Article

Teacher Evaluation in Primary and Secondary Schools: A Systematic Review of SSCI Journal Publications from 2012 to 2022

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Abstract: This study revealed the current situation and developments in teacher evaluation in primary and secondary schools by reviewing 54 articles published in the recent decade (i.e., from January 2012 to October 2022). The coding scheme was developed based on the three components of effective teacher evaluation systems: "what", "how", and "who". Specifically, we investigated the frameworks used for teacher evaluation, methods of evaluation, and participants in teacher evaluation. Based on our results, most studies evaluated teachers from the dimension of Instructional Support. Evaluation through video recording became popular due to technological advancement. Further, an increasing number of schools invited external experts to conduct teacher evaluations to ensure fairness. We also identified several crucial factors for teacher development: effective use of teaching resources and technology, high-quality feedback and communication, emotional support, classroom organization, and professional responsibilities. Due to COVID-19, many schools adopted distance learning, prompting the need to develop technological skills for teachers. Through the in-depth analysis of the current situation and development trends in the various dimensions of teacher evaluation in primary and secondary education, future research directions and issues were discussed and explored in this review.

Keywords: teacher evaluation; primary school teachers; secondary school teachers; teacher professional development; teacher assessment; systematic review

1. Introduction

From a social constructivist point of view, teachers were introduced as facilitators [1]. The role of the teacher in the classroom was to help students to build up their knowledge and to manage students during the learning process. Teachers should provide sufficient assistance to students to complete the tasks independently. Moreover, teachers needed to create an environment that enables students to finish more complicated tasks [2]. The change in the teacher's role implied that teachers should be facilitators rather than only delivering lectures and answering questions, emphasizing that the teaching process should be student centered. Furthermore, teachers also needed to provide scaffoldings for students to help them build up knowledge [3]. Such scaffoldings included reciprocal teaching, peer collaboration, cognitive apprenticeship, and problem-based instruction [4]. Thus, based on the social constructivist view of the teacher, the abilities of teachers to integrate knowledge, strategies, resources, and technologies to build scaffolding for learners and create a collaborative learning environment and community were the key issues of teacher evaluation.

As education reform increasingly focused on teachers, educators, policymakers, and researchers needed valid and reliable assessment methods to evaluate teachers and provide

guidance for improving teaching performance [5]. For this reason, schools were pushed to adopt various types of feedback and evaluation systems that aim to enhance the teachers' abilities and thereby promoting student success [6]. The threat of COVID-19 forced primary and secondary schools to implement blended/online teaching and learning modes. This temporary shift diminished the quality of teaching and learning and created obstacles and challenges for teachers [7]. Such challenges included the lack of effective interaction, difficulty adapting to the schedule and lecture format, inadequate facilities, and ineffective use of learning tools [8]. Moreover, it was difficult for teachers to implement online pedagogical strategies, form online communities, and organize collaborative learning activities online. In addition, elementary and secondary school teachers had limited access to professional development workshops related to online/blended learning and lacked technical support during the pandemic period [9]. Due to the changes in the learning environment, it is necessary to analyze the current situation of teacher evaluation and define what pedagogical and technological knowledge is needed for successful education. For example, the questions, such as "How to assess teachers' performances?" and "What types of support and professional training do teachers need?", should be answered.

Many influential studies have realized the importance of teacher professional development for primary and secondary teachers, e.g., [10–12]. It is necessary to have a systematic review of teacher evaluation focused on primary and secondary school teachers to reveal the current situation. To the best of our knowledge, this article is the first piece of work to conduct a systematic review of teacher assessment in primary and secondary schools. More importantly, such a review of teacher evaluation can provide insights into the open research questions of "How to conduct evaluations to improve teachers' teaching?" and "What needs to be paid attention to during teacher evaluation?" Furthermore, by examining the data distribution and trends from different perspectives, this review can assist researchers in understanding the current situation of professional teacher assessment. Therefore, this review study is significant and indispensable to establishing the linkage between teacher evaluation in primary and secondary schools and future trends in teacher professional development. In particular, the following research questions were investigated in this article:

(1)   From 2012 to 2022, what were the subjects included in teacher assessment?
(2)   From 2012 to 2022, what were the available frameworks for teacher assessment?
(3)   From 2012 to 2022, how was the teacher assessment being conducted?
(4)   From 2012 to 2022, who were the participants involved in teacher assessment?

Theoretical Framework

An effective teacher evaluation system could improve the quality of instruction and promote teachers' professional development [13]. A sound teacher evaluation system had a shared discussion and vision of what good teaching looks like [13]. The system developed for teacher evaluation must have several characteristics: rigorous, valid, reliable, and defensible and must be grounded in a research-based and accepted definition of good teaching. According to Danielson and McGreal [14], any attempt to develop a teacher evaluation system must answer two fundamental questions: (a) What do we believe good teaching looks like? and (b) What are the processes and procedures that will best fit what the school district wants the educational system to accomplish? Based on the above two questions, Danielson [13] identified that teacher evaluation systems need to have three major components (Figure 1): (i) a clear definition of good teaching ("what"), (ii) fair and reliable methods to demonstrate good teaching ("how"), and (iii) participants in the evaluation process ("who").
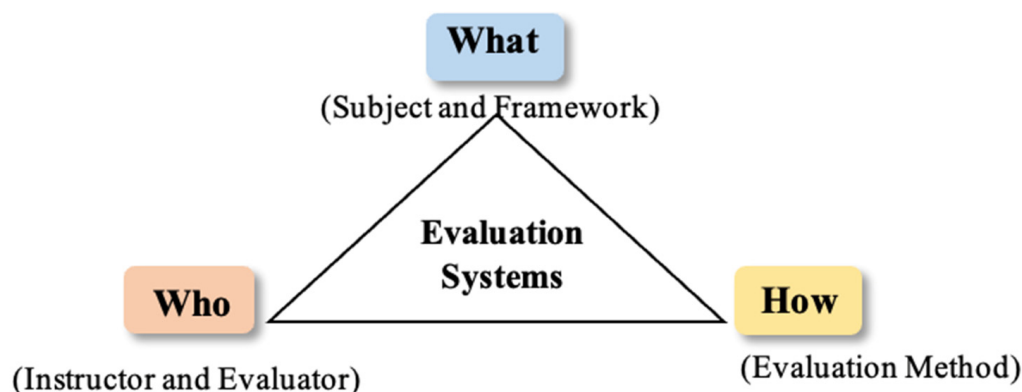
Figure 1. Three major components of the evaluation system.

What—a clear definition of good teaching: "what" refers to the accurate and objective standard for teacher performance. It included the framework for accessing teachers' performances, suggesting what a successful educator should do. Lee believed that it was necessary to think of different, more diverse versions of smart (or good) teachers. To define what is good teaching, it is important to set up different criteria to access it. Pianta [15] developed the Classroom Assessment Scoring System-Secondary (CLASS-S), an observational instrument based on the Teaching through Interactions (TTI) framework. It conceptualized teaching quality through accessing teaching behaviors and evaluating student–teacher interaction patterns. Similarly, Schmidt et al. [16] proposed a theoretical framework: Technological Pedagogical Content Knowledge (TPACK). The TPACK researchers regarded an effective teacher as one who could successfully integrate technology with the pedagogical method and content knowledge. In addition, the nature of the subject will also affect the dimensions of the assessment framework. Thus, scholars constructed valid assessments targeted at different subjects. Examples of such classroom observation instruments included the Mathematical Quality of Instruction [17] and the Protocol for Language Arts Teaching Observation [18].

Who—trained evaluators and instructors who are being evaluated: who can make consistent judgments based on evidence and who are being assessed. The evaluators need to be clear about what they are evaluating and inform the teachers being evaluated of the content and process. In such cases, the evaluators should receive adequate training to make consistent judgments about teaching, ensuring the fairness of the evaluation system [19]. Notably, there are different evaluative criteria to assess novices and experienced teachers [20]. Typically, novice teachers receive more intensive support and supervision than experienced teachers. Therefore, the focus of novice teacher evaluation is often on basic skills, such as lesson planning, classroom management, and instruction delivery [21]. In contrast, evaluation criteria for experienced teachers will focus more on advanced skills and practices, such as leadership, collaboration, and innovation [22]. As suggested by Danielson [13] and Koster et al. [23], experienced teachers are only evaluated formally every three, four, or even five years. In the other years, they engaged in self-directed professional growth, such as participating in a study group with colleagues or even being the assessor to evaluate other teachers.

How—fair and reliable methods to demonstrate good teaching: this component refers to the valid evaluation method. All the criteria must be able to identify what is good practice and be capable of being demonstrated. In other words, the method of evaluating teachers must align with the current research on what constitutes an effective teacher. Further, the evaluation procedures, methods, purposes, and timelines must follow clearly defined criteria to ensure fairness. In addition, all parties involved in the evaluation process should clearly understand them. It was also important to use multiple methods of evaluation, such as student test scores, classroom observations, and teacher self-assessments, as can ensure that get a comprehensive picture of a teacher's effectiveness and avoid relying too

heavily on any one method [24]. This review focused on research evaluating teachers' classroom teaching performance. Thus, the evaluation method might include interviews, questionnaires, videotaped lessons, audio recordings of classroom dialogue, field notes (e.g., instructional handouts, lesson plans, worksheets, and multimedia curriculum resource materials), classroom observation, student achievement, and so on.

2. Research Methods

2.1. Data Collection and Processing

As our review focused on teacher evaluation, the first group of keywords were "teaching" OR "teacher" AND "assess" OR "evaluate". The second group of keywords was limited to secondary and primary school teachers, including "junior middle school" OR "junior high school" OR "middle school" OR "junior middle school" OR "secondary schools" OR "elementary school" OR "primary school" OR "K-12" AND "lesson" OR "class" OR "classroom" OR "course" OR "lectures". To further understand teacher evaluation in the pandemic period, we added "online" OR "blended" OR "distance" OR "video" OR "MOOC" as the search terms in the Web of Science database (https://www.webofscience. com/wos/woscc/basic-search, accessed on 31 October 2022). We limited our search results to SSCI-indexed journals because SSCI covered a wide range of journals across 55 social science disciplines [25]. It collected more than 3500 world's leading scientific and technical journals [25] which represented high quality. Many previous reviews [25–27] often selected SSCI-indexed journal articles because these articles provided more detailed information and in-depth analysis. To ensure the articles we collected with high quality, our study limited the search result to SSCI-indexed journal articles. This study aims to capture the latest development and reveal the current situation of teacher evaluation. To achieve this purpose, we set the search period as a decade (from 1 January 2012 to 31 October 2022) to ensure the data set was adequate to observe the common characteristics of the articles, as suggested by the previous review [25,28]. The publication type was set as "article". Additionally, the category was "education/educational research", and a total of 223 articles were found.

Two domain experts further examined these 223 articles according to the inclusion and exclusion criteria listed in Table 1. Following the PRISMA model, the process of data collection and processing is shown in Figure 2. First, all the articles must be empirical research. Review articles, meta-analysis studies, and position papers should be excluded. This resulted in 1 meta-analysis, 1 systematic review, and 2 review articles being excluded, leaving 219 articles for further screening.

Table 1. Inclusion and exclusion criteria.

Inclusion Criteria	Exclusion Criteria
Must be empirical research	Non-empirical research
Must be involved in the teaching process	The evaluation was not conducted based on classroom teaching
Must be on teacher evaluation	The evaluation was on students or others
Must be for primary and secondary school education	The evaluation was for higher education or special education

Second, these articles should be relevant to the evaluation of teaching, such as the command of content knowledge, the use of pedagogical content knowledge, the skills of teaching and conducting learning activities, the attempts of caring and noticing students' needs, and the application of assessment. For example, the research conducted by Walker et al. [29] was excluded because it evaluated the cost-effectiveness and student outcomes related to providing breakfast in the classroom setting versus breakfast in the traditional school cafeteria which is irrelevant to teaching. Based on this criterion, 27 irrelevant articles were filtered out, and 192 articles remained. In addition, these studies should conduct teaching assessments in normal primary and secondary school classrooms. The participants should not be university or special education students; therefore, 10 articles were excluded. A total of 182 articles were left after this process.
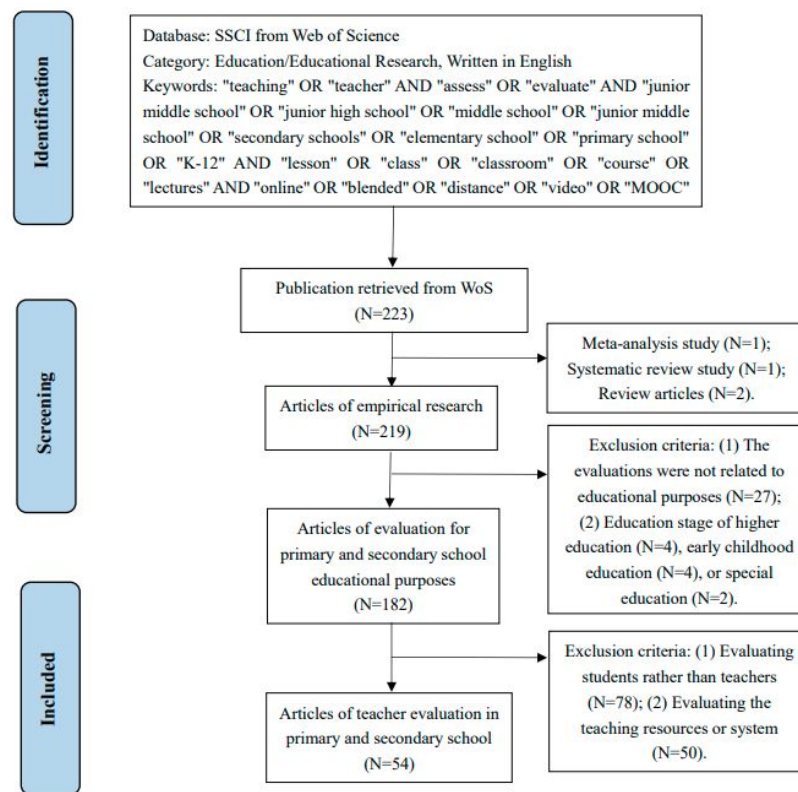
Figure 2. The procedures of data collection and processing.

Finally, these articles should be focused on evaluating teachers rather than evaluating students, resources, systems, or schools. By adopting this criterion, 128 irrelevant articles were filtered out, including 78 articles that assessed students' learning and 50 that assessed learning resources. Thus, a total of 54 articles were finalized for the review (Appendix A, Table A1).

2.2. Coding Scheme

As demonstrated above, an effective teacher evaluation system mainly includes three components: what for evaluation, how to evaluate, and who the participants are (Figure 2). This review developed the coding schemes based on this system to investigate the current status of teacher evaluation in primary and secondary education. We further divided the three components into five main categories: instructor, evaluator, subject content, framework, and method. As shown in Table 2, "what" is the evaluation criteria which includes the evaluation framework and subjects; "who" is the personnel involved in the evaluation process which comprises the instructor and evaluators; and "how" means the specific evaluation methods.

Table 2. The coding scheme.

Evaluation System	Categories	Codes
WHAT	Subject	Science, Mathematics, Languages, Biology, Chemistry, STEM, Physical Education, Music, History, Geography, Information Technologies and Software, Social Studies, Home Economics, Religion, and Ethics
	Framework	TRACK, CLASS, and FFT (further elaborated in Section 2.2.2)
WHO	Instructor	Pre-service and In-service teachers (In-service expert teachers and In-service experience teachers)
	Evaluator	Internal Evaluators (Peer, Student, and Reflective) and External Evaluators (who are not part of the school staff)
HOW	Method	Videotaped Lesson, Questionnaires, Tests, Interviews, Classroom observation, Audio Recordings of Dialogue, Field Notes, Seminar, and Student Achievement

2.2.1. Codes for Subject Content

Codes for the teaching content included Science, Mathematics, Languages, Biology, Chemistry, STEM, Physical Education, Music, History, Geography, Information Technologies and Software, Social Studies, Home Economics, and Religion and Ethics.

2.2.2. Codes for the Evaluation Framework

The Classroom Assessment Scoring System (CLASS), Framework for Teaching (FFT), and Technological Pedagogical Content Knowledge (TPACK) are the common assessment framework used in current research, e.g., [30–32]. These frameworks focused on different elements of teaching or specific aspects of instruction. Specifically, the CLASS evaluated classroom behaviors from three aspects: emotional support, classroom organization, and instructional support [15]. The FFT was designed to measure the quality of teaching interaction in four domains: planning and preparation, classroom environment, instruction, and professional responsibilities [13]. The TPACK framework mainly evaluated three knowledge categories of teachers (i.e., content knowledge, pedagogy knowledge, and technology knowledge) which emphasized integrating technology with teaching [16].

Therefore, we developed our coding scheme of the evaluation framework based on the three above-mentioned frameworks. In total, there were six dimensions (Table 3): emotional support, classroom organization, instructional support, planning and preparation, professional responsibilities, and technological knowledge. Note that Table 3 is a detailed description of the "Framework" category as shown in Table 2.

Table 3. The detailed description of the "Framework" (As shown in Table 2).

Dimension	Description
Planning and preparation	It describes what the teachers do before the teaching, including applying knowledge of content and pedagogy, knowing and valuing students, setting learning objectives, using resources effectively, planning coherent instruction, and designing and analyzing assessments.
Classroom organization	It describes what the teacher needs to organize in the classroom to create an environment of respect and rapport, establish a culture for learning, and manage classroom procedures and student behavior.
Instructional support	It describes how teachers support and promote student's thinking, problem-solving, and conversational skills. It includes supporting students by communicating with students, using questioning and discussion techniques, engaging students in learning, using assessment in instruction, and demonstrating flexibility and responsiveness.
Professional responsibilities	It describes what teachers need to do in their careers which includes reflecting on teaching, maintaining accurate records, communicating with families, participating in the professional community, growing and developing professionally, and showing professionalism.
Technological knowledge	It describes teachers' knowledge and ability to use various technologies, technological tools, and associated resources.
Emotional support	It describes the degree to which teachers establish and promote a positive climate in their classroom through their everyday interactions. Such emotional support includes creating the emotional connection between a teacher and students, recognizing and responding to the emotional needs of their students, and organizing activities and lesson plans that attract students' interests.

2.2.3. Codes for Instructor

As Aypay [33] suggested, the instructors being evaluated should be categorized based on their experience (i.e., pre-service teachers and in-service teachers). Pre-service teachers are students pursuing teacher qualifications in higher education institutions [34]. In-service teachers are defined as those who have already completed their basic training and are now teachers with a prior teaching qualification (i.e., a certificate or diploma in teaching). We further divided in-service teachers into experienced teachers and expert

teachers because these teachers think and make decisions differently [35]. Experienced teachers mean teachers who have more than five years of teaching experience [36]. As Hattie [35] suggested, expert teachers are those who can identify essential representations of their subject, guide learning through classroom interactions, monitor learning and provide feedback, attend to affective attributes, and influence student outcomes.

2.2.4. Codes for Evaluator

As suggested by Almutairi and Shraid [37], teacher evaluation involves internal or external evaluators. Specifically, internal evaluators include the head of departments, teachers themselves, peer teachers, and students. External evaluators are those people who are not part of the school staff [38], such as external experts.

2.2.5. Codes for Evaluation Methods

Following Goe et al. [39], the evaluation methods included classroom observation, videotaped lessons, audio recordings, field notes, seminars, student achievement, questionnaires, interviews, tests, and portfolio analysis. Direct observation refers to inviting observers to visit the classrooms and measuring teaching through human rating [40]. With the recent technological advances in capturing and transmitting digital audio and video, video recording of classrooms is an alternative with practical advantages [41]. It allows observers to easily access the data for analysis [42,43]. The video recording and the field notes were complementary to each other. The evaluators watched the recorded videos and evaluated the teaching materials, including lesson plans, worksheets, handouts, other printed materials, and the technology (hardware and software) used [44].

3. Results

3.1. Distribution of Instructors

As shown in Figure 3a, in-service teachers were often selected as instructors in these studies. About 87.1% (47 out of 54) of the studies selected in-service teachers, 14.8% of studies assessed pre-service teachers, and one study selected both in-service teachers and pre-service teachers. As suggested by Hattie [35], we further categorized in-service teachers into general in-service teachers, experienced teachers, and expert teachers. Figure 3b showed that most reviewed studies evaluated general in-service teachers, only four looked at experienced teachers, and one focused on expert teachers.
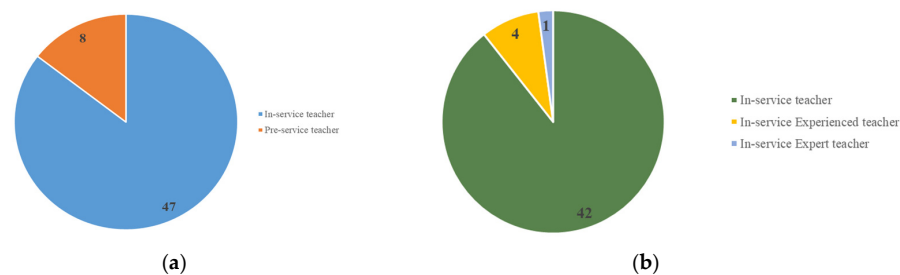

(a)   (b)

Figure 3. (**a**) The distribution of the instructor involved in teacher evaluation; (**b**) The distribution of in-service teacher involved in teacher evaluation.

3.2. Distribution of Evaluators

Figure 4 indicates that external experts are the main evaluators employed in these studies. Among the 53 studies, 98.1% (53 out of 54) involved external experts. External experts included externally experienced teachers (i.e., teachers with more than 30 years of teaching experience), certified researchers (i.e., certified coders, English-speaking raters), and specialized experts (i.e., professors from universities, scientists, and researchers). Further, four studies included internal evaluators (i.e., peer teachers, teachers themselves, and students.) to help teachers reflect on teaching and improve the quality of teaching. Internal evaluations were performed close to daily teaching practice which was less valued

by the instructors [45]. As Hult et al. [45] described, external evaluations normally had criteria to measure teachers. They were conducted by people outside of the school or from the Education Bureau while internal evaluations were organized by schoolteachers (mostly informally) from the school. Norman et al. [46] argued that external evaluation should be conducted with internal evaluation to bring meaningful changes to elementary teacher preparation programs. For example, Piwowar et al. [47] included external observers and school students to evaluate in-service secondary school teachers in classroom management and found that the evaluation results were more rigorous and fairer.
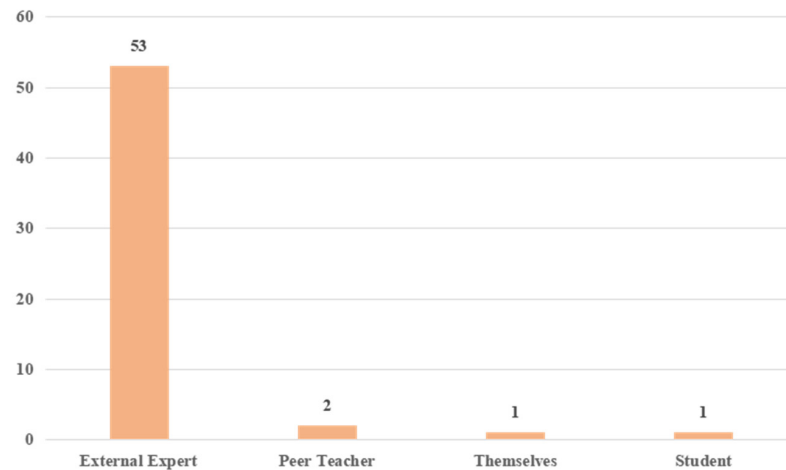

Figure 4. The distribution of the evaluators involved in teacher evaluation.

3.3. Distribution of Evaluaion Methods

As shown in Figure 5, the videotaped lesson was the most popular method with 42 studies. This method allowed evaluators to observe and evaluate classroom teaching with validity and reliability. The evaluation conducted through interviews and questionnaires was the second and third popular method with 38.9% (21/54) and 29.6% (16/54), respectively. For example, Baricaua [12] analyzed the transcripts collected through videotape recordings, non-structured questions, and formal written interviews to investigate the effectiveness of a professional development model. Moreover, ten studies applied the field notes, and nine used audio recordings for evaluation. The evaluation methods based on the student achievement and seminar had the same proportions with 13% (7 out of 54). We also observed that only four studies applied traditional classroom observation, and three evaluated teachers using paper and pencil tests.
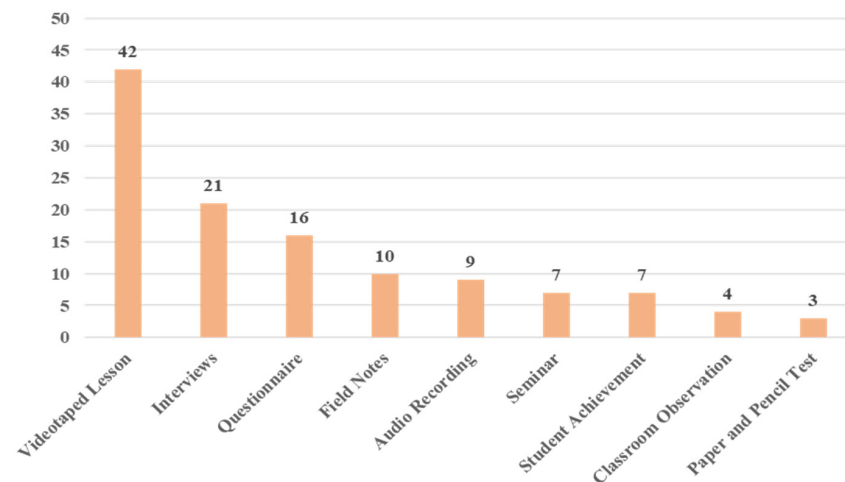

Figure 5. The distribution of the evaluation methods used in teacher evaluation.

3.4. Distribution of Evaluaion Subject Content

According to Figure 6, Mathematics was frequently selected as the subject for evaluation, accounting for 33.33% of the reviewed studies (18 out of 54). Furthermore, 17 studies evaluated science teachers, and 15 studies assessed language teachers. Biology, physical education, and chemistry were also frequently investigated with eight, six, and five articles. For example, Wu et al. [48] assessed 211 secondary school teachers' TPACK in various subject domains, including Chinese, English, Mathematics, Physics, Chemistry, Biology, History, Geography, Information, Music, and Physical Education. Information Technologies, Social Studies, and Music had the same proportion of 5.6% (3/54), while the other three studies did not specify teachers' teaching subjects. In addition, Physics, Geography, Religion, and Ethics also shared 3.7% of the total studies. We found that fewer studies involved subjects in History, Home Economics, and STEM for primary and secondary teachers.
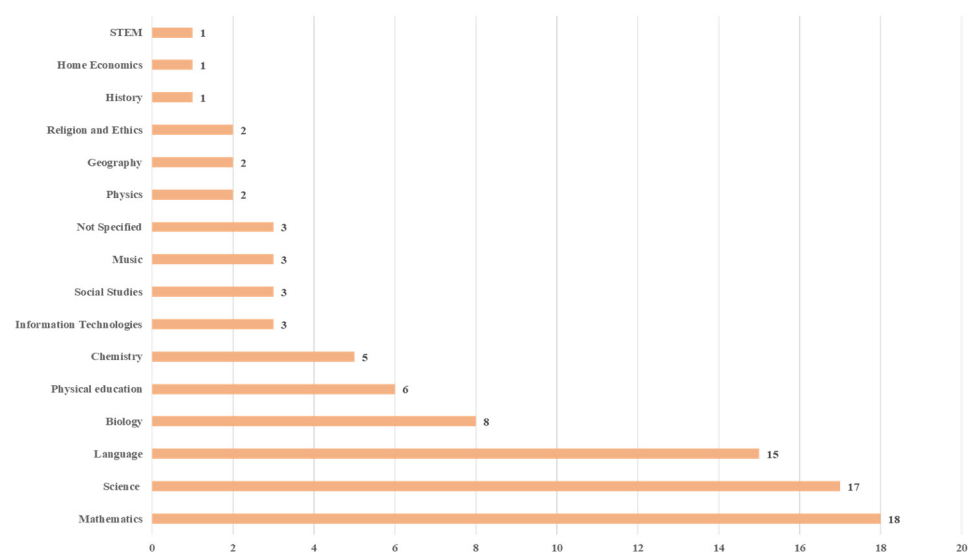

Figure 6. The distribution of the subjects included in teacher evaluation.

3.5. Distribution of Evaluaion Framework

Figure 7 showed that the most frequently adopted evaluation framework was Instructional Support which was used in 32 out of 54 studies. The second most frequent evaluation framework was Technological Knowledge (56.7%) which indicated that Technological Knowledge was also important to primary and secondary classroom teaching. It was worth pointing out that Professional Responsibilities, Emotional Support, and Classroom Organization were frequently selected as evaluation content, with seven, seven, and six studies, respectively. Only one study evaluated teachers based on the dimension of Planning and Preparation. It was relatively less investigated compared with other evaluation dimensions.
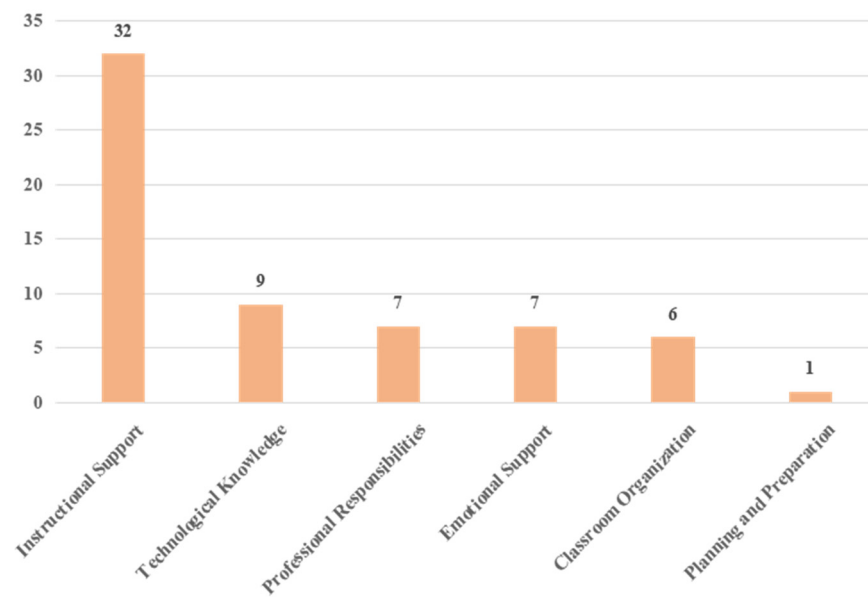
Figure 7. The distribution of the evaluation framework adopted in teacher evaluation.

4. Discussion

4.1. Research Issues Related to the Instructors

Our results revealed that few studies evaluated expert and experienced teachers. A possible reason is that the evaluation of all in-service teachers was more representative and demonstrated their overall teaching quality. The in-service teachers included novice teachers (i.e., four years of teaching experience or less), experienced teachers (i.e., five years of teaching experience or more), and expert teachers. According to Jotkoff [49], 55% of teachers claimed that they wanted to quit their job earlier than planned due to the problem of burnout. Moreover, studies also showed that the annual turnover rate of American teachers is between 8% to 14%. A total of 30% to 46% of teachers worked for less than five years, and 12% had one or two years of teaching experience [49]. It implied that fewer senior teachers worked at schools and more young people joined the teaching team, indicating little research about experienced teachers and expert teachers. In addition, assessment is a process of developing teachers into expert and experienced teachers. Schools need to identify the problems of teachers to improve their teaching quality through evaluation. As discussed by König et al. [50], novice teachers' general pedagogical knowledge and skills were associated with teacher education, teaching experience, and working conditions. They faced many challenges and gained experiences through daily teaching [32]. Thus, they needed several years of in-service teaching experience and practice to become expert teachers rather than only passing the teacher education examination [51,52]. Moreover, it is difficult to evaluate expert and experienced teachers because they have very high levels of performance after many years of teaching. Experienced teachers have developed a range of skills and knowledge through years of teaching experience [22]. Most of them were the "evaluators" rather than the "instructors". For example, Gitomer et al. [53] used five experienced teachers as observers to evaluate 82 Algebra I teachers' instructional practices, four observers had experience teaching secondary mathematics, and one observer taught English language arts.

It is worth pointing out that pre-service teachers were also selected for the study (eight studies), suggesting that the evaluation of pre-service teachers in primary and secondary schools is also important. Pre-service teachers' professional knowledge and skills are essential for primary and secondary education. For example, Liu [10] evaluated three pairs of mentor teachers and pre-service teachers' TPACK. It was found that pre-service teachers tend to lack sufficient skills and opportunities to apply TPACK. They needed to develop teaching competence before they became in-service teachers which needed to train in the

first phase at university with a heavy focus on theory and practical skills in the second phase [50]. Therefore, opportunities for practice and evaluation of teachers' competence are essential for pre-service teachers.

4.2. Research Issues Related to the Evaluators

Based on our results, evaluations conducted by external experts are more frequently used in these studies. In contrast, peer assessment, student evaluations, and teacher self (reflective) evaluation are rarely selected. The European Commission [54] also had similar findings: over half of the schools received support from external experts. These experts offered advice, guidance, and training on how to conduct an internal evaluation and improve evaluation processes (i.e., which tools can be used, how to present findings, and how to draft action plans). External experts were not directly involved in the school's activities and supported the evaluation process in various ways [54]. It implied that external experts acted in multiple roles, such as 'critical friends' and 'facilitators', who gave effective feedback and suggestions to teachers and schools with their profound knowledge.

External evaluations had several advantages compared to internal evaluation which explains why many researchers used external evaluation to ensure fairness and rigor. First, external evaluation evaluators received professional training in evaluation and had experience in evaluating programs. They offered both objectivity and systemic evaluation [55], and they were able to help teachers and schools to continue their professional development. Kirkwood [56] reported that the outside expert played the leading role at the beginning of the evaluation project, while the participants gradually took on a more central role as the research progressed.

In addition, teachers value third-party evaluation more because the experts are more consistent in making judgments. External experts belonged to third-party evaluation. It represented fairness and high quality. Thus, teachers tended to take the results more seriously. The external experts could identify the problems that the teachers and schools were unnoticed and provided useful suggestions to help the teachers. For example, O'Brien et al. [57] found that the group of teachers evaluated by external experts made more changes in their teaching, and their students improved more than the group that only used peer evaluation. From the perspective of teacher professional and sustainable development, it is necessary for teachers to share their knowledge about their teaching and to receive guidance from experts on relevant topics [58].

It was noticed that most of the studies included both external experts and internal evaluators. For example, Warwick [59] evaluated teachers' performance in six phases. In the first three phases, teachers needed to conduct the Lesson Study (LS) cycles and participate in peer evaluation (usually 3–4 teachers). In the next three phases, every school formed LS groups, and each group had three teachers participating in external evaluations. Many of these studies pointed out the importance of the partnership between teachers and external experts, e.g., [1,58,60]. The internal peer evaluators were more familiar with a program or project. They would continue to work on the project, and they could learn from the evaluation results. External evaluators could share their knowledge and experiences learned from other organizations. Cohen et al. [61] argued that the main contribution of the experts was not only related to providing training methods but sharing decisionmaking thinking with the teachers. Combining internal and external evaluation could have the advantages mentioned above.

With an increasing emphasis on internal evaluation, many countries provide a range of support to guide schools. The internal evaluation included an assessment by other teachers, students, and administrators which helped teachers' development. These evaluations gave valuable information and feedback to teachers concerning how they are perceived. Atkins [62] found that most teachers felt that peer observation and peer professional coaching would be helpful to professional growth. Peer evaluation consists of the review of teaching performance by colleagues, usually in the same or a similar educational field [63]. The peer teachers assessed their colleague's teaching to improve the quality of teaching in

the classroom and department, making the faculty monitor the teaching quality. Recognizing the advantages of using external experts and internal evaluators for evaluation, we suggested teaching evaluation programs could be both included in internal and external evaluators. Professional development must integrate the researchers' domain knowledge and the in-service teachers' practical experiences to conduct instructional decision-making and promote effective learning for students [64].

4.3. Research Issues Related to the Evaluation Method

According to the result, many studies evaluated teachers' performance by watching video recordings. It allowed the evaluators to observe teachers' completed teaching performance while reducing class interruption. Over the last few years, video-based assessment has been a popular method used in teacher training. The benefit of this assessment form was that it provided a standardized measurement and presented the real teaching context [65]. Studies pointed out that the user acceptance of video-based assessment was very high, and its high reliability and validity promote the application of this assessment method [65]. Compared with video-based assessment, it is more intrusive for experts to enter the classroom for observation. It would affect the actual performance of students and teachers, resulting in a lack of authenticity. Although teachers would submit videotapes of their best lessons, they still presented the actual classroom. On the other hand, observations have been used to support collaborative learning. Peer teachers could observe their colleague's classes and discuss their teaching performances in regular meetings, leading to improvements in teaching [66]. It showed that videos and observation instruments are promising tools for evaluation.

Moreover, video recordings were also employed to improve teaching practice and reflection [67] because it is easier for evaluators to provide an analysis of classroom events when they cannot remember them [68]. The video data enabled researchers and evaluators to re-watch the recordings [69]. For instance, Hiltunen [70] recorded the lesson and analyzed how pre-service teachers talked with students during their inquiry-based biology lesson. The recordings could be played repeatedly, allowing for a depth reflection and analysis less likely to happen during live observations. The recorded videos could also be the materials to develop teachers' professional vision. Studies used actual classroom recordings as a sample to construct teacher knowledge [71]. For instance, instructors used them as examples (1) to illustrate certain rules, concepts, and principles; (2) to demonstrate particular phenomena; (3) to facilitate teacher reflection as suggested by Kersting [71]. Seidel et al. [72] found that video recordings helped facilitate learning factual knowledge, the evaluation of classroom teaching, and lesson planning. It showed that videos could provide pre-service teachers with concrete images of innovative practices and a context for developing analytical skills.

4.4. Research Issues Related to the Evaluation Subject

Our study found that most of the teachers being evaluated were science teachers. The reason is that Science is the basic Curriculum in primary and secondary schools in the US, UK, Singapore, China, and other countries. For example, the sciences in the US included Life Sciences, Life Sciences (Biology), Physical Sciences (Chemistry and Physics), and Earth and Space Sciences. Learning Science can develop students' ability to ask questions, collect information, organize and develop their ideas, solve problems, and apply what they learn. Thus, science teachers needed to employ teaching strategies to inspire and prepare children. According to Zippia [73], there were more than 1,305,298 science teachers (2010–2019) in the United States. The competition for science faculty jobs was so intense that every job advertisement attracted hundreds of qualified applicants. In addition, primary and secondary schools emphasized learning mathematical content in the context of real-world situations due to the development of artificial intelligence. The curriculum frameworks also focused on computational thinking and mathematical abilities to solve problems and foster a deeper understanding.

In the US, the primary school curriculum included Mathematics and English, Language, Science, Social Studies, and Physical Education [74] In China, the lower grades of primary schools offered courses, such as Morality and Life, Chinese, Mathematics, Physical Education, and Arts (e.g., Music and Arts) [75]. The junior high school set up a combination of subjects and comprehensive courses, mainly including Ideology and Morality, Chinese, Mathematics, Foreign Languages, Science (or physics, chemistry, biology), History and Society (or History, Geography), Physical Education and Health, Art (or music) and comprehensive practical activities. In Singapore, there were four subjects in Singapore's PSLE: English, Mother Tongue, Science, and Mathematics. Further, primary schools in Taiwan have Chinese, English, Mathematics, Music, Art, and other subjects, such as Physical Education, Health, Legal System, Information Technology, and Comprehensive Practice [76]. In the UK Primary and Secondary Education System, compulsory core subjects include Mathematics, English, and Science. Thus, the subjects of Science, Mathematics, and Language are the core subjects in most countries' primary and secondary schools [77].

It is worth pointing out that STEAM Education needed students to have solid Science and Mathematical skills as they head to the future, a special initiative in Mathematics and Science Education launched by National leaders in November 2009 [78]. Furthermore, National leaders regularly discuss the importance of improving science, technology, engineering, and mathematics (STEM) programs at state and local levels and the need to fund STEM programs to promote college and career readiness for studying and working in STEM fields. This suggests the importance of Science and Mathematics learning for K-12 education which includes Chemistry and Biology.

4.5. Research Issues Related to the Evaluation Framework

The results showed that the most frequently used dimension to evaluate teachers was Instructional Support which assesses how teachers support children's thinking, problem-solving, and conversational skills. Effective support included linking concepts and skills students learned in class with everyday life, asking questions that encourage children to think, providing sufficient help, and offering feedback. Specifically, 42.3% (11/26) of studies evaluated teachers' Instructional Support focused on Assessment in Instruction and 26.9% (7/26) of studies on Communicating with Students. The possible reason was that primary and secondary school education emphasized providing feedback and instructional dialogue which enhanced students' critical thinking, understanding, and performance, e.g., [79,80]. Studies also indicated that teachers' use of feedback had impacts on student learning [81,82], making it a crucial factor in the dimension of Instructional Support. Verbal communication in the classroom enabled teachers to set up learning objectives, assess student knowledge through questions, and effectively deliver new knowledge [83]. However, it was challenging for novice teachers to provide feedback and communicate with students [84,85]. Novice teachers tended to focus on their teaching performance rather than student learning. Therefore, they cared less about students' understanding, and it was difficult for them to adopt different strategies to provide individualized support. Expert teachers assessed student comprehension throughout the entire lecture, while the novices ignored this aspect. Experts tended to ask higher-order questions, including the analysis or synthesis of information, while novice teachers used rhetorical questions to guide their instruction [83]. To address this issue, novice, and pre-service teachers must be trained to provide conceptual feedback and communicate with students. It was not only to develop general guidelines but also to create opportunities for practice. Researchers attempted to train teachers' ability to provide feedback and conduct dialogue teaching from different aspects. For example, Stovner and Klette [85] investigated how 47 teachers provided feedback in 172 mathematics lessons in Norwegian lower secondary schools, highlighting feedback relevant to both pre-and in-service mathematics teacher training (e.g., procedural feedback, conceptual feedback, and feedback on practices). Hattie [35] reported that expert teachers could guide learning, notice students' needs, and provide

feedback through classroom interactions. Therefore, it was important for expert teachers to share their experiences in providing feedback with novice teachers.

We can identify several research trends based on our results. The first research trend is that researchers began to pay more attention to assessing teachers' technological knowledge. Technological Knowledge ranked as the second most frequently used dimension for teacher evaluation which refers to teachers' knowledge and ability to use various technologies and technological tools [86]. As shown in Figure 8, increasing numbers of studies focused on integrating technologies in primary and secondary education. It was consistent with previous research that the TPACK framework was mainly used for teacher training, especially for pre-service teachers [87]. The technological developments of the last few decades have undoubtedly prompted a revolution affecting education [88]. For example, Dalby and Swan [88] explored how iPads were used in two secondary schools' formative assessment processes and classes. It was found that iPad contributed to effective student learning through formative assessment. Due to COVID-19, online and multimedia mobile learning is viewed as a socially situated practice, providing new communication and social interaction methods [89]. Thus, it is also important to examine teachers' ability to use technology in the classroom. For instance, Aslan [90] found that middle school teachers complained that students did not attend the online courses on time or at all. Students had low learning interest, inadequate feedback, limited interaction, and insufficient learning hours. Another critical finding was that the teachers only use homework, end-of-unit quizzes, and participation in online courses as measurement and evaluation tools. Teachers admitted that these tools are not reliable and valid for evaluation. The effects of using technology in the classroom did not reach the expected outcomes. According to Higgins et al. [91], the key issue was not whether digital technology should be used but how it could be used to support teaching and learning. Primary and secondary school teachers failed to make pedagogical adjustments to adapt to the rapid changes in using technology. Consequently, educational reform requires teachers to understand how technology contributes to effective learning processes.
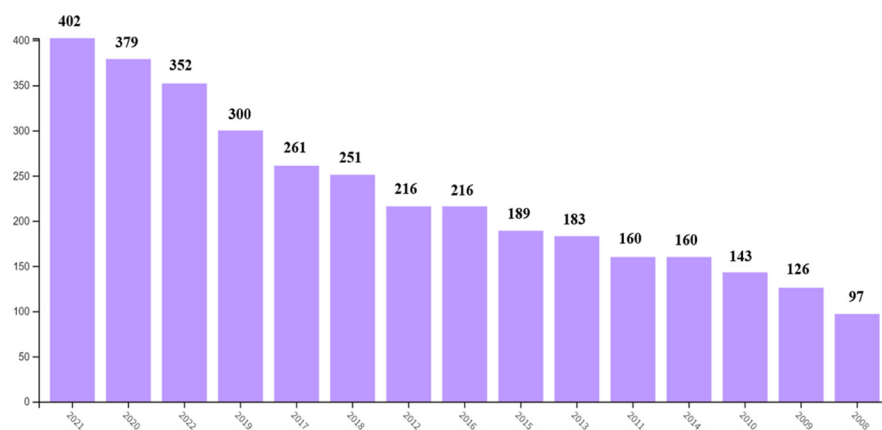

Figure 8. The distribution of publications focused on the use of technology in K-12. Adapted from "Web of Science", accessed on 1 January 2023. (https://www.webofscience.com/wos/woscc/analyze-results/f616a956-9d15-4779-888d-aa38548024bd-67837633).

As indicated in Table 3, Professional responsibilities included Reflecting on Teaching, Growing and Developing Professionally, and Showing Professionalism. Within this domain, 42.8% (3/7) of studies employed teachers' self-reflection. According to the Lifelong Learning UK Standards, reflection is a core component of effective Continuing Professional Development (CPD) and the key to becoming a skilled teacher. Since research and knowledge in different fields are always changing and being updated, reflection was significant for building the foundation of the teachers' professional sustainability [92]. Educators need to have time and space to discuss and analyze their work. However, critical reflection is a struggle for teachers with professional practice. On the one hand, the heavy workload

and tight teaching schedule prevent teachers from doing reflection. On the other hand, reflection can become a passive process. Teachers identified a problem in a course or classroom (or were informed during classroom observations) but did not have the time or support to analyze the problem and come up with solutions [93]. Teaching reflection is a long process that requires teachers to put a lot of time and effort into it which is not easily cultivated with short-term training. There are many ways for teacher self-reflection, such as self-reflective, student observation, peer observation, and video recording.

Emotional Support was also less likely to be evaluated. It represents teachers' care and attempts to cater to students' needs. Primary and secondary schools often have large class sizes. The average class size for primary school is 23.1 students for every class, while the class size is 24.3 for a secondary school in the United States. In the United Kingdom, the average class size increased to 22 in 2020 [94]. China also reported a large class with 38 students for primary school and 46 for junior high school [95]. The teacher–student ratio in a class indicates the teacher's ability to manage a class, especially for distance learning. Smaller class sizes allowed students to receive more personalized feedback and more flexibility to use different instructional approaches from their teachers which ensures effective teaching is possible with individualized teaching [96]. However, students from large classes received less individualized attention from teachers, and it was difficult for them to keep up with the learning pace [97]. It posed challenges for classroom management as teachers struggled to care about every student in the class. Students were facing increasing mental health problems, especially during the pandemic period [98]. As suggested by Reinke et al. [99], they found that teachers did not have sufficient knowledge and skills to support students with mental health needs. They lacked professional training and adequate support from the school [98,100]. Results indicated that emotional support from teachers helped create a positive learning environment that fosters academic success [100]. However, traditional teacher evaluations focused on academic outcomes. In this case, future evaluation should be more focused on the aspects of emotional support to deal with the problems of mental health. With the development of information technologies, many technological devices can be used to detect people's emotions and cognition while the problem of privacy and data security would be a concern [101]. Consequently, children's privacy, mental health, and ethical issues in technology use are other possible reasons for restricting studies on Emotional Support.

5. Conclusions

Teacher evaluation is the key issue of teacher professional development. In this study, we investigated teacher evaluation from several aspects, including the subjects of teacher evaluation, evaluation framework, evaluation method, and participants of teacher assessment by analyzing selected studies related to teacher evaluation from 2012 to October 2022. We proposed a systematic coding scheme to analyze these articles which were developed based on the elements of the effective teacher evaluation system raised by Danielson [13]. The results of each category of the coding scheme are discussed and analyzed.

Furthermore, regarding experience and teaching level, Hattie [102] identified differences between novice teachers, expert teachers, and experienced teachers. For example, expert teachers offered the students more challenges and had a deeper understanding of the content [102]. In addition, novice teachers had lower classroom management abilities than expert teachers, so novice teachers needed to receive certain training [103]. From the perspective of evaluators, Brown et al. [104] believed that the teachers' professional development evaluation needed to integrate external evaluation and internal evaluation to bring together the advantages of both types of evaluators. Nevertheless, understanding various specific evaluation methods is critical to facilitate the assessment process. For instance, video allowed teachers to reflect more effectively and accurately on their performance and evaluate the whole lesson from the student's perspective. It allowed teachers to receive feedback from others and ensured the objectivity of the evaluation progress. Evaluation

based on video recordings brought a new level of depth and awareness to teacher reflection, making it a highly effective tool for teacher professional development [105].

In addition, some research issues and potential future research directions were discussed. According to the results, it was found that only a few studies paid attention to the assessment of teachers' technological knowledge. Nowadays, technologies are widely used in education with many schools providing laptops or tablets for students and teachers [106] due to COVID-19. Teachers were flexible in using digital educational resources to tailor their instruction so that it fulfills students' needs. For example, digital technology (e.g., virtual reality and educational games) could bring new and exciting learning experiences to the classroom that facilitate students' cognitive engagement and enhance their social-emotional skills [107]. Newly developed technologies, such as artificial intelligence (AI), using advanced algorithms to provide students with personalized learning to maximize learning effectiveness and promote self-regulated learning [108,109]. The personalized learning system would collect learners' data which specified their preferences and performances to develop their profiles [110,111]. Additionally, it assisted students' learning by suggesting appropriate learning content to cater to various learning needs, levels, and needs [110,112]. Previous research had demonstrated the effectiveness of using adaptive learning systems in classrooms, e.g., [110], and teachers showed their willingness to integrate personalized learning in classroom activities [25]. It was suggested that schools could encourage teachers to use related AI technologies to facilitate their teaching in physical classrooms [113]. In addition, digital educational resources changed the form of school curricula and textbooks, making them more affordable and accessible [114]. As such, scholars have called for a shift from focusing on technological tools to focusing on teachers as the agent of change in transformative technology integration. Research may give more attention to the development and training of teachers' technological knowledge in the future. On the other hand, Emotional Support aims to collect students' emotional data by wearing devices or using AI technologies. However, there were many obstacles to adapting these methods in a classroom context due to privacy concerns and ethical issues.

To sum up, this study discussed the current status and trends in the domain of teacher assessment in primary and secondary schools by reviewing studies in recent decades. However, our research only focused on SSCI-indexed journal articles. Future research could consider including other indexes (e.g., A and HCI) and other types of papers (e.g., conference papers and book chapters) to provide a more comprehensive analysis. In addition, our study was limited to primary and secondary school teachers. Teacher evaluation for higher education should be further investigated. Overall, our research provided insights into the framework and methods of teacher evaluation which guided future research to develop teacher evaluation. Our research also revealed that digital technologies have great potential for enhancing instruction and learning. Artificial intelligence, cloud computing, and wearable technologies could be used to enhance blended learning, flipped learning, multimedia mobile learning, and tablet-based education, especially during the COVID-19 pandemic.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. The coded papers.

	Authors	Title	Journal	References
1	Aslan et al. (2021)	Teachers' views related the middle school curriculum for distance education during the COVID-19 pandemic	Education and Information Technologies	[91]
2	Baricaua Gutierez (2016)	Building a classroom-based professional learning community through lesson study: Insights from elementary school science teachers.	Professional Development in Education	[12]
3	Barnhart and Van Es (2015)	Studying teacher noticing: Examining the relationship among pre-service science teachers' ability to attend, analyze and respond to student thinking.	Teaching and Teacher Education	[115]
4	Borghouts et al. (2021)	Effectiveness of a lesson study intervention on teacher behaviour and student motivation in physical education lessons.	Physical Education and Sport Pedagogy	[116]
5	Brindley and Marshall (2015)	"Resisting the rage for certainty": dialogic assessment: A case study of one secondary English subject classroom in the UK	English Teaching: Practice & Critique	[117]
6	Chen et al. (2020)	Exploring the pedagogical features of integrating essential competencies of scientific inquiry in classroom teaching	Research in Science & Technological Education	[118]
7	Dalby and Swan (2019)	Using digital technology to enhance formative assessment in mathematics classrooms.	British journal of educational technology	[88]
8	Davies et al. (2017)	Quality Talk and dialogic teaching—an examination of a professional development programme on secondary teachers' facilitation of student talk	British Educational Research Journal	[119]
9	Dignath and Büttner (2018)	Teachers' direct and indirect promotion of self-regulated learning in primary and secondary school mathematics classes–insights from video-based classroom observations and teacher interviews	Metacognition and Learning	[120]
10	Dini et al. (2020)	Characterizing the formative assessment enactment of experienced science teachers.	Science Education	[121]
11	Doğan and Kılıç (2019)	Mathematical opportunities: Noticing and acting.	Education and Science	[122]
12	Dorfner et al. (018)	Effects of three basic dimensions of instructional quality on students' situational interest in sixth-grade biology instruction.	Learning and Instruction	[123]
13	Furtak et al. (2018)	Developing knowledge-in-action with a learning progression: Sequential analysis of teachers' questions and responses to student ideas	Teaching and teacher education	[124]
14	Furtak et al. (2016)	Teachers' formative assessment abilities and their relationship to student learning: *Findings from a four-year intervention study*	Instructional Science	[80]

Table A1. *Cont.*

	Authors	Title	Journal	References
15	Gamlem and Munthe (2014)	Mapping the quality of feedback to support students' learning in lower secondary classrooms.	Cambridge Journal of Education	[125]
16	Gitomer et al. (2014)	The instructional challenge in improving teaching quality: Lessons from a classroom observation protocol.	Teachers College Record	[53]
17	Haug and Ødegaard (2015)	Formative assessment and teachers' sensitivity to student responses.	International Journal of Science Education	[126]
18	He et al. (2016)	Using Rasch measurement to validate an instrument for measuring the quality of classroom teaching in secondary chemistry lessons.	Chemistry Education Research and Practice	[127]
19	Hiltunen et al. (2020)	Biology student teachers' dialogic talk in inquiry-based instruction.	Journal of Biological Education	[70]
20	Holmqvist and Olander (2017)	Analysing teachers' operations when teaching students: what constitutes scientific theories?	International Journal of Science Education	[128]
21	Hsiao et al. (2022)	Developing a plugged-in class observation protocol in high-school blended STEM classes: Student engagement, teacher behaviors and student-teacher interaction patterns	Computers & Education	[129]
22	Hung (2016)	Teacher readiness for online learning: Scale development and teacher perceptions.	Computers & Education	[11]
23	König et al. (2015)	Early career mathematics teachers' general pedagogical knowledge and skills: Do teacher education, teaching experience, and working conditions make a difference?	International Journal of Science and Mathematics Education	[50]
24	Li (2022)	Chinese folk music: Study and dissemination through online learning courses.	Education and Information Technologies,	[130]
25	Li et al. (2022)	Characteristics of Chinese high-quality mathematics lessons from a lesson structure perspective.	ZDM–Mathematics Education	[131]
26	Lim et al. (2022)	"From the beginning, I think it was a stretch"–teachers' perceptions and practices in teaching multiliteracies.	English Teaching: Practice & Critique	[132]
27	Liu et al. (2015)	Collaborative professional development of mentor teachers and pre-service teachers in relation to technology integration.	Journal of Educational Technology & Society	[10]
28	Martos-García, and García-Puchades (2021)	Emancipation or simulation? The pedagogy of ignorance and action research in PETE.	Physical Education and Sport Pedagogy	[133]
29	Maulana et al. (2015)	Within-year changes of lesson structure: an exploration of pedagogical functions of lessons by means of multilevel growth curve modelling in Indonesia.	Teachers and Teaching	[134]
30	Nochumson (2020)	Elementary schoolteachers' use of Twitter: exploring the implications of learning through online social media	Professional Development in Education	[135]
31	Ocak and Baran (2019)	Observing the indicators of technological pedagogical content knowledge in science classrooms: Video-based research.	Journal of Research on Technology in Education	[31]

Table A1. *Cont.*

	Authors	Title	Journal	References
32	Piwowar et al. (2013)	Training inservice teachers' competencies in classroom management. A quasi-experimental study with teachers of secondary schools.	Teaching and Teacher Education	[47]
33	Polly et al. (2016)	Primary grades teachers' instructional decisions during online mathematics professional development activities.	Early Childhood Education Journal	[136]
34	Schmier (2019)	Performing the performance assessment.	English Teaching: Practice & Critique	[40]
35	Sekalegga (2022)	An analysis of four instructional strategies used by secondary school music teachers in Uganda.	International Journal of Music Education	[137]
36	Sezen-Barrie and Kelly (2017)	From the teacher's eyes: facilitating teachers noticings on informal formative assessments (IFAs) and exploring the challenges to effective implementation.	International Journal of Science Education	[138]
37	Sezen-Barrie et al. (2018)	Science teachers' sensemaking of the use of epistemic tools to scaffold students' knowledge (re) construction in classrooms.	Journal of Research in Science Teaching	[139]
38	Sherry et al. (2018)	Positioning in prospective secondary English teachers' annotations of teaching videos.	English Teaching: Practice and Critique	[140]
39	Siegel et al. (2019)	Attending to assessment problems of practice during community-centered professional development.	International Journal of Educational Research	[141]
40	Soysal (2021)	Talking science: Argument-based inquiry, teachers' talk moves, and students' critical thinking in the classroom.	Science & Education	[142]
41	Soysal and Yilmaz-Tuzun (2021)	Relationships between teacher discursive moves and middle school students' cognitive contributions to science concepts.	Research in Science Education	[143]
42	Stovner and Klette (2022).	Teacher feedback on procedural skills, conceptual understanding, and mathematical practices: A video study in lower secondary mathematics classrooms.	Teaching and Teacher Education	[85]
43	Taut et al. (2019)	Evaluating the quality of teaching: can there be valid differentiation in the middle of the performance distribution?	School Effectiveness and School Improvement	[30]
44	Tsunemoto et al. (2020)	Pre-service teachers' beliefs about second language pronunciation teaching, their experience, and speech assessments.	Language Teaching Research,	[144]
45	Tytler and Aranda (2015)	Expert teachers' discursive moves in science classroom interactive talk.	International Journal of Science and Mathematics Education	[145]
46	Ünal and Köse (2019)	A lesson study to develop teachers' geometric habits of mind.	Croatian Journal of Education	[146]
47	van Vondel et al. (2018)	The effects of video feedback coaching for teachers on scientific knowledge of primary students.	Research in science education	[147]
48	Vongkulluksn et al. (2020)	Investing Time in Technology: Teachers' Value Beliefs and Time Cost Profiles for Classroom Technology Integration	Teachers College Record: The Voice of Scholarship in Education	[148]

Table A1. *Cont.*

	Authors	Title	Journal	References
49	Vattøy and Gamlem (2020)	Teacher–student interactions and feedback in English as a foreign language classrooms.	Cambridge journal of education	[149]
50	Warwick et al. (2019)	The role of pupil voice as a trigger for teacher learning in Lesson Study professional groups.	Cambridge Journal of Education	[59]
51	Wei et al. (2019)	An investigation of sources of science teachers' practical knowledge of teaching with practical work	International Journal of Science and Mathematics Education	[150]
52	Wilkinson et al. (2017)	Toward a more dialogic pedagogy: Changing teachers' beliefs and practices through professional development in language arts classrooms.	Language and education	[151]
53	Wong and Moorhouse (2021)	Digital competence and online language teaching: Hong Kong language teacher practices in primary and secondary classrooms	System	[152]
54	Wu et al. (2022)	Exploring secondary school teachers' TPACK for video-based flipped learning: the role of pedagogical beliefs	Education and Information Technologies	[48]

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