	2	0	**0,9**
11	2	0	2	2	2	2	**0,9**
12	0	0	2	2	2	2	**0,6**
13	2	2	2	2	2	0	**0,8**
14	2	0	2	2	2	0	**0,8**
15	2	0	2	2	2	2	**0,8**
16	0	0	0	0	2	0	**0,3**
17	2	NA	2	2	2	0	**0,9**
18	2	2	2	2	2	2	**1**
19	0	0	0	0	0	2	**0,2**
20	0	0	0	0	0	0	**0,3**
21	0	0	0	0	2	0	**0,4**
22	2	0	0	2	0	0	**0,5**
23	2	2	2	2	2	0	**0,9**
24	2	2	2	2	2	2	**0,9**
25	x	x	x	x	x	x	**x**
26	0	0	0	0	0	0	**0,3**
27	2	0	0	2	2	2	**0,7**
28	2	0	2	2	2	2	**0,9**
29	0	0	2	2	2	0	**0,6**
30	0	0	2	0	2	0	**0,4**
31	2	0	2	2	2	2	**0,9**
32	x	x	x	x	x	x	**X**
33	2	2	2	2	2	0	**0,7**
34	0	2	0	0	2	0	**0,4**
35	x	x	x	x	x	x	**X**
36	x	x	x	x	x	x	**X**

37	x	x	x	x	x	x	**X**
38	x	x	x	x	x	x	**X**
39	2	0	0	2	0	2	**0,7**
40	0	0	2	0	2	0	**0,6**
41	2	0	2	2	0	2	**0,7**
42	2	2	2	2	0	2	**0,7**
43	2	2	0	2	2	2	**0,8**
44	0	0	2	2	2	2	**0,7**
45	0	0	2	0	2	2	**0,5**
46	0	0	0	2	0	0	**0,2**
47	x	x	x	x	x	x	**X**
48	0	0	0	2	2	0	**0,4**
49	0	0	0	0	0	2	**0,3**
50	x	x	x	x	x	x	**X**
51	0	0	2	2	2	2	**0,7**
52	0	2	0	2	0	0	**0,5**
53	0	2	2	2	2	0	**0,7**
54	x	x	x	x	x	x	**X**
55	2	0	0	2	0	0	**0,6**
56	2	0	0	2	0	0	**0,5**
57	0	0	0	2	0	0	**0,2**
58	2	0	0	0	2	0	**0,6**
59	0	0	0	0	0	0	**0,1**
60	0	0	0	0	0	2	**0,3**
61	0	0	0	0	0	2	**0,4**
62	0	2	0	0	2	0	**0,6**
63	2	0	0	0	0	0	**0,2**
64	2	0	2	2	0	0	**0,7**
65	2	0	0	2	0	2	**0,7**
66	2	0	2	0	0	2	**0,5**
75	x	x	x	x	x	x	**X**
76	2	0	0	2	2	2	**0,6**
77	0	0	0	0	0	2	**0,2**
78	0	0	0	0	0	0	**0,2**
79	0	0	0	0	0	0	**0,3**
80	0	0	0	2	0	0	**0,3**
81	x	x	x	x	x	x	**X**
82	0	2	0	2	0	0	**0,6**
83	2	0	2	2	0	2	**0,8**
84	2	2	0	2	2	2	**0,9**
85	2	0	0	0	0	0	**0,4**
86	2	2	2	0	0	2	**0,7**
88	0	2	2	0	2	0	**0,6**
89	2	2	2	2	2	2	**1**
90	0	2	2	0	2	0	**0,7**
91	2	2	2	2	2	2	**0,9**
92	x	x	x	x	x	x	**x**
93	2	2	0	2	2	2	**0,9**

*Mixed = mixed methods; Qual = qualitative, Quan = quantitative.

Appendix B. Standard Quality Scores for Quantitative Studies

				C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**C10**	**C11**	**C12**	**C13**	**C14**	**MEAN**
Nr.	Year of publi-ca-tion	Author(s)	Design method*															
1	2016	Eckert J.; Ulmer, J.; Khachatryan, E.; Ledesma, P.	Mixed	2	2	2	2	N/A	N/A	N/A	2	N/A	2	0	0	2	2	**0,6**
2	2017	King, F.; Stevenson, H.	Qual															
3	2017	Baker-Doyle, K.	Qual															
4	2016	Klar, H.; Huggins, K.S.; Hammonds, H.L.; Buskey, F.C.	Qual															
5	2016	Poekert, P.; Alexandrou, A.; Shannon, D.	Qual															
6	2014	Law, E.H.F.; Lee, J.C.K.; Wan, S.W.Y.; Ko, J.; Hiruma, F.	Mixed	0	0	N/A	0	N/A	N/A	N/A	2	N/A	N/A	N/A	N/A	2	2	**0,5**
7	2018	Heikka, J.; Halttunen, L.; Waniganayake, M.	Qual															
8	2016	Collins, C.	Qual															
9	2015	Osmond-Johnson, P.	Qual															
10	2017	Supovitz, J.A.	Qual															
11	2017	Szeto, E.; Yan-Ni Cheng, A.	Qual															

12	2016	Naicker, I.; Grant, C.C.; Pillay, S.S.	Qual															
13	2017	Struyve, C.; Hannes, K.; Meredith, C.; Vandecandelaere, M.; Gielen, S.; De Fraine, B.	Qual															
14	2016	Liljenberg, M.	Qual															
15	2018	Douglass, A.	Qual															
16	2016	Vranješević, J.; Frost, D.	Qual															
17	2014	Hanuscin, D.; Cheng, Y-W.; Rebello, C.; Sinha, S.; Muslu, N.	Qual															
18	2014	Snoek, M.; Volman, M.	Qual															
19	2015	O'Meara, J.G.; Whiting, S.; Steele-Maley, T.	Qual															
20	20162016	Ying, I.D.; Ho, D.	Qual															
21	2017	Liu, P.; Liu, L.; Xie, L.	Qual															
22	2017	Cravens, X.; Wang, J.	Qual															
23	2015	Fairman, J.C.; Mackenzie, S.V.	Qual															
24	2015	Snoek, M.; Enthoven, M.; Kessels, J.; Volman, M.	Qual															
25	2016	Avsec, S.	Quan	2	0	2	2	N/A	N/A	N/A	0	2	2	0	0	2	2	**0,6**
26	2015	Torrance, D.	Qual															
27	2016	Hovardas, T.	Mixed	2	2	N/A	2	N/A	N/A	N/A	2	N/A	2	N/A	0	2	2	**0,9**
28	2018	Criswell, G.T.; Rushton, G.T.; Nachtigall, D.; Staggs, S.; Alemadar, M.; Capelli, C.	Qual															
29	2018	Palmer, D.K.	Qual															
30	2014	Jacobs, J.; Beck, B.; Crowell, L.	Qual															
31	2014	Yow, J.A.; Lotter, C.	Qual															
32	2018	Cheung, A.C.K.; Keung, C.P.C.; Kwan, P.Y.K., Cheung, L.Y.S.	Quan	2	2	0	2	N/A	N/A	N/A	2	2	2	2	0	2	2	**0,8**
33	2017	Leaf, A.; Odhiambo, G.	Qual															
34	2017	Sean Smith, P.; Hayes, M.L.; Lyons, K.M.	Qual															
35	2014	Lee, Y.L.	Quan	2	2	2	2	N/A	N/A	N/A	2	N/A	0	0	0	2	2	**0,7**
36	2015	Menlo, A.	Quan	2	2	0	0	N/A	N/A	N/A	0	0	0	N/A	0	0	0	**0,2**
37	2014	Kilinc, A.C.	Quan	2	2	2	2	N/A	N/A	N/A	2	N/A	2	2	0	2	2	**0,9**
38	2014	Aliakbari, M.; Sadeghi, A.;	Quan	2	2	N/A	2	N/A	N/A	N/A	2	N/A	2	2	0	2	2	**0,9**
39	2016	Al-Zboon, E.	Mixed	2	2	2	2	N/A	N/A	N/A	0	2	2	2	0	2	2	**0,8**
40	2015	Hairon, S.; Goh, J.W.P; Chua, C.S.K.	Qual															
41	2016	Wang, T.	Qual															
42	2016	Cheng, A.Y.N.; Szeto, E.	Qual															
43	2016	Lu, Y. Y.; Chen H.T.; Hong, Z.R.; Yore, L.D.	Mixed	2	2	2	2	N/A	N/A	N/A	2	N/A	2	0	0	2	2	**0,8**
44	2016	Öqvist, A.; Malmström,.	Qual															
45	2016	Reeves, T.D.; Lowenhaupt, R.J.	Mixed	2	2	2	0	N/A	N/A	N/A	2	N/A	N/A	N/A	0	2	2	**0,8**
46	2014	Botha, R.J.	Qual															
47	2015	Kilinc, A.C.; Cemaloglu, N.; Savas, G.	Quan	2	2	0	2	N/A	N/A	N/A	2	N/A	2	0	0	2	2	**0,7**
48	2017	Stout, R.M.; Cumming-Potvin, C.; Wildy, H.	Mixed	2	0	0	0	N/A	N/A	N/A	0	N/A	N/A	N/A	0	0	2	**0,3**
49	2016	Greenier, V.T.; Whitehead, G.E.K.	Qual															
50	2018	Öqvist, A.; Malmström, M.	Quan	2	2	2	2	N/A	N/A	N/A	2	N/A	2	2	2	2	2	**1,0**
51	2017	Boe, M.; Hognestad, K.	Qual															
52	2016	Sales, A.; Moliner, L.; Amat,.F.	Qual															
53	2017	Sinha, S.; Hanuscin, D.L.	Qual															
54	2016	Yuet, F.K.C.; Yusof, H.; Mohamad, S.I.S.	Quan	2	2	2	0	N/A	N/A	N/A	2	N/A	2	N/A	NA	2	2	**0,9**
55	2017	Javadi, V.; Bush, T.; Ng, A.	Qual															
56	2016	Huang, T.	Qual															
57	2016	Good, A.J.; Petty, T.M.; Handler, L.K.	Qual															
58	2018	Holloway, J.; Nielsen, A.; Saltmarsh, S.	Qual															
59	2015	Supovitz, J.	Qual															
60	2018	Woods, P.A.; Roberts, A.	Qual															
61	2017	Searby, L.; Browne-Ferrigno, T.; Wang, C.	Mixed	2	0	2	2	N/A	N/A	N/A	0	N/A	0	0	0	2	2	**0,5**
62	2018	Alemar, M.; Capelli, C.J.; Criswell, A.; Rushton, G.T.	Qual															
63	2015	Lai, E.; Cheung, D.	Qual															
64	2016	Cooper, K.S.; Stanulis, R.N.; Brondyk, S.K.; Hamilton, E.R.; Macaluso, M.; Meijer, J.A.	Qual															
65	2018	Nguyen, T.D.; Hunter, S.	Qual															

66	2018	Polizzi, S.J.; Head, M.; Barret-Williams, D.; Ellis, J.; Roehrig, G.H.; Rushton, G.T.	Qual															
75	2017	James, S.; Huang, H.; Allensworth, E.	Quan	2	2	2	0	N/A	N/A	N/A	2	2	0	2	2	2	2	**0,8**
76	2018	Reid, S.	Mixed	0	2	2	0	N/A	N/A	N/A	0	N/A	N/A	N/A	0	0	2	**0,4**
77	2016	Allen, L. Q.	Mixed	0	0	2	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0	0	**0,1**
78	2018	O'Donovan, M.	Qual															
79	2018	Collay, M.	Qual															
80	2015	Conway, J.M.; Andrews, D.	Mixed	0	2	2	0	N/A	N/A	N/A	0	N/A	0	N/A	0	0	0	**0,2**
81	2017	Boyce, J.; Browers, A. J.	Quan	2	2	2	0	N/A	N/A	N/A	2	2	2	N/A	N/A	2	2	**0,9**
82	2017	Zhang, Y.; Henderson, D.	Qual															
83	2017	Von Esch, K. S.;	Qual															
84	2014	Jacobs, J.; Crowell, L.	Qual															
85	2018	Chukowry, D.M.C.;	Qual															
86	2015	Gilles, C.; Wang, Y.; Fish, J.; Stegall, J.	Qual															
88	2014	Lin, W.; Lee, M.; Riordan, G.	Mixed	0	2	2	0	N/A	N/A	N/A	2	2	0	0	0	2	0	**0,5**
89	2016	Hite, R.; Milbourne, J.	Qual															
90	2018	Timor, T.	Mixed	2	2	0	0	N/A	N/A	N/A	2	N/A	N/A	N/A	0	2	0	**0,5**
91	2018	Biggs, E.E.; Gilson, C.B.; Carter, E.W.	Qual															
92	2018	Tsai, K.C.	Quan	2	0	0	2	N/A	N/A	N/A	2	N/A	2	N/A	N/A	2	2	**0,8**
93	2016	Lowery-Moore, H.; Latimer, R.M.; Villate, V.M	Qual															

*Mixed = mixed methods; Qual = qualitative, Quan = quantitative; C1 = Criteria 'Research Question'; C2 = Criteria 'Study Design'; C3 = Criteria 'Method Appropriate'; C4 = Criteria 'Subjects'; C5 = Criteria 'Random allocation'; C6 = Criteria 'Blinding investigator; C7 = Criteria 'Blinding subjects'; C8 = Criteria 'Outcomes'; C9 = Criteria 'Sample size'; C10 = Criteria ''Analysis'; C11 = Criteria 'Estimates of Variance'; C12 = Criteria 'Confounders'; C13 = Criteria 'Results'; C14 = Criteria 'Conclusions'.

Appendix C. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.edurev.2020.100352 and open ac cess on line: https://osf.io/xpkrc/?view_only = ef42279d766249ab888ecc45eee21848.

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