How has teaching effectiveness been conceptualized? Questioning the consistency between definition and measure

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Teaching effectiveness (TE) research impacts educators and their careers, learners and the quality of education they receive, and administrators and the organizations they safeguard. However, there is a lack of consistency in how TE has been conceptualized: many papers used inaccurate or implied definitions of TE, or despite discussing and often measuring TE, did not define TE—other papers defined TE without proposed measures or provided measures of the concept without defining it. We found two dimensions of TE, student-focused (outcome) and educator-focused (input), and an existing TE definition evaluated as the strongest for both dimensions. Further, TE measurements may be summarized in five categories: student evaluation of teaching effectiveness (SETE), objective measures, peer review, administrative evaluation, and self-reflection. To conceptualize TE, our findings suggest pairing the TE student-focused construct with SETE and objective measures, while the educator-focused dimensions of TE should be measured with peer review, self-assessment, and administrator evaluation. By consistently conceptualizing TE, researchers may contribute to rigorous research and work together to consistently add to the body of knowledge, thus furthering the quality of TE research.

KEYWORDS

teaching effectiveness, conceptualization, student evaluation, teacher evaluation, research quality

1. Introduction

Teaching effectiveness (TE) research impacts educators and their careers, learners and the quality of education they receive, and administrators and the organizations they safeguard. However, a lack of consistency exists in how TE has been conceptualized (defined and measured) [Lewis (1999), as cited by Stronge et al. (2011)] for the TE construct and its dimensions (educator and student foci). Thus, a lack of consistent definition and measurement of the TE construct and its dimensions may have harmed the progress of the TE body of research and educators, learners, administrators, and organizations.

Teaching may be formal or informal, mandated by law or optional, where the standards may vary depending on the teacher or learner's geographic location, demographic characteristics, and technology constraints. Just as teaching and learning have been categorized into broad categories, effective teaching practices' assessment(s) were also broad. TE has often been assessed through student achievement of learning outcomes (Boeker et al., 2013; Balakrishnan et al., 2021) and student perception (Hessler et al., 2018). The evaluation of an educator's TE was used in the tenure and promotion process (Staiger and Rockoff, 2010), subsequently affecting career

plans (Johnson et al., 2012), and stress management (Roeser et al., 2012). Similarly, administrators evaluate TE and implement best practices from successful charter schools in lower-income communities (Fryer, 2014), managed unintended consequences of student evaluation of TE, such as grade inflation (Stroebe, 2016), and considered implementing interventions to mitigate gender bias in educator ratings (Peterson et al., 2019). The implications of TE on policy choices have been plentiful, wide-ranging, and often with significant consequences.

While much literature exists, an agreed-upon conceptualization (i.e., definition and measurement) of TE does not exist (Campbell et al., 2004). The lack of defining TE and the inconsistency in measuring may have been detrimental to TE research and thus harmful to teaching, education, and training practices. We seek to fill that gap and address the larger question, "How has TE been conceptualized?" with three lines of inquiry: conceptualization of a construct, definition of TE, and measurement of TE. Through this paper, we argue for pairing an existing strong definition of TE with educator-focused (input) and student-focused (outcome) measures of TE.

1.1. Operationalization of TE

In social sciences, an event may be studied when a concept is operationalized; through that transformation, a theoretical hypothesis may be transformed into an empirical one (Gavard-Perret et al., 2008). Mackenzie notes that appropriate definitions should specify the constructs' conceptual domain, be clear and definitive, consistent with existing scholarship, and be distinguishable from other constructs (MacKenzie, 2003). The definition (MacKenzie, 2003) and the measurement (Churchill, 1979) must first be determined to operationalize the construct.

Nielsen (2014) suggested that each theory has two components of equal importance: measurement and description (i.e., definition). He criticized management scholars for being "predominantly preoccupied with the latter – often at the expense of the former" and encouraged scholars to "pay more attention to measurements issues in general, and construct validity, appropriateness of measurement across contexts, as well as the matching of measurement to theory" (p.405). The operationalization of a concept, in this case, TE, allowed for its empirical testing (Gavard-Perret et al., 2008); thus, defining the construct is imperative when contributing to scholarship (MacKenzie, 2003). Churchill (1979) suggested that a valid construct should specify its domain, such that a definition involves "attributes of objects that are measured and not the objects themselves" (p.65). A good construct definition should specify its conceptual theme, provide clear, unambiguous terms, be consistent with previous scholarship, and differentiate itself from related constructs (MacKenzie, 2003).

1.2. TE definition

Despite the importance and age of the concept, there has yet to be a consensus on how to define TE (Mastrokoukou et al., 2022). Young and Shaw (1999) observe the lack of clarity regarding a single, generally agreed-upon definition of TE. In *Profiles of Effective College and University Teachers*, the authors discuss "whether it [TE] might

be defined in multiple ways, and if so, how it might be defined" (p.670). Yet, Young and Shaw's methods focused solely on defining TE from the perspective of student evaluation of TE, thus capturing only one aspect of measuring TE.

When seeking to determine what TE is, O'Neill (1988, p.162) suggested researchers may look to the elements that contribute best to student learning, specifically the "teaching methods, under what conditions, with what students, in what subject areas, and at what grade levels contribute most effectively to student achievement." There appears to be a common acceptance amongst scholars that a positive correlation exists between TE and student learning (Ding and Sherman, 2006).

Liu et al. (2022) did not define TE, though did reference their prior works about how to teach more effectively. Barnes (2000) used operational definitions to define TE: "Keeps an effective lesson pace. Minimizes time between events, makes smooth transitions," "Supports and encourages the best efforts of students *Maintains a positive tone in the class/lesson*," and "Controls and varies speech speed *The speech speed is not static*" [Hamann and Baker (1998), as cited by Barnes (2000), p.6)]. In addition, Barnes measured TE without adequately defining the concept. She is not alone in this approach, as researchers have published measures (of TE) without defining them (Becker, 2006; Blanchard et al., 2010).

1.3. TE measurement

There has been a lack of consensus in the literature on measuring TE. "Teacher quality is a complex phenomenon, and there is little consensus on what it is or how to measure it" [Lewis (1999), para. 3, as quoted by Stronge et al. (2011)]. Some research has been published with a combination of measures ("multiple measurements") (e.g., Cinnamon et al., 2021; Lohman, 2021; Taylor et al., 2021), while some papers chose not to measure TE even though they were writing about TE (e.g., Voogt et al., 2013; Huang et al., 2015).

The lack of defining TE and the inconsistency in measuring may have harmed TE research's progress and quality. It is through this paper we argue for pairing an existing strong definition of TE with educator-focused (input) and student-focused (outcome) measures of TE.

2. Materials and methods

To understand how to conceptualize TE, we analyzed recent and relevant publications for their definitions and measurements of TE. Education is both a discipline of its own and a sub-discipline of other disciplines (e.g., mathematics education). We sought guidance from the information systems discipline to effectively organize various disciplines' research. We followed information systems scholar Okoli's (2015a) guidance, a collection and synthesis of other information scholars' systematic literature guides, in *A Guide to Conducting a Standalone Systematic Literature Review* where we identified the purpose, drafted the protocol and trained the team, applied practical screening, searched for literature, extracted data, appraised quality, synthesized studies, and wrote the review.

Our process was as follows. First, we identified the purpose and reviewed the available literature on "teaching effectiveness" to assess

FIGURE 1
Data collection process.
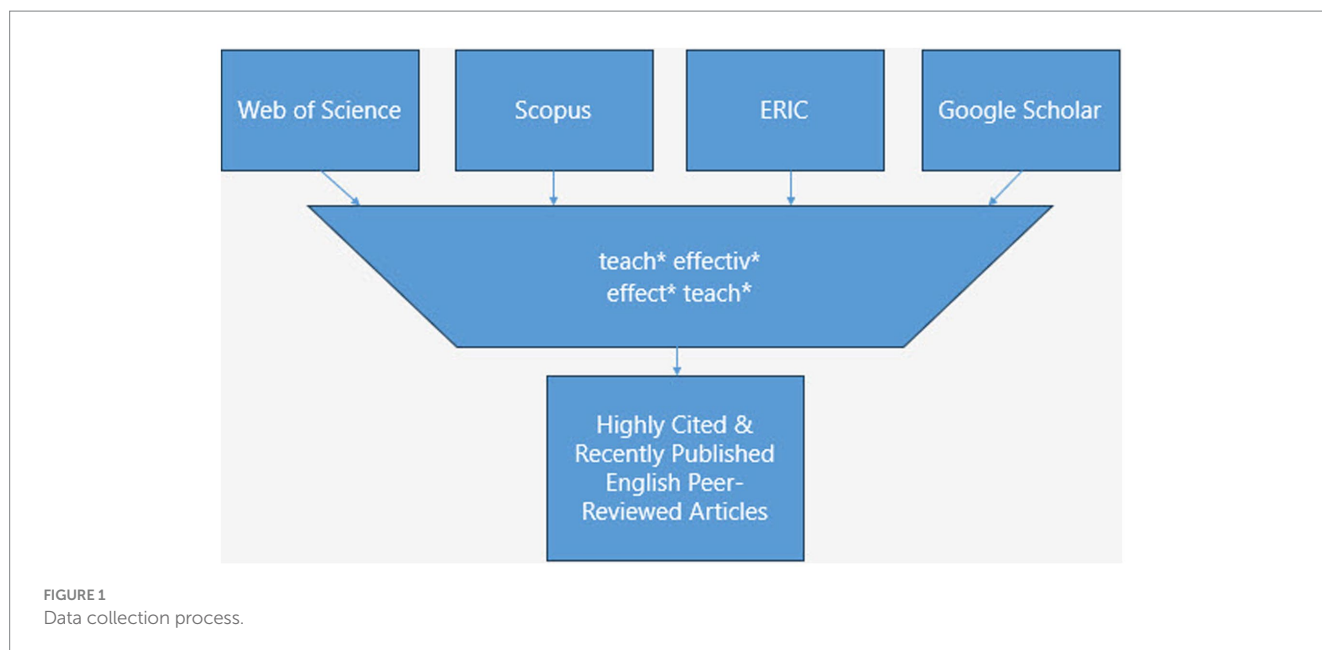
how the most recent and relevant literature defines and measures TE. Next, we drafted the protocol described below and trained the team. A master spreadsheet with results was maintained and the authors selected and obtained the publications for data collection and data extraction.

2.1. Data collection

To collect our data, we applied a practical screen. Due to practical limitations (e.g., the first author's language proficiency), only papers published in English were included. As the research aimed to conceptualize TE, we focused our search on scholarly peer-reviewed publication journals. Subsequently, we searched for literature using the Web of Science (WoS), Scopus, Education Resource Information Centre (ERIC) and Google Scholar, focusing on papers published from 1980 to 2023 to retrieve high-quality peer-reviewed journal articles containing "teach* effective*" or "effect* teach*" in the title, abstract, or keywords which were either the most cited or most cited in recent years. The asterisk represents the software's ability to search any key term that includes "teach" when paired with "effective." Figure 1 outlines our data collection process. We received 5,259 results from WoS. After filtering for journal articles, there were 3,056 journal articles and no non-English publications to remove. We sorted by most relevant and recently published and removed duplicates, collecting 109 peer-reviewed publications. To add robustness to our corpus, we added the most relevant results from Scopus, ERIC, and Google Scholar for 143 peer-reviewed papers.

2.2. Data extraction

Data extraction followed. We leveraged the extraction process (Okoli, 2015a) used. First, the primary author reviewed all papers collected, extracted the definitions of TE, and recorded how each study measured TE. To complete this extraction, the full publications

were reviewed for the definition of TE; the abstracts, then the entire publication (when necessary), were reviewed for their measurement of TE. Where present, we extracted their TE definitions and measurements. The measurement types were then categorized into themes and re-coded using these themes.

The RA independently replicated this process with one exception: they received a list of coded themes to document the measurement types. The co-author "arbitrated" any differences between the primary author and RA in the papers' extracted definitions and measurement categorizations. For example, some papers had partial TE definitions or defined a related construct (e.g., learning effectiveness). Only once two research team members (i.e., the primary author and RA, or one of the primary author or RA and co-author) agreed with the TE definition and measurement extraction (or exclusion) from each paper were the results finalized. Figure 2 outlines our data extraction process.

2.3. Data analysis

During our analysis, we evaluated TE definitions from our extracted data and looked at the relative representation of TE measures in papers that defined TE. Due to the variance in how TE was defined in the literature, we sought guidance from how the English language defines a definition. We generously interpreted the word "definition" from Merriam-Webster: "a statement of the meaning of a word or word group or sign or symbol"[1] and the Britannica Dictionary: "an explanation of the meaning of a word, phrase, etc."[2]

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1 Accessed 7 Aug 2022 from https://www.merriam-webster.com/dictionary/definition

2 Accessed 24 Sep 2022 from https://www.britannica.com/dictionary/definition
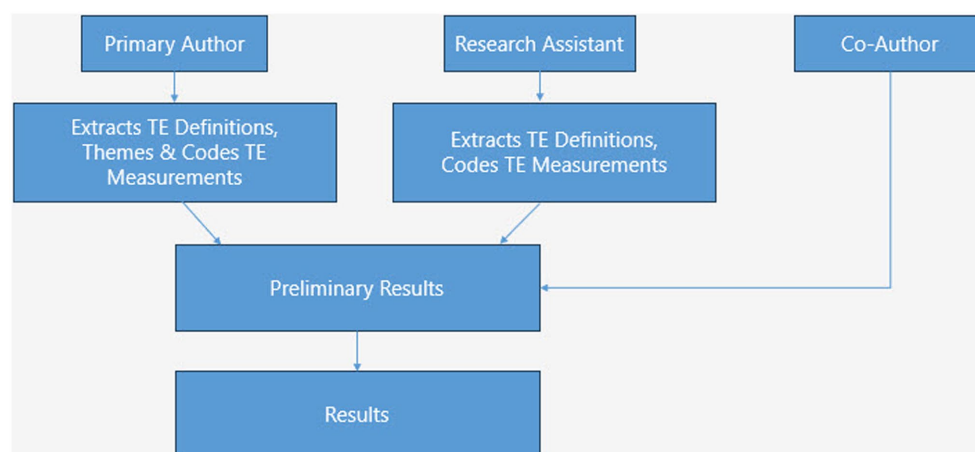
FIGURE 2
Data extraction process.

To determine the quality of our findings of TE definitions in our target papers, we applied MacKenzie's (2003) applicable three criteria of a "good definition" (specified conceptual theme, clear terms, and consistent with previous research), which were clearly distinguished from other constructs, as summarized in Table 1. We used the SCImago[3] (SCI) Journal Rankings to understand the area of discipline of the journal and analyzed the definitions according to their foci (educator and/or student). We synthesized the studies and wrote our review in this paper's Results and Discussion sections. Following argument-crafting guidance from Okoli (2015b), we wrote our discussion to offer a theoretical contribution to the literature.

3. Results

3.1. Defining teaching effectiveness

In our corpus, we found only nine of the 143 papers defined TE, though some papers discussed constructs close to TE, such as teacher effectiveness (Goldhaber and Anthony, 2007 p.135; Sass et al., 2012 p.43), learning effectiveness (Kuo et al., 2022; Vlachogianni and Tselios, 2022; Walinski et al., 2023) and academic performance (Gumasing et al., 2023). Some studies discussed learning experiences (Campbell et al., 2004), and found TE was dependent, in part, on (an educator's) personality traits (Renaud and Murray, 1996), while others analyzed student personality in relation to TE (Yunker, 1983). Thus, our review demonstrates that effective teaching is multidimensional, consistent with Pan and colleagues, who said, "understanding the multidimensionality of effective teaching is essential when validating

instruments and interpreting final ratings of different teaching approaches" (Pan et al., 2021 p.3).

In our literature review, the concept of teacher effectiveness emerged as a related but different concept. Sass et al. (2012 p.431) define teacher effectiveness as "…teacher effectiveness can therefore be interpreted as the impact of a teacher on student learning gains…" while Goldhaber and Anthony (2007), define teacher effectiveness as "teachers' contributions toward student gains in achievement." Both definitions focus on the impact of one type of teaching intervention (i.e., the teacher) on student learning. Definitions of teacher effectiveness observed in our corpus are like the TE definitions observed. However, with the distinction of the teacher (in teacher effectiveness) as the antecedent to learning (versus a broader, less defined antecedent of learning when we observed TE definitions). While a teacher and their effectiveness may always appear to be integrated with TE directly, an organization or program may evaluate TE using both the TE construct and its teacher effectiveness sub-dimension.[4] Thus, Teacher effectiveness may be a sub-dimension of TE. As such, we have analyzed both TE and teacher effectiveness in Table 1.

We noted that papers that defined TE and teacher effectiveness were from the Education (4), Economics and Econometrics (3), and Physical Therapy, Sports Therapy and Rehabilitation (2). Curiously, of the papers that defined TE and teacher effectiveness, only Galbraith et al. (2012), Rink (2013), and Adnot et al. (2017) quote other papers' definitions of TE and teacher effectiveness, while Goldhaber and Anthony (2007), Sass et al. (2012), Philip and Garcia (2013), Reynolds et al. (2014), and Boring et al. (2016) all developed their own definitions of TE and teacher effectiveness. Table 1 provides a summary of definitions collected.

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3 "The SCImago Journal & Country Rank is a publicly available portal that includes the journals and country scientific indicators developed from the information contained in the Scopus® database (Elsevier B.V.). These indicators can be used to assess and analyze scientific domains. Journals can be compared or analysed separately" SJR − About Us (scimagojr.com).

4 For example, *Chartered Professional Accountants Western School of Business* (Taylor et al., 2023) use SETE surveys to evaluate TE. They survey students on three distinct areas: learning environment (location), teacher performance (instruction), and content (materials). Thus, their measurement of TE, in part, includes a measurement of teacher effectiveness as a part of the School's measurement of TE.

TABLE 1 Evaluation of target paper definitions as "good" definitions.

Author(s)	Context	Definition of TE	TE Dimension	SCI (n.d.) Category	Specified conceptual theme?[a]	Clear terms?	Consistent with previous research?[b]	Measurement
Galbraith et al. (2012), p.357	Higher education, Business	"We take teaching effectiveness to be the degree to which one has facilitated student achievement of education goals (McKeachie, 1979; p.385)"	Educator-focused; Student-focused	Education	Yes	Yes	Yes	SETE
Ward (2013), p.431	Unspecified grade level, implied primary and secondary school, Physical Education	"…teaching effectiveness is defined in terms of student learning"	Educator-focused; Student-focused	Physical therapy, sports therapy and rehabilitation	Yes	No	No	Student objective
Boring (2017), p.33	Higher education, Multiple disciplines	"…teaching effectiveness can be defined as how successful professors are in helping students learn"	Educator-focused; Student-focused	Economics and econometrics	Yes	Weak	Yes	SETE & student objective
Reynolds et al. (2014), p.214	Primary and secondary education (Grades 1–12), Education effectiveness research	"…teaching effectiveness is seen as a multi-dimensional construct and a variable factor rather than a universal 'given'"	No focus	Education	Yes	No	No	No measure
Adnot et al. (2017), p.56	Primary education (public schools), Grades 4–8	"…more effective teachers* can dramatically improve students' short- and long-run life outcomes (Rockoff, 2004; Rivkin et al., 2005; Aaronson et al., 2007; Jackson, 2012; Chetty et al., 2014)"	Not applicable	Education	Weak	No	Not applicable	Student Objective (Student achievement)
Goldhaber and Anthony (2007), p.135, footnote 8	Primary education (Grades 3–5)	"We discuss teacher effectiveness* in this paper in terms of the teachers' contributions toward student gains in achievement"	Not applicable	Economics and Econometrics	Weak	Yes	Not applicable	Student objective (academic achievement)
Sass et al. (2012), p.431	Primary education (Grades 3–5)	"…teacher effectiveness* can therefore be interpreted as the impact of a teacher on student learning gains…"	Not applicable	Economics and Econometrics	Weak	Yes	Not applicable	Student objective

(Continued)

TABLE 1 (Continued)

Author(s)	Context	Definition of TE	TE Dimension	SCI (n.d.) Category	Specified conceptual theme?[a]	Clear terms?	Consistent with previous research?[b]	Measurement
Philip and Garcia (2013), p.308	Unspecified grade level, implied secondary education; Technology	"Effective teachers* are essential in differentiating, orchestrating, and negotiating students' individual and collective interests and capacities, whether technological or not, to support their academic and holistic growth over time."	Not applicable	Education	Weak	Yes	Not applicable	Student objective (student achievement)
Rink (2013), pp.407–08	Primary and secondary education (Grades 1–12), Physical Education	"Medley (1979) traced the development of conceptions of teacher effectiveness* up to that point as: (a) the possessor of desirable personal traits, (b) the user of effective methods, (c) the creator of a good classroom climate, (d) the master of a repertoire of competencies, and (e) the professional decision maker"	Not applicable	Physical therapy, sports therapy and rehabilitation	Weak	Weak	Not applicable	Student objective (observation – student achievement)

*These definitions refer to teacher effectiveness (not teaching effectiveness).[a]"…a good conceptual definition should specify the underlying theme that ties the exemplars together" (MacKenzie, 2003, p. 325). As such, a paper whose TE definition is tied to a paper's theme directly by the author was declared a "Yes" classification; those who implied it were classified as "Weak," and if papers had not attempted to tie to a conceptual theme to the definition, they would have been classified as "No".
[b]Definitions were classified as "Yes" when they were consistent with earlier definitions of TE in our corpus, "Not applicable" if they were definitions for teacher (not teaching) effectiveness, and "No" when not consistent with earlier definitions of TE in our corpus.

There exists a variety of TE definitions in the literature. Galbraith et al. (2012, p.357) quotes McKeachie (1979, p.385) when defining TE: "We take teaching effectiveness to be the degree to which one has facilitate student achievement of education goals." Ward (2013, p.431) says, "teaching effectiveness is defined in terms of student learning." This perspective leads to more questions because while many authors attempted to say what learning was (i.e., growth, achievement), Ward did not.

When evaluating the foci, we noted the TE definitions had both student and educator foci (Galbraith et al., 2012; Ward, 2013; Boring, 2017). Because Goldhaber and Anthony (2007), Sass et al.'s (2012), Philip and Garcia (2013), Rink (2013), and Adnot et al. (2017) definitions were for a similar construct (teacher effectiveness), we classified their foci as "not applicable," while Reynolds et al. (2014) did not have a focus.

After applying Mackenzie's (2003) criteria in Table 1, we observed one of the nine definitions, Galbraith et al.'s (2012) paper quoting McKeachie (1979), was rated higher, in some instances significantly higher than the other definitions in our corpus, suggesting that McKeachie proposed the most appropriate definition of the TE construct.

3.2. Measuring teaching effectiveness

TE can be measured using student evaluation of teaching effectiveness (SETE), objective measures (objective), self-assessment, administrator evaluation (administrator), and peer review.

Student-focused measures for TE include SETE (Wilson, 1986; Renaud and Murray, 1996) and student objective evaluation. Objective measures include class means (McKeachie et al., 1971; Ni, 2013). Some papers measure TE with single measure of SETE (Hiebert et al., 2007; Allgood et al., 2015), while other papers include SETE as a part of multiple measures (Boring, 2017), use SETE to develop a conceptual

model (Hargreaves, 1999) orin a case study (Esquembre, 2004). The papers analyzed that measured TE solely by SETE included various contexts such as business education (Paul et al., 2012), e-learning (Wang, 2003), and medical education (Rosen et al., 1993; Moraros et al., 2015).

Objective measures of TE include observer measures (Howes, 1997; Rink, 2013), proxies of care through subject improvement (Suri and Schultz, 1999; Ramani and Leinster, 2008), post-test results (Holcomb et al., 2002; Blanchard et al., 2010), and other objective measures of academic achievement (Hallinger et al., 2014; Bowers, 2016). Specific measures include the Protocol for Language Arts Teaching Observation (Grossman et al., 2014), student academic and behavioral outcomes (Espelage et al., 2013), changes between measurements using pre- and post-test results (Holcomb et al., 2002; Blanchard et al., 2010), and test scores and attendance (Holcomb et al., 2002).

The educator-centered measurements include administrator evaluation, self-assessment, and peer review. Administrator evaluation as a measurement of TE was used in *Medical Interviewing and Interpersonal Skills Teaching in United-States Medical-Schools-Progress, Problems, and Promise* (Novack et al., 1993), and in combination with other measures including objective (Jacob and Lefgren, 2008; Staiger and Rockoff, 2010), self-assessment (Price, 2012; Sobaih et al., 2016), and both peer review and objective (Fryer, 2014). Similarly, both self-assessment and peer-review measures are paired with other measures of TE. Self-assessment has been measured alongside SETE (Butler, 2012), objective (Rockoff et al., 2011; Hamre et al., 2012), and administrator evaluation (Price, 2012; Roeser et al., 2012), and peer review has been paired with administrator evaluation and objective measures (Fryer, 2014). No researchers in our corpus had used the TE measures self-assessment and peer-review on their own to measure TE, though some (Chen et al., 2021; Taylor et al., 2021; Hamann et al., 1998; Lohman, 2021; Baum and Brown, 1980; Centra, 1994) use these evaluations in combinations with SETE. Consequently, we consider that these measures, taken alone, measure Teacher Effectiveness which is another concept.

TE has been measured using a combination of student- and educator-focused measures, such as administrator evaluation and student objective measures (Jacob and Lefgren, 2008; Roeser et al., 2012). Some papers have chosen not to measure TE, including in review articles (Ashton, 1984; Reynolds et al., 2014), whilst developing a conceptual model (Srinivasan et al., 2011), and in a case study (Esquembre, 2004).

3.3. The TE construct

Table 1 outlines the variations of papers that define TE, whether each paper leveraged existing literature or created their own definition, an evaluation of the strength of their definitions, and how each paper that defined TE measured TE. For example, Galbraith et al.'s (2012) TE definition had both student and educator foci and measured TE using SETE, while Ward's (2013) TE definition had the same dual foci and used student objective measurements for TE.

We observed three papers have both student and educator foci (Galbraith et al., 2012; Ward, 2013; Boring, 2017), one paper appears to not have a focus while five papers were deemed to not be applicable as they defined teacher effectiveness (Goldhaber and Anthony, 2007;

Sass et al., 2012; Philip and Garcia, 2013; Rink, 2013; Adnot et al., 2017).

Also outlined in Table 1, SETE represented 22.2% of papers, Student Objective Measures were at 77.8% while 11.1% of papers that defined TE did not measure it. Of note, 11.1% of papers contained multiple measures of SETE and Student Objective Measures, hence our representation of measurements exceeds 100%.

Contexts in our observations included Higher Education (Galbraith et al., 2012; Boring et al., 2017), Unspecified (Philip and Garcia, 2013; Ward, 2013), and Primary and/or Secondary Education (Goldhaber and Anthony, 2007; Sass et al., 2012; Rink, 2013; Reynolds et al., 2014; Adnot et al., 2017).

Existing literature appears to be conflicted when determining how definitions and measurements of TE are paired to create a construct. As such, we conclude with an evaluation of the TE construct where we argue for pairing an existing strong definition of TE with educator-focused (input) and student-focused (outcome) measures of TE.

4. Discussion

The literature often does not define TE, even when measuring it. When defining TE, there is neither an agreed-upon definition nor a common paper or cluster of papers cited for its creation. Most papers we analyzed did not define TE (e.g., Price, 2012; Fryer, 2014) and had a variety of multiple measures of TE (e.g., Rivard, 1994; Price, 2012), while some review papers did not define or measure TE (Collins, 2004; Leslie et al., 2013). Interestingly, some measures (self-assessment and peer review) were not observed independently in our corpus but were present alongside the SETE measure. This suggests that self-assessment and peer review should be used with other TE measures. For example, in *Using Multiple Measures of Teaching Quality to Improve the Preparation of Urban Teachers* (Quartz et al., 2017) presented a case where Eduardo, a student teacher, was meeting with his classroom mentor to discuss and reflect on feedback Eduardo had received from peer review and student objective data. Thus, using peer review and self-assessment TE measures alongside an objective TE measure such that Eduardo could improve his teaching effectiveness.

Our review is consistent with Reynold et al. (2014, p.214) who saw TE as "a multi-dimensional construct and a variable factor rather than a universal 'given'" when discussing TE in a primary and secondary education context, and Mastrokoukou et al. (2022) who found in their scoping review of TE in higher education that a single agreed-upon definition of TE did not exist. As such, our research extends Reynold et al. (2014) and Mastrokoukou et al. (2022) findings to pair an existing strong definition of TE with educator-focused (input) and student-focused (outcome) measures of TE.

4.1. Conceptualization of a construct

The prevailing omission when discussing and measuring TE without defining it could be due to "Obliteration by Incorporation" or OBI. Merton (1988, p.622) defines OBI as: "the obliteration of the source of ideas, methods, or findings by their being anonymously incorporated in current canonical knowledge." Examples of OBI include the terms "role model," "deconstruction," and "self-fulfilling prophecy".

TE literature has been derived both from the discipline dedicated to the study of teaching (education) and sub-disciplines of teaching, education, and training within each discipline (e.g., accounting education, medical education, computer science education). Our results reflect the mix of education and sub-disciplines contributing to the literature on TE. One possibility is that TE is rarely defined as a construct because it has been "obliterated" by its "incorporation" in all disciplines. Regardless of the reason, the failure to define TE could, in part, be responsible for the lack of a universally accepted measurement for TE (Nielsen, 2014). Similar to TE, as summarized in Table 1, we found that constructs related to TE also had no true definition.

The lack of defining TE and the inconsistency in measuring it may have been detrimental to TE research and thus have a negative effect on teaching, education, and training practices and this interference could impede TE research. Separating the two foci into separate dimensions of TE is consistent with how the measurements are presented in the literature. Sánchez-Cabrero et al. (2021) found the most central factor in teaching quality was related to teachers and their training while student-focused measures are commonly used by universities to evaluate teaching quality (Chau and Vien, 2020). Therefore, we propose pairing an appropriate TE definition with each of the student-focused (results-oriented) or educator-focused (process-oriented) dimensions.

We allocate appropriate definitions to their TE dimension in Table 1. Cohen (1981, p.281) shares, "[TE can be] operationalized as the amount students learn in a particular course." While McKeachie's (1979) definition of TE, as used by Galbraith et al. (2012), may appear similar to Cohen's, it has one distinction: McKeachie operationalizes TE as the facilitation of student achievement of educational goals, whereas Cohen quantifies effective teaching as an amount. This distinction suggests that measuring how much a student learns is best supported by objective measurement of TE, while the facilitation students receive towards that objective achievement may be best assessed via SETE.

When self-assessment, administrator evaluation, and peer review are used to measure TE, it is often done in combination with other TE measures [e.g., Cinnamon et al. (2021) who used objective data (observation) and self-assessment to measure the TE of a new professional development intervention], and is consistent with Reynolds et al. (2014, p.214), "teaching effectiveness is seen as a multi-dimensional construct and a variable factor rather than a universal 'given'" and Berk (2005), p.49, "unified conceptualization of teaching effectiveness, whereby evidence is collected from a variety of sources to define the construct and to make decisions about its attainment". We found McKeachie's (1979) TE definition also fits the educator-focused dimension of TE.

We recommend pairing TE dimension with appropriate TE measurements. Specifically, the student-focused dimension should be paired with student-focused measurements (SETE[5] and objective), while the educator-focused dimension may be definition should be paired with educator-focused TE measurements (peer review, administrator evaluation, and self-reflection). We observed in Table 1 that SETE has been used to evaluate TE and teacher effectiveness exclusively in higher education, with no instances in primary or

secondary education contexts. Similarly, Wei et al. (2023) found that one observation (out of 54 articles reviewed) used SETE to measure teacher effectiveness in primary and secondary education. As such, we recommend removing the SETE measure when evaluating TE in primary or secondary education contexts. Furthermore, we qualify the use of self-assessment and peer review as appropriate to be used in combination with at least one other TE measurement method, and suggest SETE should be used in conjunction with at least one other method when evaluating educator performance. Thus, by pairing the specific dimensions of the TE construct, we provide student-and-educator-focused TE constructs in line with MacKenzie's (2003) definition of a good construction.

The SETE measure has been problematic throughout the literature. Student evaluations may be gender-biased (Boring et al., 2016; Boring, 2017; Fan et al., 2019), culture-biased (Fan et al., 2019), impacted by "illusions of learning" (e.g., experiences that minimize effort, increase the appearance of fluency, engagement, and enthusiasm) (Carpenter et al., 2020), and impacted by grade expectations (Boring et al., 2016). In their paper titled *Availability of cookies during an academic course session affects evaluation of teaching* (Hessler et al., 2018) found the availability of cookies during the student's evaluation of TE to have a significant effect on course evaluation. Despite these drawbacks and research suggesting institutions abandon SETEs (Uttl et al., 2017), SETEs are still used to measure TE. As such, we recommend when using SETE to evaluate educator performance [e.g., for tenure and promotion (Staiger and Rockoff, 2010)], it should be paired with at least one other TE measurement.

4.2. Contributions

To ensure the quality of TE research and contributions to the field, TE must be accurately defined and appropriately measured. Pairing an appropriate definition and measurements for each of the student-and-educator-focused dimensions allow for appropriate TE constructs and enhance the quality of TE research. Such constructs effectively address the question, *How is teaching effectiveness conceptualized?* And contribute to the academy, educators, administrators, and institutions such that our collective efforts may improve the research impacting students, teachers, and administrators and related organizations.

Our research makes several contributions to the literature. First, we recommend the strongest TE definition by McKeachie (1979, p.385), "we take teaching effectiveness to be the degree to which one has facilitated student achievement of educational goal." Next, we separate TE into two dimensions: student-focused (outcome) and educator-focused (input) and find that McKeachie's (1979) TE definition speaks to both educator and student foci, thus recommend their TE definition applies to both student-focused (outcome) and educator-focused (input) dimensions. Lastly, we identify and separate the literature into five types of measurements of TE, SETE, objective, peer review, administrative evaluation, and self-reflection, and sort them as either student- or educator-focused measures of TE. We find that when conceptualizing TE, student-focused measurements (SETE[5] and objective) should be paired with student-focused definition of TE, and educator-focused measurements (peer review, administrator evaluation, and self-reflection) paired with our educator-focused definition of TE, as summarized in Table 2.

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5   Exclude when in primary and secondary school contexts.

TABLE 2 Definition, measures, and Foci of TE.

Definition of TE	Measurement of TE	Student-Focused	Educator-Focused
"…we take teaching effectiveness to be the degree to which one has facilitated student achievement of educational goal "(McKeachie, 1979, p.385).	Objective	X	
	SETE[&#]	X	
	Administrator evaluation		X
	Self-assessment[$]		X
	Peer review[$]		X

[&]Remove SETE when in primary and secondary education contexts. [$]Use in conjunction with other measure(s) (Objective, SETE, Administrator Evaluation). [#]Use in conjunction with another measure(s) (Objective, Administrator Evaluation, Self-Assessment, Peer review) when SETE results directly or indirectly impact an educator's career.

Through our paper we pair an existing strong definition of TE with educator-focused (input) and student-focused (outcome) measures of TE. By conceptualizing TE, researchers may contribute to rigorous research and work together to consistently add to the body of knowledge, thus furthering the quality of TE research.

4.3. Limitations and future research

This study has limitations. We excluded publications that were not peer-reviewed journal publications which may have precluded analysis of literature which may have been additive to our discussion. While we did not exclude any publications by discipline, a systematic literature would have been preferable. In this research, we did not test empirically both dimensions of TE. Consequently, noting the relative disparity of TE definitions in higher education, a future avenue of research could be developing a TE definition specific to the higher education context. We did not empirically test both dimensions of TE. Such empirical study may be an interesting avenue for future research.

Author contributions

SaT: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. StT: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Writing – review & editing.

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Conflict of interest

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

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References

Aaronson, D., Barrow, L., and Sander, W. (2007). Teachers and student achievement in the Chicago Public High Schools. *Journal of Labor Economics* 25, 95–135. doi: 10.1086/508733

Adnot, M., Dee, T., Katz, V., and Wyckoff, J. (2017). Teacher turnover, teacher quality, and student achievement in DCPS. *Educ. Eval. Policy Anal.* 39, 54–76. doi: 10.3102/0162373716663646

Allgood, S., Walstad, W. B., and Siegfried, J. J. (2015). Research on teaching economics to undergraduates. *J. Econ. Lit.* 53, 285–325. doi: 10.1257/jel.53.2.285

Ashton, P. (1984). Teacher efficacy: a motivational paradigm for effective teacher education. *J. Teach. Educ.* 35, 28–32. doi: 10.1177/002248718403500507

Balakrishnan, A., Puthean, S., Satheesh, G., Unnikrishnan, M. K., Rashid, M., Nair, S., et al. (2021). Effectiveness of blended learning in pharmacy education: a systematic review and meta-analysis. *PLoS One* 16:e0252461. doi: 10.1371/journal.pone.0252461

Barnes, G. V. (2000). Self-efficacy and teaching effectiveness. *String Res. J.* 1, 37–57. doi: 10.1177/1948499200OS-100103

Baum, P., and Brown, W. W. (1980). Student and faculty perceptions of teaching effectiveness. *Res. High. Educ.* 13, 233–242. doi: 10.1007/BF00991824

Becker, K. (2006). The teaching effectiveness of standardized patients. *J. Nurs. Educ.* 45, 103–111. doi: 10.3928/01484834-20060401-03

Berk, R. A. (2005). Survey of 12 strategies to measure teaching effectiveness. *Int. J. Teach. Learn. High. Educ.* 17, 48–62.

Blanchard, M. R., Southerland, S. A., Osborne, J. W., Sampson, V. D., Annetta, L. A., and Granger, E. M. (2010). Is inquiry possible in light of accountability?: a quantitative comparison of the relative effectiveness of guided inquiry and verification laboratory instruction. *Sci. Educ.* 94, 577–616. doi: 10.1002/sce.20390

Boeker, M., Andel, P., Vach, W., and Frankenschmidt, A. (2013). Game-based e-learning is more effective than a conventional instructional method: a randomized controlled trial with third-year medical students. *PLoS One* 8:e82328. doi: 10.1371/journal.pone.0082328

Boring, A. (2017). Gender biases in student evaluations of teaching. *J. Public Econ.* 145, 27–41. doi: 10.1016/j.jpubeco.2016.11.006

Boring, A., Ottoboni, K., and Stark, P. (2016). Student evaluations of teaching (mostly) do not measure teaching effectiveness. *ScienceOpen Res.* Available at: https://www.scienceopen.com/document/read?vid=818d8ec0-5908-47d8-86b4-5dc38f04b23e

Bowers, J. S. (2016). The practical and principled problems with educational neuroscience. *Psychol. Rev.* 123, 600–612. doi: 10.1037/rev0000025

Butler, R. (2012). Striving to connect: extending an achievement goal approach to teacher motivation to include relational goals for teaching. *J. Educ. Psychol.* 104, 726–742. doi: 10.1037/a0028613

Campbell, R. J., Kyriakides, L., Muijs, R. D., and Robinson, W. (2004). Effective teaching and values: some implications for research and teacher appraisal. *Oxf. Rev. Educ.* 30, 451–465. doi: 10.1080/0305498042000303955

Carpenter, S. K., Witherby, A. E., and Tauber, S. K. (2020). On students' (Mis) judgments of learning and teaching effectiveness. *J. Appl. Res. Mem. Cogn.* 9, 137–151. doi: 10.1016/j.jarmac.2019.12.009

Centra, J. A. (1994). The use of the teaching portfolio and student evaluations for summative evaluation. *J. High. Educ.* 65, 555–570. doi: 10.2307/2943778

Chau, T., and Vien, T. (2020). Student evaluation of teaching effectiveness: efl teachers' and students' perceptions. *Int. J. Educ. Learn. Develop.* 8, 1–19.

Chen, Z., Liu, Y., and Hou, H. (2021). "Do they really know what we need?" Exploring learners' versus universities' views on open educational resources in Chinese universities. *International Journal of Educational Research*, 109:101817. doi: 10.1016/j.ijer.2021.101817

Chetty, R., Friedman, J. N., and Rockoff, J. E. (2014). Measuring the impacts of teachers II: Teacher value-added and student outcomes in adulthood. *American Economic Review* 104, 2633–2679. doi: 10.1257/aer.104.9.2633

Churchill, G. A. (1979). A paradigm for developing better measures of marketing constructs. *J. Mark. Res.* 16, 64–73. doi: 10.1177/002224377901600110

Cinnamon, S. A., Rivera, M. O., and Sellers, H. K. D. (2021). Teaching disciplinary literacy through historical inquiry: training teachers in disciplinary literacy and historical inquiry instructional practices. *J. Soc. Stud. Res.* 45, 241–252. doi: 10.1016/j.jssr.2021.03.001

Cohen, P. A. (1981). Student ratings of instruction and student achievement: a meta-analysis of multisection validity studies. *Rev. Educ. Res.* 51, 281–309. doi: 10.3102/00346543051003281

Collins, J. (2004). Education techniques for lifelong learning: principles of adult learning. *Radiographics* 24, 1483–1489. doi: 10.1148/rg.245045020

Ding, C., and Sherman, H. (2006). Teaching effectiveness and student achievement: examining the relationship. *Educ. Res. Q.* 29, 41–51.

Espelage, D., Anderman, E. M., Brown, V. E., Jones, A., Lane, K. L., McMahon, S. D., et al. (2013). Understanding and preventing violence directed against teachers: recommendations for a national research, practice, and policy agenda. *Am. Psychol.* 68, 75–87. doi: 10.1037/a0031307

Esquembre, F. (2004). Easy Java simulations: a software tool to create scientific simulations in Java. *Comput. Phys. Commun.* 156, 199–204. doi: 10.1016/S0010-4655(03)00440-5

Fan, Y., Shepherd, L. J., Slavich, E., Waters, D., Stone, M., Abel, R., et al. (2019). Gender and cultural Bias in student evaluations: why representation matters. *PLoS One* 14:e0209749. doi: 10.1371/journal.pone.0209749

Fryer, R. G. (2014). Injecting charter school best practices into traditional public schools: evidence from field experiments. *Q. J. Econ.* 129, 1355–1407. doi: 10.1093/qje/qju011

Furney, S. L., Orsini, A. N., Orsetti, K. E., Stern, D. T., Gruppen, L. D., and Irby, D. M. (2001). Teaching the one-minute preceptor. *J. Gen. Intern. Med.* 16, 620–624. doi: 10.1046/j.1525-1497.2001.016009620.x

Galbraith, C. S., Merrill, G. B., and Kline, D. M. (2012). Are student evaluations of teaching effectiveness valid for measuring student learning outcomes in business related classes? A neural network and Bayesian analyses. *Res. High. Educ.* 53, 353–374. doi: 10.1007/s11162-011-9229-0

Gavard-Perret, M., Gotteland, D., Haon, C., and Jolibert, A.. Méthodologie de la recherche: réussir son mémoire ou sa thèse en sciences de gestion [Internet]. Paris: Pearson éducation; (2008). Available at: https://www.pearsonelt.ch/download/media/9782744076046_SP_itres.pdf

Goldhaber, D., and Anthony, E. (2007). Can teacher quality be effectively assessed? National board certification as a signal of effective teaching. *Rev. Econ. Stat.* 89, 134–150. doi: 10.1162/rest.89.1.134

Grossman, P., Cohen, J., Ronfeldt, M., and Brown, L. (2014). The test matters: the relationship between classroom observation scores and teacher value added on multiple types of assessment. *Educ. Res.* 43, 293–303. doi: 10.3102/0013189X14544542

Gumasing, M., Janice, J., and Castro, F. M. F. (2023). Determining ergonomic appraisal factors affecting the learning motivation and academic performance of students during online classes. *Sustainability* 15:1970. doi: 10.3390/su15031970

Hallinger, P., Heck, R. H., and Murphy, J. (2014). Teacher evaluation and school improvement: an analysis of the evidence. *Educ. Ass. Eval. Acc.* 26, 5–28. doi: 10.1007/s11092-013-9179-5

Hamann, D. L., and Baker, D. S., (1998). Assessing music teaching effectiveness. In Presentation at music educators National Conference, Phoenix, AZ.

Hamann, D. L., Lineburgh, N., and Paul, S. (1998). Teaching effectiveness and social skill development. *J. Res. Music. Educ.* 46, 87–101. doi: 10.2307/3345762

Hamre, B. K., Pianta, R. C., Burchinal, M., Field, S., LoCasale-Crouch, J., Downer, J. T., et al. (2012). A course on effective teacher-child interactions: effects on teacher beliefs, knowledge, and observed practice. *Am. Educ. Res. J.* 49, 88–123. doi: 10.3102/0002831211434596

Hargreaves, D. H. (1999). The knowledge-creating school. *Br. J. Educ. Stud.* 47, 122–144. doi: 10.1111/1467-8527.00107

Hessler, M., Pöpping, D. M., Hollstein, H., Ohlenburg, H., Arnemann, P. H., Massoth, C., et al. (2018). Availability of cookies during an academic course session affects evaluation of teaching. *Med. Educ.* 52, 1064–1072. doi: 10.1111/medu.13627

Hiebert, J., Morris, A. K., Berk, D., and Jansen, A. (2007). Preparing teachers to learn from teaching. *J. Teach. Educ.* 58, 47–61. doi: 10.1177/0022487106295726

Holcomb, J. B., Dumire, R. D., Crommett, J. W., Stamateris, C. E., Fagert, M. A., Cleveland, J. A., et al. (2002). Evaluation of trauma team performance using an advanced human patient simulator for resuscitation training. *J. Trauma Acute Care Surg.* 52, 1078–1086. doi: 10.1097/00005373-200206000-00009

Howes, C. (1997). Children's experiences in center-based child care as a function of teacher background and adult:child ratio. *Merrill-Palmer Q.* 43, 404–425.

Huang, J., Liang, G., and Li, X. (2015). An effective teaching-learning-based cuckoo search algorithm for parameter optimization problems in structure designing and machining processes. *Appl. Soft Comput.* 36, 349–356. doi: 10.1016/j.asoc.2015.07.031

Jacob, B. A., and Lefgren, L. (2008). Can principals identify effective teachers? Evidence on subjective performance evaluation in education. *J. Labor Econ.* 26, 101–136. doi: 10.1086/522974

Jackson, C. K. (2012). *Non-cognitive ability, test scores, and teacher quality: Evidence from 9th grade teachers in North Carolina (Working Paper No. 18624)*. Cambridge, MA: National Bureau of Economic Research.

Johnson, S. M., Kraft, M. A., and Papay, J. P. (2012). How context matters in high-need schools: the effects of teachers' working conditions on their professional satisfaction and their students' achievement. *Teach. Coll. Rec.* 114, 1–39. doi: 10.1177/016146811211401004

Kuo, Y.-K., Kuo, T.-H., Wang, J.-H., and Ho, L.-A. (2022). The antecedents of university students' E-learning outcome under the COVID-19 pandemic: multiple mediation structural path comparison. *Sustainability* 14:16794. doi: 10.3390/su142416794

Leslie, K., Baker, L., Egan-Lee, E., Esdaile, M., and Reeves, S. (2013). Advancing faculty development in medical education: a systematic review. *Acad. Med.* 88, 1038–1045. doi: 10.1097/ACM.0b013e318294fd29

Lewis, L. (1999). *Teacher quality a report on the preparation and qualifications of public school teachers*. Washington, DC: DIANE Publishing.

Liu, M., Gorgievski, M. J., Qi, J., and Paas, F. (2022). Increasing teaching effectiveness in entrepreneurship education: course characteristics and student needs differences. *Learn. Individ. Differ.* 96:102147. doi: 10.1016/j.lindif.2022.102147

Lohman, L. (2021). Evaluation of university teaching as sound performance appraisal. *Stud. Educ. Eval.* 70:101008. doi: 10.1016/j.stueduc.2021.101008

MacKenzie, S. B. (2003). The dangers of poor construct conceptualization. *J. Acad. Mark. Sci.* 31, 323–326. doi: 10.1177/0092070303031003011

Mastrokoukou, S., Kaliris, A., Donche, V., Chauliac, M., Karagiannopoulou, E., Christodoulides, P., et al. (2022). Rediscovering teaching in university: a scoping review of teacher effectiveness in higher education. *Front. Educ.* 7:861458. doi: 10.3389/feduc.2022.861458

McKeachie, W. J. (1979). Student ratings of faculty: a reprise. *Academe* 65, 384–397. doi: 10.2307/40248725

McKeachie, W. J., Lin, Y. G., and Mann, W. (1971). Student ratings of teacher effectiveness: validity studies. *Am. Educ. Res. J.* 8, 435–445. doi: 10.3102/00028312008003435

Medley, D. (1979). *Teacher competence and teacher effectiveness: A review of process product research*. New York, NY: American Association of Colleges for Teacher Education, Committee on Performance-Based Teacher Education.

Merton, R. K. (1988). The Matthew effect in science, II: cumulative advantage and the symbolism of intellectual property. *Isis* 79, 606–623. doi: 10.1086/354848

Moraros, J., Islam, A., Yu, S., Banow, R., and Schindelka, B. (2015). Flipping for success: evaluating the effectiveness of a novel teaching approach in a graduate level setting. *BMC Med. Educ.* 15:27. doi: 10.1186/s12909-015-0317-2

Ni, A. Y. (2013). Comparing the effectiveness of classroom and online learning: teaching research methods. *J. Public Affairs Educ.* 19, 199–215. doi: 10.1080/15236803.2013.12001730

Nielsen, B. B. (2014). Construct measurement in management research: the importance of match between levels of theory and measurement. *J. Bus. Res.* 67, 403–406. doi: 10.1016/j.jbusres.2012.12.020

Novack, D. H., Volk, G., Drossman, D. A., and Lipkin, M. (1993). Medical interviewing and interpersonal skills teaching in US medical schools: Progress, problems, and promise. *JAMA* 269, 2101–2105. doi: 10.1001/jama.1993.03500160071034

O'Neill, G. P. (1988). Teaching effectiveness: a review of the research. *Canadian J. Educ. Revue.* 13, 162–185. doi: 10.2307/1495174

Okoli, C. (2015a). A guide to conducting a standalone systematic literature review. CAIS [internet]. 37. Available at: https://aisel.aisnet.org/cais/vol37/iss1/43/ (Accessed March 29, 2022).

Okoli, C. (2015b). A critical realist guide to developing theory with systematic literature reviews. Available at: http://papers.ssrn.com/abstract=2115818

Pan, G., Shankararaman, V., Koh, K., and Gan, S. (2021). Students' evaluation of teaching in the project-based learning Programme: an instrument and a development process. *Int. J. Manag. Educ.* 19:100501. doi: 10.1016/j.ijme.2021.100501

Paul, J. A., Baker, H. M., and Cochran, J. D. (2012). Effect of online social networking on student academic performance. *Comput. Hum. Behav.* 28, 2117–2127. doi: 10.1016/j.chb.2012.06.016

Peterson, D. A. M., Biederman, L. A., Andersen, D., Ditonto, T. M., and Roe, K. (2019). Mitigating gender bias in student evaluations of teaching. *PLoS One* 14:e0216241. doi: 10.1371/journal.pone.0216241

Philip, T., and Garcia, A. (2013). The importance of still teaching the iGeneration: new technologies and the centrality of pedagogy. *Harv. Educ. Rev.* 83, 300–319. doi: 10.17763/haer.83.2.w221368g1554u158

Price, H. E. (2012). Principal–teacher interactions: how affective relationships shape principal and teacher attitudes. *Educ. Adm. Q.* 48, 39–85. doi: 10.1177/0013161X11417126

Quartz, K. H., Martinez, J. F., and Kawasaki, J. (2017). *Using multiple measures of teaching quality to improve the preparation of urban teachers* SAGE Publications Limited.

Ramani, S., and Leinster, S. (2008). AMEE guide no. 34: teaching in the clinical environment. *Med. Teach.* 30, 347–364. doi: 10.1080/01421590802061613

Renaud, R. D., and Murray, H. G. (1996). Aging, personality, and teaching effectiveness in academic psychologists. *Res. High. Educ.* 37, 323–340.

Reynolds, D., Sammons, P., De Fraine, B., Van Damme, J., Townsend, T., Teddlie, C., et al. (2014). Educational effectiveness research (EER): a state-of-the-art review. *Sch. Eff. Sch. Improv.* 25, 197–230. doi: 10.1080/09243453.2014.885450

Rink, J. E. (2013). Measuring teacher effectiveness in physical education. *Res. Q. Exerc. Sport* 84, 407–418. doi: 10.1080/02701367.2013.844018

Rivard, L. O. P. (1994). A review of writing to learn in science: implications for practice and research. *J. Res. Sci. Teach.* 31, 969–983. doi: 10.1002/tea.3660310910

Rivkin, S. G., Hanushek, E. A., and Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica* 73, 417–458. doi: 10.1111/j.14680262.2005.00584.x

Rockoff, J. E. (2004). The impact of individual teachers on student achievement: Evidence from panel data. *The American Economic Review*. 94, 247–252.

Rockoff, J. E., Jacob, B. A., Kane, T. J., and Staiger, D. O. (2011). Can you recognize an effective teacher when you recruit one? *Educ. Fin. Policy* 6, 43–74. doi: 10.1162/EDFP_a_00022

Roeser, R. W., Skinner, E., Beers, J., and Jennings, P. A. (2012). Mindfulness training and teachers' professional development: an emerging area of research and practice. *Child Dev. Perspect.* 6, 167–173. doi: 10.1111/j.1750-8606.2012.00238.x

Rosen, R. C., Rosekind, M., Rosevear, C., Cole, W. E., and Dement, W. C. (1993). Physician education in sleep and sleep disorders: a national survey of U.S. medical schools. *Sleep* 16, 249–254. doi: 10.1093/sleep/16.3.249

Sánchez-Cabrero, R., Estrada-Chichón, J. L., Abad-Mancheño, A., and Mañoso-Pacheco, L. (2021). Models on teaching effectiveness in current scientific literature. *Educ. Sci.* 11:409. doi: 10.3390/educsci11080409

Sass, T. R., Hannaway, J., Xu, Z., Figlio, D. N., and Feng, L. (2012). Value added of teachers in high-poverty schools and lower poverty schools. *J. Urban Econ.* 72, 104–122. doi: 10.1016/j.jue.2012.04.004

SCImago, (n.d.). SJR — SCImago Journal & Country Rank [portal]. Available at: http://www.scimagojr.com (Accessed August 24, 2023).

SCI, (n.d.). SJR — About Us. Available at: http://www.scimagojr.com

Sobaih, A. E. E., Moustafa, M. A., Ghandforoush, P., and Khan, M. (2016). To use or not to use? Social media in higher education in developing countries. *Comput. Hum. Behav.* 58, 296–305. doi: 10.1016/j.chb.2016.01.002

Srinivasan, M., Li, S. T. T., Meyers, F. J., Pratt, D. D., Collins, J. B., Braddock, C., et al. (2011). "Teaching as a competency": competencies for medical educators. *Acad. Med.* 86, 1211–1220. doi: 10.1097/ACM.0b013e31822c5b9a

Staiger, D. O., and Rockoff, J. E. (2010). Searching for effective teachers with imperfect information. *J. Econ. Perspect.* 24, 97–118. doi: 10.1257/jep.24.3.97

Stroebe, W. (2016). Why good teaching evaluations may reward bad teaching: on grade inflation and other unintended consequences of student evaluations. *Perspect. Psychol. Sci.* 11, 800–816. doi: 10.1177/1745691616650284

Stronge, J. H., Ward, T. J., and Grant, L. W. (2011). What makes good teachers good? A cross-case analysis of the connection between teacher effectiveness and student achievement. *J. Teach. Educ.* 62, 339–355. doi: 10.1177/0022487111404241

Suri, R. E., and Schultz, W. (1999). A neural network model with dopamine-like reinforcement signal that learns a spatial delayed response task. *Neuroscience* 91, 871–890. doi: 10.1016/S0306-4522(98)00697-6

Taylor, S., Laguduva, S., and Bury, K.. (2023). 2023 CPAWSB's candidate journey eBook. Chartered Professional Accountants Western School of Business. Available at: https://www.cpawsb.ca/CPAWSB/media/PDFs/Current%20Learners/PEP/2023-CPAWSB-Candidate-Journey-eBook.pdf.

Taylor, S. G., Roberts, A. M., and Zarrett, N. (2021). A brief mindfulness-based intervention (BMBI) to reduce teacher stress and burnout. *Teach. Teach. Educ.* 100:103284. doi: 10.1016/j.tate.2021.103284

United Nations. Goal 4 | Department of Economic and Social Affairs [internet]. (2015); Available at: https://sdgs.un.org/goals/goal4 (Accessed July 7, 2021).

Uttl, B., White, C. A., and Gonzalez, D. W. (2017). Meta-analysis of Faculty's teaching effectiveness: student evaluation of teaching ratings and student learning are not related. *Stud. Educ. Eval.* 54, 22–42. doi: 10.1016/j.stueduc.2016.08.007

Vlachogianni, P., and Tselios, N. (2022). The relationship between perceived usability, personality traits and learning gain in an e-learning context. *Int. J. Info. Learn. Technol.* 39, 70–81. doi: 10.1108/IJILT-08-2021-0116

Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J., and van Braak, J. (2013). Technological pedagogical content knowledge – a review of the literature. *J. Comput. Assist. Learn.* 29, 109–121. doi: 10.1111/j.1365-2729.2012.00487.x

Walinski, C. J., Ontiveros, J. C., Liu, F., Crain, G., and Vardar-Sengul, S. (2023). Optimizing teaching effectiveness in dental education for a new generation of learners. *J. Dent. Educ.* 87, 182–188. doi: 10.1002/jdd.13108

Wang, Y. S. (2003). Assessment of learner satisfaction with asynchronous electronic learning systems. *Inf. Manag.* 41, 75–86. doi: 10.1016/S0378-7206(03)00028-4

Ward, P. (2013). The role of content knowledge in conceptions of teaching effectiveness in physical education. *Res. Q. Exerc. Sport* 84, 431–440. doi: 10.1080/02701367.2013.844045

Webster, J., and Hackley, P. (1997). Teaching effectiveness in technology-mediated distance learning. *Acad. Manag. J.* 40, 1282–1309. doi: 10.2307/257034

Wei, X., Chow, M.-K., Huang, L., Huang, X., and Cheng, G. (2023). Teacher evaluation in primary and secondary schools: a systematic review of SSCI journal publications from 2012 to 2022. *Sustainability* 15:7280. doi: 10.3390/su15097280

Wilson, R. C. (1986). Improving faculty teaching: effective use of student evaluations and consultants. *J. High. Educ.* 57, 196–211. doi: 10.1080/00221546.1986.11778762

Young, S., and Shaw, D. G. (1999). Profiles of effective college and university teachers. *J. High. Educ.* 70, 670–686. doi: 10.2307/2649170

Yunker, J. A. (1983). Validity research on student evaluations of teaching effectiveness: individual student observations versus class mean observations. *Res. High. Educ.* 19, 363–379. doi: 10.1007/BF00976513

Zhang, Y., Zhou, L., Liu, X., Liu, L., Wu, Y., Zhao, Z., et al. (2015). The effectiveness of the problem-based learning teaching model for use in introductory Chinese undergraduate medical courses: a systematic review and meta-analysis. *PLoS One* 10:e0120884. doi: 10.1371/journal.pone.0120884