

Professional development in classroom assessment: a systematic literature review

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ABSTRACT

Professional development in classroom assessment techniques plays a crucial role in enhancing student learning outcomes. The preferred reporting items for systematic review and meta-analysis (PRISMA)-guided systematic review of the research literature assesses these programs to identify effective methodologies, research limitations, and trends in development, providing evidence-based recommendations for education leaders and policymakers. A structured search of Scopus and Web of Science databases, using keywords “classroom,” “professional development,” and “assessment,” yielded a final set of 43 studies. The analysis revealed four major themes: i) student-centered education; ii) classroom practices and teacher development; iii) specialized education and teacher training; and iv) assessment in education. The review demonstrates the impact of professional development programs (PDP) on teachers and addresses challenges in improving student achievement. By adhering to recognized standards for systematic reviews, this study provides a comprehensive analysis of professional development in classroom assessment, highlighting various strategies, obstacles, and successes. The findings emphasize the significance of efficient assessment for student learning outcomes and offer insights into enhancing PDP in this critical area of education.

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1. INTRODUCTION

Emerging pedagogical trends, technological advancements, and a growing understanding of the crucial role evaluation plays in determining students' learning experiences are driving significant changes in the field of education. In this dynamic environment, the concept of professional development in classroom evaluation has garnered considerable attention [1]. Effective educational leaders and teachers are vital to students' success, largely due to their ability to design and implement relevant assessments.

The term “classroom evaluation” encompasses the array of techniques and tools educators employ to assess and enhance student learning. From traditional tests and quizzes to project-based assessments and formative feedback, teachers continually seek ways to improve the relevance and effectiveness of their assessments for students [2]. The goal of professional development in classroom assessment is to provide teachers with the essential knowledge, skills, and tools needed to create and administer assessments that effectively promote student development [3]. A comprehensive examination of professional development in classroom evaluation is essential to understand the impact of programs and guide future developments in educational practice. This review explores not only the efficacy of professional development programs (PDP)

but also their delivery methods, duration, and the specific skills and knowledge intended to be imparted to educators. It explores the various assessment methods, the impact of teacher training on student performance, and the new trends that are transforming evaluation practices in education [4]. Professional development initiatives, offered in diverse formats like online courses, workshops, and collaborative groups, are aimed at providing educators with the skills required to effectively manage contemporary classrooms [5]. This review investigates the impact of such programs on classroom evaluations, emphasizing the evolving nature of education [6]. It underscores the vital link between teacher preparation and student achievement, particularly through improved assessment methods [7]–[9]. By elucidating this relationship, educators, policymakers, and administrators can make informed decisions regarding resource allocation and policy formulation [10], [11].

Furthermore, this review stresses the role of continuous teacher training in meeting the demands of 21st-century classrooms and enhancing student success [12], [13]. Recent studies highlight the importance of ongoing professional development in classroom assessment, particularly in shifting towards formative assessment methods [14]–[16]. Notably, initiatives like classroom assessment for student learning (CASL) and formative assessment-focused programs have shown positive impacts on both teacher practices and student outcomes [17].

Several knowledge-intensive programs are available to teachers to enhance their professional development, as evidenced by multiple studies examining their effects. As an example, a one-year PDP in Hong Kong enabled 47 primary school teachers to successfully implement assessment-as-learning (AaL), with on-site assistance significantly enhancing both the frequency and importance of AaL [18]. The impact of CASL in elementary schools revealed increased teacher assessment expertise and student involvement in assessments, albeit with no evident effect on math proficiency [19]. A qualitative study in Norway examined the views and use of the classroom assessment scoring system (CLASS) by early childhood education and care (ECEC) professionals for their professional development, emphasizing its contribution to enhancing communication, creating professional communities, and supporting learning at both individual and group levels [20].

Additional studies investigated the effects of professional development courses on teachers, including a program in Thailand focusing on functional behavior assessment (FBA) [21]–[23]. The classroom strategy assessment system (CSAS) was utilized to assess and improve teacher practices, with feedback received positively by teachers and shown to be beneficial for their professional development [24]. In high school math, two PDP emphasizing formative assessment were compared, indicating significant increases in teachers' knowledge and self-efficacy, while also highlighting a preference for network technology-based approaches [25].

This thorough understanding of the role professional development plays in classroom assessment provides crucial insights for educators, researchers, and policymakers, with the goal of enhancing education through more effective and informed strategies. Together, these studies highlight the significance of professional development in improving teaching practices and encouraging collaborative learning, offering key perspectives for overcoming challenges in teacher professional development related to classroom assessments.

In this context, the study seeks to examine the literature related to professional development in classroom assessment through a systematic review approach. The main research question is: what is the relationship between teachers' PDP and classroom assessment? the specific questions guiding the study are: i) how does professional development in classroom assessment impact the practice and assessment strategies of educators in the classroom? and ii) how does this professional development result in better student learning and academic performance? the study primarily focuses on how more extensive teacher training in assessment impacts classroom practices, exploring whether it leads to enhanced academic performance and learning outcomes, as well as evaluating the effectiveness of various professional development methods in strengthening teachers' assessment skills.

2. METHOD

2.1. Research design

In this study, the systematic literature review (SLR) method is employed to systematically identify, evaluate, and analyze relevant research in order to answer the research questions set by the researchers. The preferred reporting items for systematic review and meta-analysis (PRISMA) framework, widely recognized in public health and medical research, is referenced as a standard approach. It consists of forty-three steps that guide the construction of an SLR [26]. While primarily designed for health-related fields, PRISMA is also applicable to social science research as it aids in developing clear research questions and conducting a structured search. Additionally, PRISMA helps reduce various biases and supports a thorough synthesis of the studies reviewed.

2.2. Identification

This study's systematic review process was conducted in three main stages to select suitable publications. In the first stage, relevant keywords were identified, and the search was broadened by incorporating associated terms using resources such as dictionaries, thesauruses, encyclopedias, and previous studies. Using these terms, search queries were constructed specifically for the Web of Science and Scopus

databases see in Table 1. As a result, a total of 3,846 publications were initially retrieved from these databases during this stage of the review process.

Table 1. Search strings

Database	Search strings
Scopus (n=2098)	TITLE-ABS-KEY ((professional AND development AND classroom AND assessment)) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SUBJAREA , "SOCT")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (EXACTSRCTITLE , "Education Sciences") OR LIMIT-TO (EXACTSRCTITLE , "Teacher Development") OR LIMIT-TO (EXACTSRCTITLE , "Teaching And Teacher Education") OR LIMIT-TO (EXACTSRCTITLE , "Studies In Educational Evaluation") OR LIMIT-TO (EXACTSRCTITLE , "Professional Development In Education") OR LIMIT-TO (EXACTSRCTITLE , "Profile Issues In Teachers Professional Development") OR LIMIT-TO (EXACTSRCTITLE , "International Journal Of Learning Teaching And Educational Research") OR LIMIT-TO (EXACTSRCTITLE , "International Journal Of Education And Practice") OR LIMIT-TO (EXACTSRCTITLE , "Educational Research") OR LIMIT-TO (EXACTSRCTITLE , "British Educational Research Journal") OR LIMIT-TO (EXACTSRCTITLE , "Australian Journal Of Teacher Education") OR LIMIT-TO (EXACTSRCTITLE , "Assessment For Effective Intervention")) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2023))
Web of Science (n=1748)	Results for professional AND development AND classroom AND assessment (Topic) and Article (Document Types) and English (Languages) and TEACHING AND TEACHER EDUCATION or ASSESSMENT IN EDUCATION PRINCIPLES POLICY PRACTICE or PROFESSIONAL DEVELOPMENT IN EDUCATION or ASSESSMENT FOR EFFECTIVE INTERVENTION or EDUCATIONAL RESEARCH or EDUCATIONAL ASSESSMENT or TEACHING EDUCATION or SOUTH AFRICAN JOURNAL OF EDUCATION or JOURNAL OF RESEARCH ON EDUCATIONAL EFFECTIVENESS or JOURNAL OF EDUCATION FOR TEACHING or EDUCATIONAL STUDIES or EDUCATIONAL RESEARCHER or ASSESSMENT IN EDUCATION IMPLICATIONS FOR LEADERSHIP or EURASIAN JOURNAL OF EDUCATIONAL RESEARCH or IRISH EDUCATIONAL STUDIES or JOURNAL OF EDUCATION or JOURNAL OF NEGRO EDUCATION (Publication Titles) and 2023 or 2022 or 2021 (Publication Years)

2.3. Screening

Duplicate articles were removed during the initial screening phase, resulting in the exclusion of seven papers. In the following step, 59 articles were reviewed according to specific inclusion and exclusion standards set by the researchers. The primary inclusion criterion focused on research articles, as they provide the most relevant data for this study. Other types of publications, including books, book chapters, review articles, meta-analyses, systematic reviews, and book series, were not considered. Additionally, only articles written in English were eligible. The review was limited to studies published within a three-year span, from 2021 to 2023. Applying these criteria led to the exclusion of a total of 3,787 publications.

The main objective of this SLR is to identify and examine the results of previous research rather than offering analysis or critique. Consequently, only studies presenting relevant empirical data will be considered for inclusion, while reviews will be excluded. Additionally, a key inclusion criterion is that the findings must primarily address the professional development of teachers in the context of classroom assessment.

2.4. Eligibility

A total of 52 articles progressed to the eligibility phase, the third stage of the process. During this phase, each article's title and key content were thoroughly reviewed to ensure alignment with the inclusion criteria and the study's objectives. Consequently, nine articles were excluded because they lacked a fully empirical basis in educational research. Ultimately, 43 articles remained available for detailed analysis, as outlined in Table 2.

Table 2. The selection criterion is searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Time line	2021-2023	<2021
Literature type	Journal (article)	Journal (conference, book, review)
Publication stage	Final	In press
Subject area	Sciences social	Non-sciences social
Source title	Education	Non-education

2.5. Data abstraction and analysis

This study utilized an integrative analysis to assess and synthesize multiple research designs, including qualitative, quantitative, and mixed-method approaches. In conducting specialized research, the researchers formulated core topics and relevant subtopics with precision. The data collection stage marked the initial phase of theme development, with the researchers meticulously reviewing 43 scholarly

publications to extract valuable insights and address the study's central questions concerning professional development in classroom assessment. In the subsequent stage, the researchers rigorously analyzed the collected data, identifying patterns, trends, and key findings in consultation with field experts. This comprehensive literature review, combined with expert insights, significantly expanded the study's scope and depth, allowing for an extensive exploration of the complex area of professional development in classroom assessment. Following this, each theme and any related concepts or ideas were further refined. Throughout the study, the primary author collaborated with co-authors to highlight the core themes that emerged from the findings. A detailed log was maintained throughout the data analysis process, recording analyses, questions, observations, and essential insights crucial for interpreting the data.

To address any variances in the theme generation process, the authors reviewed and aligned their findings at the conclusion. Notably, any conceptual discrepancies were openly discussed, leading to minor refinements for consistency across themes. To ensure validity, two experts-specialists in education and teacher professional development-reviewed the issues in question. This expert evaluation phase was instrumental in establishing domain validity, enhancing the precision, clarity, and relevance of each sub-theme. Adjustments were made as needed, based on expert feedback. Figure 1 presents an outline of the search process using the PRISMA flow diagram.

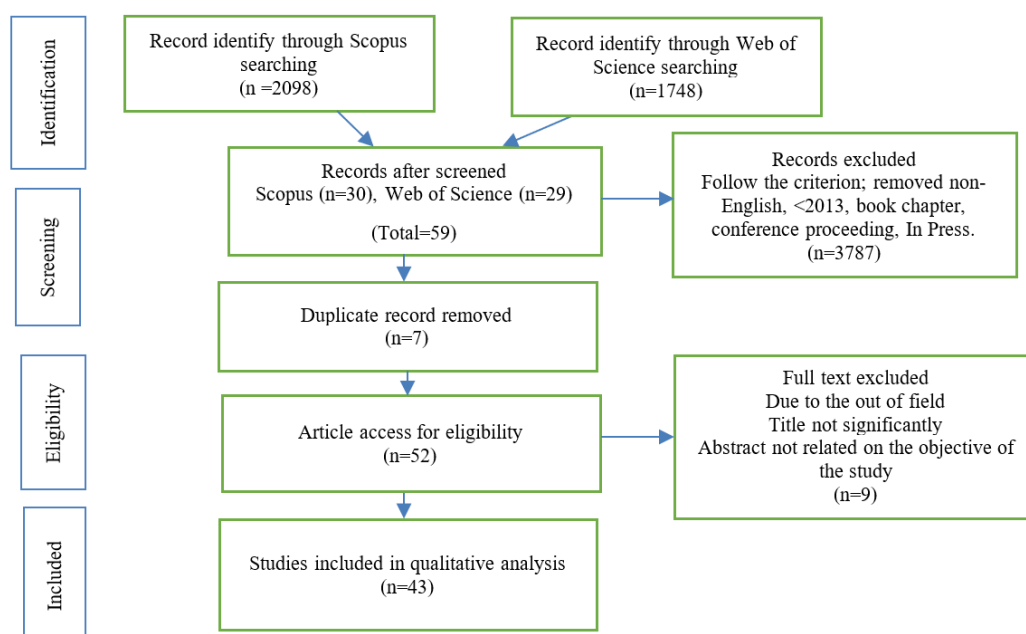


Figure 1. Flowchart of the study selection process

3. RESULTS AND DISCUSSION

Based on the papers retrieved from Web of Science and Scopus databases, 43 articles were categorized under the keyword “professional development in classroom measurement.” This comprehensive study has explored various aspects of professional development, instructional strategies, and assessment in education, providing valuable insights and recommendations for improving educational standards [27]. The categorization of all publications was based on four primary themes: assessment in education (8 articles), student-centered education (3 articles), classroom practices and teacher development (10 articles), and specialized education and teachers (21 articles) (refer to Figure 2).

3.1. Assessment in education

Assessment in education is the process of gathering and analyzing data regarding students' performance and learning. Its primary goals are to understand what students know and can do, identify areas for improvement, and make informed decisions to support their educational progress. This study validates Guskey's methodology for evaluating learning interventions, identifying four constructs: knowledge from professional learning, classroom skills, attitudes towards learning, and evaluation beliefs. Educators with self-regulated learning (SRL) abilities may exhibit a more adaptable, accommodating, and optimistic outlook when incorporating SRL into the classroom [28], [29]. To maximize student potential, formative evaluation and various methodologies must be blended [30].

The study suggests structured support initiatives and tailored PDP to help teachers overcome obstacles in applying AaL methods [18]. Both school administrators and teachers evaluated the CSAS, specifically the teacher (CSAS-T) and observer (CSAS-O) components, as effective or highly effective, underscoring their value in steering professional development dialogues [24].

Methods such as audio recordings allow for quantifiable analysis of instructional practices [31]. Nonetheless, rubric-based observations might pose challenges due to the intensive training they require. Variations in professional development during the pandemic have highlighted the need for further investigation into the effectiveness of educational technologies [32], [33]. Currently, there is an increasing focus in education on using a balanced assessment strategy, integrating various assessment forms to offer a well-rounded perspective on students' learning progress and competencies.

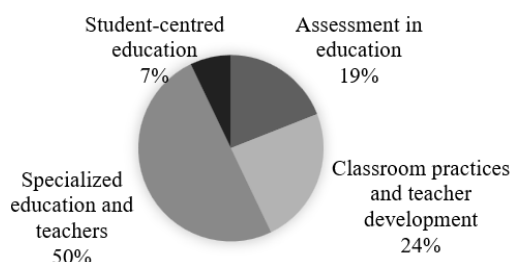


Figure 2. The themes based on the research articles on the searching criterion

3.2. Classroom practices and teacher development

Classroom practices and teacher development are integral aspects of education that contribute to effective teaching and student learning. Improved attitudes towards teaching reflection have a favorable effect on teacher education, particularly when teachers reflect on their own instructional teaching videos [34]. This approach aims to enhance instructors' literacy and formative assessment skills, encourage open communication, and foster a sense of community among educators. Structured introspection, participatory sense-making, and reflexive dialogue can be facilitated through invisible observation, potentially leading to significant improvements in professional learning [35], [36].

The South African study underscored the importance of professional learning communities in cognitive education and offered guidance for leadership on effectively incorporating Bloom's taxonomy within South African classrooms [37]. Research in Indonesia has shown that assessment procedures related to learning agency-learning-oriented, performance-driven, and student agency are inconsistent in Indonesian classrooms [15]. The main elements of learning agency include explicit learning, promoter of autonomy, and error. Teachers must carefully analyze environmental and personal factors when implementing dynamic assessment [38].

Previous research has identified challenges in educational development, such as technology integration, formative assessment, professional development, and perception gaps between teachers and students [16]. To improve technology integration strategies, school administrators should provide more consistent support, open communication, and increased teacher involvement.

Video-based professional development (VBPD) has shown positive effects on classroom interactions, assessment practices, and teachers' self-awareness [39]. The inverse relationship between growth on the partnership for assessment of readiness for college and career (PARCC) and teachers' discrepancy scores highlights the importance of continuous professional learning and informed instructional choices [40]. Successful teaching and student achievement rely on teacher development coupled with effective classroom strategies, with lifelong learning, adaptability, and a focus on continuous improvement serving as key components.

3.3. Emphasis on student-centred education

Education that centers on students customizes the learning experience to align with each learner's unique needs, interests, and preferred learning styles [41]. The primary goals of this approach are to inspire a passion for learning, cultivate skills for lifelong learning, and prepare students to thrive in an ever-evolving world. Adopting a student-centered approach brings multiple advantages, such as enhanced teaching readiness, improved academic performance, greater student engagement, and strengthened self-assessment abilities [42]. Educators are more inclined to implement this approach when they employ a mix of thorough instructional strategies, inclusive assessments, active student participation, and information and communication technology (ICT) tools [43].

The study demonstrates the close connection between teacher professional development and topics including ICT, individualized learning strategies, student feedback, and assessment [43]. These findings are

supported by comparisons with prior studies, which also have implications for teacher professional development and the potential to raise overall instructional standards [44].

3.4. Specialized education and teacher training

Specialized education includes programs and support services designed specifically to address the varied needs of students with unique talents or significant learning difficulties. Teacher preparation in this field equips educators with the necessary tools to effectively engage with a diverse student population and cater to their unique requirements. The study highlights the indirect influence of standard assessments on teachers' perceptions of coaching, particularly regarding technology integration techniques [16], [45]. Continuous support and encouragement from school administrators are crucial for facilitating teachers' ongoing professional development. Professional development workshops and instructional support interventions (ISI) have a positive impact on teachers' performance in standard assessments across various subjects [46].

However, a negative correlation was found between PARCC growth ratings and teacher discrepancy scores, with PARCC growth being notably higher for lower scores [40]. The overall discrepancy scores from CSAS accounted for a significant portion of the variation in PARCC math performance, underscoring the need for a supervisory model to ensure consistent application of standards [40]. While feedback remains a common instructional method in math classrooms, supportive coaching had no direct impact on technology integration strategies due to standardized testing [47]. The relationship between teacher participation in ISI and professional development and standardized test scores in various subjects is expected to inform future PDP and their impact on student achievement [46], [48].

To conclude, professional development in classroom assessment fosters multiple dimensions of effectiveness, underscoring formative assessment's pivotal role in advancing student learning. The evaluation highlights how contextual elements shape classroom assessment techniques, affirming the critical impact of teacher development on student performance and the broader quality of education [49]–[51]. A solid foundation in assessment literacy empowers educators to conduct precise and dependable assessments, which strengthens teaching practices and enhances student outcomes. Future studies should address disparities in the implementation of professional development, especially considering the disruptions caused by the pandemic, and further examine the role of educational technology in enriching classroom assessment practices.

4. CONCLUSION

The literature's current findings indicate that educational institutions are actively working to enhance teacher professional development and education quality to meet the objectives of international education. This effort encompasses three key areas: professional development, teaching practices, and evaluation in the education sector. Professional development, particularly in classroom assessment, has emerged as a critical focus. Institutions are implementing this training through seminars and a lean methodology at various administrative levels—state, district, and school. The primary goals of these initiatives are to encourage cultural awareness, improve evaluation literacy, and provide actionable feedback. This multi-tiered approach to professional development aims to equip educators with the necessary skills to navigate the complexities of international education. A significant emphasis is placed on ensuring fair and equitable student assessments.

The PDP are designed to enhance teachers' abilities to create and implement assessment tools that are culturally sensitive and free from bias. This focus on assessment practices reflects the growing recognition of the importance of evaluation in shaping educational outcomes and ensuring that all students have equal opportunities to demonstrate their learning. However, the literature also highlights areas that require further investigation. Future research should explore the ethical components of professional development, particularly in relation to student privacy, fairness, and potential bias in evaluation instruments. To comprehensively evaluate these aspects, the use of large-scale surveys is recommended. This approach would allow for a broader understanding of how professional development initiatives are addressing these crucial ethical considerations across diverse educational contexts.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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Kharhan Jait				✓	✓		✓			✓				

C : **C**onceptualization

M : **M**ethodology

So : **S**oftware

Va : **V**alidation

Fo : **F**ormal analysis

I : **I**nvestigation

R : **R**esources

D : **D**ata Curation

O : Writing - **O**riginal Draft

E : Writing - Review & **E**ditng

Vi : **V**isualization

Su : **S**upervision

P : **P**roject administration

Fu : **F**unding acquisition

CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

INFORMED CONSENT

All participant had signed the informed consent to participate in the study.

ETHICAL APPROVAL

All participants provided informed consent to participate in the study.

DATA AVAILABILITY

- The data that support the findings of this study are available on request from the corresponding author, [HZ]. The data, which contain information that could compromise the privacy of research participants, are not publicly available due to certain restrictions.
- Derived data supporting the findings of this study are available from the corresponding author [HZ], on request.

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