

Systematic Review

Exploring the Effects of Professional Learning Experiences on In-Service Teachers' Growth: A Systematic Review of Literature

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Abstract: This systematic review examines the effects of professional learning (PL) experiences on in-service teachers' self-perceived growth. The study compares formal and informal PL models, drawing on diverse approaches, such as coaching, mentorship, collaborative learning, and reflective practices, to understand how these frameworks impact teachers' professional efficacy and instructional practices. Using databases like Scopus, Web of Science, and ERIC we analyzed 38 empirical studies, focusing on the teachers' PL experiences and the resulting self-perceived professional growth across its various domains. The findings indicate that while formal PD sessions (e.g., structured workshops and seminars) support skill development, they often yield mixed results due to their limited adaptability to specific contextual needs. In contrast, informal PL approaches, like mentorship and peer collaboration, foster reflective and practical growth. Combining both PL methods provides the most comprehensive benefits, blending structured learning with the flexibility of informal settings. This review underscores the need for hybrid PL models that address collective and individualized growth pathways, recommending future research into context-sensitive, mixed PL designs to effectively support in-service teachers.

Keywords: in-service teachers; professional learning; professional development; informal professional learning; systematic review of literature; formal professional learning



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1. Introduction

The teachers' professional growth is critical in enhancing instructional practices and subsequently improving student learning outcomes. The in-service teachers' professional growth is a complex process influenced by various factors and by the diverse approaches to professional learning (PL), both formal and informal (Ayvaz-Tuncel & Çobanoğlu, 2018; Lohman, 2006; Molway, 2019; Zhang et al., 2024). Traditional professional development (PD) methods are often criticized as inadequate and irrelevant as they often fall short of meeting the teachers' needs, their content can be seen as irrelevant, and their planning as inadequate (Ayvaz-Tuncel & Çobanoğlu, 2018). Informal learning, including interactive activities with colleagues, is common, but can be hindered by factors like lack of time and proximity to peers (Lohman, 2006). The effectiveness of the teachers' in-service professional learning is evaluated and examined using various instruments and stakeholders, such as international tests like TIMSS (Latifi & Latifi, 2022).

Professional development (PD) is widely studied, yet there is no clear definition of the concept (Sancar et al., 2021). In recent years, its definition has been increasingly contrasted with that of professional learning (PL), highlighting the evolving nature of these interrelated concepts (Njenga, 2023). The distinction often lies in their underlying approach: PD traditionally positions teachers as recipients of externally driven learning, while PL emphasizes teachers as active participants and initiators of their own learning processes (Girvan et al., 2016; O'Brien & Jones, 2014; Sharimova & Wilson, 2025). Furthermore, PD is frequently discussed in relation to continuing professional development (CPD), which encompasses all learning activities aimed at enhancing professional expertise by acquiring new knowledge and skills, beyond the foundational training received during initial education (Njenga, 2023). Boylan et al. add to this by conceptualizing PL as a complex, non-linear process that can be guided by various models, which recognize the interconnectedness of the teachers' beliefs, practices, and their educational environment (Boylan et al., 2018).

Recent frameworks, such as the holistic conceptualization of PD proposed by Sancar et al. (2021) define PD as a comprehensive process that begins during teacher education and continues throughout a teacher's career. This framework features PD as an encompassment of both formal and informal learning activities, shaped by the interplay of teacher characteristics, instructional practices, and contextual factors, such as the schools' environments and educational policies (Njenga, 2023).

This systematic review focuses on the teachers' self-perceived professional growth by examining one of the core elements of PD: formal and informal learning, collectively referred to as professional learning experiences. By exploring these experiences, the study aims to shed light on how they contribute to the teachers' development and effectiveness.

Informal learning, compared to formal learning, is an ongoing, reflective, and adaptive process, during which the teachers actively engage in learning communities or practice-oriented collaborations, which are integral to the enhancement of the instructional practices over time (Boylan et al., 2018). Meanwhile, formal learning is structured, often top-down, to be specifically content- or skill-focused (Boylan et al., 2018). PL, both formal and informal, emphasizes sustained, content-focused, and inclusive active learning and collaborative components; is aligned with the teachers' contextual needs; promotes collaboration; and allows for reflection and practical application within the classroom (Molway, 2019; Zhang et al., 2024).

This systematic review aims to explore the in-service teachers' experiences of professional learning. We explore the effects of PL experiences, specifically focusing on the teachers' self-perceived growth and effectiveness. The review question is framed using PICO frameworks, which include population (in-service teachers), interventions (informal learning experiences), comparators (formal learning experiences), and outcomes (self-perceived growth) (Centre for Reviews and Dissemination, 2009). The research question of the study is as follows: How do the in-service teachers' (P) experiences with informal learning (I) and formal learning (C) affect their self-perceived teacher growth (O)?

1.1. Systematic Reviews of the Literature on In-Service Teachers' PL

Before starting this systematic review, we searched and examined the systematic reviews published in Scopus, Web of Science, and ERIC databases for the period 2018–2024. The rapid review of the systematic reviews on the professional learning of in-service teachers revealed that the topic has been widely examined, particularly with a focus on its different dimensions and on subject-specific professional learning (Kim & Graham, 2022); specific forms and strategies of professional learning (e.g., Bucher et al., 2024; Dille & Røkenes, 2021; Li et al., 2023); technology-driven professional learning (Komalaward-

hana & Panjaburee, 2023); competency, skill and awareness focused professional learning (Bancroft & Nyirenda, 2020; Matschiner, 2023; Wilkinson et al., 2020), and systematic reviews on professional learning focusing on student achievement (Basma & Savage, 2023). The aims and questions of these systematic reviews focus on examining trends, central phenomena, and characteristics of PL, as well as its effects and effectiveness. These systematic reviews significantly advance the field of teacher education by emphasizing the necessity for tailored PL opportunities that encompass both personalized and collaborative collegial learning environments. While all these systematic reviews focus on the various dimensions of the in-service teachers' professional learning, there are limited systematic reviews specifically focusing on the impact of PL experiences on self-perceived teacher growth or development. Furthermore, all these systematic reviews on the professional learning of in-service teachers are conducted in English, and only a few studies focus on the developments in middle- and low-income countries (Qureshi & Demir, 2019; Salazar-López & Peñaloza, 2024). This systematic review aims to fill this gap and suggests its implications for non-Western contexts.

These and other results of the systematic reviews on in-service teachers' PL provide a general picture of the empirical research conducted on the in-service teachers' professional learning and also suggest further research on these learning experiences.

1.2. In-Service Teachers' Self-Perceived Professional Growth

The professional growth of teachers is a multi-dimensional, iterative, continuous, and personalized process that emerges from complex interactions across the varied domains of teachers' experiences, beliefs, and practices. As Clarke and Hollingsworth (2002) argue, professional growth encompasses more than just skill acquisition or knowledge enhancement; it reflects a dynamic and ongoing adaptation to changing contexts and professional challenges. This makes evaluating teacher growth challenging, which is further complicated by the need to consider both the tangible changes in practice, the teachers' understanding, and the re-conceptualizations, leading to growth and changes in classroom practices (Taylor, 2023).

Clarke and Hollingsworth define professional growth as a "continuing process of learning", where growth is driven by the teacher's reflective participation and experimental application within their professional environment (Clarke & Hollingsworth, 2002). This view recognizes teachers as active agents in their growth, continuously constructing and reconstructing their professional identities, knowledge, and competencies through cycles of reflection and action, and consists of four domains. The external domain encompasses the sources of external information, stimulus, and support that influence teachers, including professional learning, and any learning experiences of teachers. The personal domain includes teacher knowledge and understanding, which are central to initiating changes in teacher practice. The domain of practice involves the teacher's professional enactment and classroom practice, where they implement new strategies, approaches, or instructional methods. The outcome domain reflects the consequences of the teachers' actions, specifically the perceived impact of the new practices on students, such as the changes in engagement or learning outcomes. The interconnected model emphasizes the processes of reflection and enactment as mediators between these domains.

Similarly, Taylor positions the teacher's professional growth within a framework of complex thinking, defining it as a recursive and adaptive process, where growth is shaped by intertwined threads of purpose, opportunity, and response (Taylor, 2023). According to Taylor (2023), these dimensions are both unique to each teacher and context-dependent, underscoring the role of interactions between teachers' motivations, professional environments, and the broader socio-political landscape of education (Taylor, 2023). Taylor's approach both complements and extends Clarke and Hollingsworth's model. While Clarke

and Hollingsworth (2002) emphasize distinct domains and structured processes, Taylor (2023) argues that these domains are inherently fluid and interdependent, making the process of professional growth less predictable and more adaptable.

Both models emphasize the iterative nature of growth, yet Taylor's (2023) framework departs from the more structured, cyclical model by highlighting the unpredictability and contextual sensitivity of professional growth. Clarke and Hollingsworth's (2002) interconnected model provides a foundational understanding of teacher professional growth as a reflective and enacted process across distinct domains, while Taylor's (2023) complexity approach adds depth by framing growth as an adaptive, contextually embedded process of mutual influence. Together, these perspectives underscore the need for a flexible and inclusive framework in studying teacher professional growth—one that values both structured reflection and the unpredictability of complex interactions within professional learning environments.

2. Methods

2.1. Protocol

We followed the evidence-based PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol as a framework for this review. This protocol serves as a widely adopted standard, in numerous review studies (Page et al., 2021), to uphold the rigor and transparency of the review methodologies and reporting. The description of PRISMA protocol, including the accompanying checklist and flow diagram, is available online (Makhmetova et al., 2024). This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 6 October 2024. The registration number is INPLASY2024100021. The DOI number is: <https://inplasy.com/inplasy-2024-10-0021/> (accessed on 6 October 2024). Below, we explain how each step was tailored for this systematic review.

2.2. Eligibility Criteria, Information Sources, and Search Strategy

This review includes empirical studies on the in-service teachers' experiences with professional learning experiences, along with their self-assessed professional growth. Inclusion and exclusion criteria are designed based on the PICO research question of the study, as only the studies that examine the experiences of in-service teachers in professional learning, as well as their perceived growth in teaching, are considered. Participants in the selected studies must exclusively be in-service teachers, encompassing subject teachers across disciplines such as STEM, humanities, languages, arts, and social sciences, while excluding pre-service, preschool, vocational, and higher education teachers.

The review concentrates on studies prioritizing the in-service teachers' engagement and experiences with professional learning. It excludes empirical studies that do not place these experiences at the core of their inquiry. Furthermore, studies on subject-specific professional learning needs, teacher literacy, knowledge, gender, religious education, racial issues, equity, or specific skill perspectives are not considered. Additionally, empirical research evaluating professional learning based on outcomes like student achievement or observations conducted by individuals other than in-service teachers is also excluded.

We used Web of Science, Scopus and ERIC databases for this systematic review. While the Web of Science and Scopus databases are widely recognized and extensive databases, the ERIC database is specially focused studies in education field. The keywords for the search are "professional development" OR "professional learning" AND "in-service teachers" OR "inservice teachers" AND "personal growth" OR "personal improvement" AND "professional growth" OR "teacher growth", which is used to search in Abstract, Title and Keywords (Scopus, ERIC), Keywords PLUS (Web of Science). The timeframe for

the search is 2018–2024. Additional filters for search are journal articles, which exclude conference papers, dissertations, books, book chapters, and reports. Another filter for searching in the ERIC database is specifying the subject field to in-service teachers, primary or elementary teachers, middle school teachers and high school teachers. The filter for language is not applied.

2.3. Screening Process and Data Extraction

The screening and data extraction process aimed to systematically identify the studies relevant to the professional learning of in-service teachers. This process began with an extensive search across multiple databases and registers, yielding 6438 studies in total.

Data Sources and Search Results:

- Web of Science: 3084 records
- ERIC: 2146 records
- Scopus: 629 records
- Google Scholar: 579 records
- Grey literature: 0 records

To refine the dataset, duplicate records were removed in two stages. Covidence software identified 979 duplicates, while an additional 31 duplicates were manually detected by the researchers. This process resulted in leaving 5428 unique studies for screening.

The titles and abstracts of the remaining 5428 studies were screened against predetermined inclusion and exclusion criteria. As a result, 5006 studies were excluded due to their lack of relevance to the review's scope. Following this initial screening, 422 studies were selected for full-text retrieval and reviewed for eligibility. After applying the criteria, 38 studies were confirmed to meet the inclusion criteria and were incorporated into the review.

In the full-text assessment phase, 384 studies were excluded for specific reasons, including wrong settings, theoretical papers, inappropriate participant populations, etc.

This systematic review, which focuses on the in-service teachers' experiences and outcomes in professional learning contexts, is based on the final selection of 38 studies.

2.4. Study Risk of Bias Assessment, Selection Process, Data Analysis

A team of four researchers strictly follows a predefined protocol to reduce potential bias in this systematic review. Research questions are crafted using the PICO (Population, Intervention, Comparator, Outcome) framework, which offers a systematic structure for identifying the essential elements of the review. In alignment with rigorous standards, the team adheres to the PRISMA guidelines. Additionally, the review process is facilitated by Covidence, an organized platform that streamlines each phase of the systematic review. Any disagreements regarding study inclusion, exclusion, or analysis are resolved through a collective discussion among the team members.

The selection process was conducted in the Covidence system. Two researchers independently screened the title and abstract, conducted the full-text review, and extracted the study (Figure 1). The 38 articles were extracted for synthesis using narrative synthesis. The data extraction template was created in Covidence following the PICO format, and extraction type 2 was used for data extraction which is more flexible and suitable for narrative analysis (Appendix A).

The studies included in this review were conducted on in-service teachers. We excluded studies that collected data from pre-service, early childhood, and in-service teachers during the screening and full-text review.

The quality of the studies included was assessed using the Joanna Briggs Institute (JBI) checklist, which is well-suited for evaluating qualitative research (Porritt et al., 2014).

Given that this review encompasses qualitative, mixed-methods, and quantitative studies, the JBI approach was selected for its versatility in assessing diverse methodologies. The JBI checklist consists of 10 criteria, each evaluated with either a 'Yes', 'No', 'Not Sure', or 'Not Applicable' response. The appraisal process was conducted independently by the third and fourth authors. Any discrepancies were resolved collaboratively. All studies included in the review met between 7 and 10 criteria, reflecting their high quality.

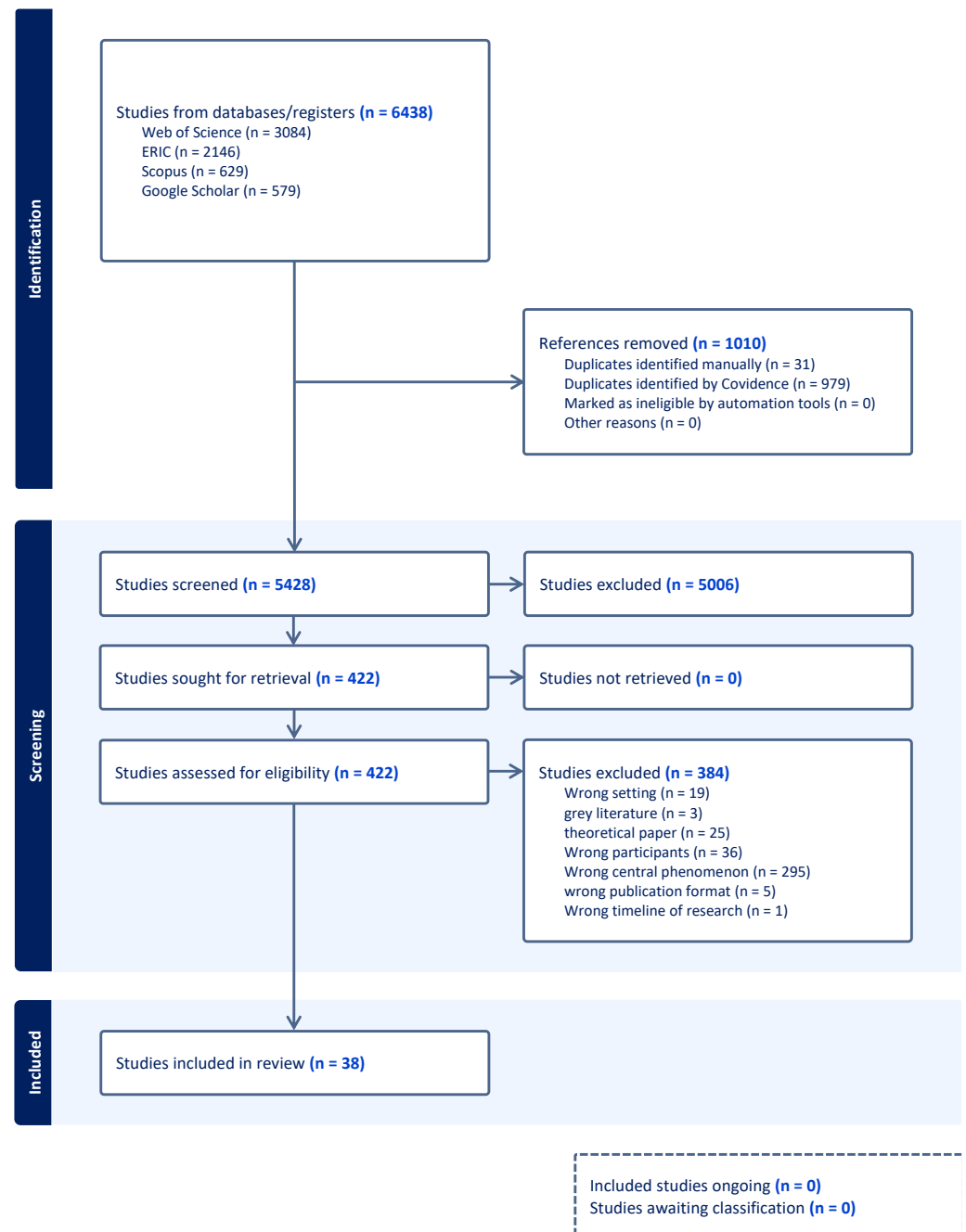


Figure 1. PRISMA flow diagram.

Data analysis was conducted using a narrative approach, which allows for the analysis and synthesis of studies by employing different research methods. Initially, we undertook a descriptive analysis to compare informal and formal professional learning experiences, and a thematic analysis of the outcomes of the studies. A thematic analysis of the study

outcomes was conducted by combining and synthesizing different aspects of the self-perceived growth (Appendix B).

3. Results

The results are presented in three subsections: informal professional learning and teacher professional growth ($n = 19$); formal professional learning and teacher growth; and combined professional learning and teacher growth.

3.1. Informal Professional Learning and Teacher Growth

The studies exploring the teachers' informal professional learning and its impact on teacher professional growth ($n = 18$) were conducted mainly in Western and Nordic countries ($n = 9$), in non-Western contexts like East Asian and African countries ($n = 5$) and also in hybrid contexts such as Turkey, which combines both Middle Eastern and European cultures ($n = 4$) (Table 1). The majority of the studies were qualitative studies ($n = 10$). Some studies used mixed methods ($n = 3$) and some studies used both qualitative and quantitative methods ($n = 2$). Only three studies employed quantitative methods (Akiba et al., 2019; Jhang, 2019; Wang et al., 2024) using self-perceived questionnaires. In one group of qualitative studies, researchers mainly employed multiple data collection methods to explore the effect of informal professional learning as individual interviews and reflection writing (e.g., Geeraerts et al., 2018), or as individual interviews, field notes and observations (e.g., Walters et al., 2020).

Studies conducted in the Western context heavily rely on qualitative designs, particularly individual interviews and reflection writing (Geeraerts et al., 2018; Lund, 2020; Matewos et al., 2019; Solheim et al., 2018; van Schaik et al., 2019; Walters et al., 2020). Research in the Western context focuses on individualized professional development and reflective practices. In non-Western contexts, researchers mainly use self-perceived questionnaires and focus group interviews, emphasizing individual and group perspectives. The mixed methods approach often combines qualitative interviews with measurable data (Thant Sin, 2023). Studies in hybrid contexts incorporate diverse methods, such as document analysis, individual interviews, and self-perceived questionnaires (Özyildirim et al., 2024). The variety in the methods used reflects the need to triangulate data across different cultural settings.

The overall number of teachers who participated in these studies is 7792, and, in sum, on average these studies involved 624 teachers. The studies mainly involved teachers with different lengths of experience, which include both novice, middle-career and experienced teachers ($n = 14$). The majority of the studies did not specify subjects taught by teachers ($n = 10$). The grade level of teaching of participating teachers was also not specified by most studies ($n = 7$). The location of schools where teachers were from was not specified either ($n = 16$).

Table 2 provides a structured overview of 18 studies examining the impact of informal PL on the in-service teachers' self-perceived professional growth, the analysis through theoretical frameworks, the types of informal PL, the self-reported outcomes, and the resulting professional growth domains. The studies utilize a variety of theories, including teacher-professional learning communities, social constructivism, self-efficacy, sociocultural theory, and reflective practices. This diversity reflects an understanding of informal PL as a complex and multidimensional process that depends on social interactions, personal reflection, and collaborative learning.

Table 1. Principal features of examined studies on informal professional learning.

N	Study ID	Study Design	Data Collection	Context of the Study
1	Akiba 2019	Quantitative	Self-perceived questionnaire	Western
2	Culajara 2023	Qualitative	Focus group interviews; Individual interviews	Eastern (Asian)
3	Geeraerts 2018	Qualitative	Individual interviews; Reflection writing	Western
4	Huang 2023	Both	Individual interviews; Self-perceived questionnaire	Eastern (Asian)
5	Jhang 2019	Quantitative	Self-perceived questionnaire	Hybrid (Western, Middle Eastern, Asian, etc.)
6	Kowalczuk-Waledziak 2023	Qualitative	Individual interviews	Hybrid (Western, Middle Eastern, Asian, etc.)
7	LoriHernandez 2024	Both	Individual interviews; Self-perceived questionnaire	Western
8	Lund 2020	Qualitative	Individual interviews; Field notes; Reflection writing	Western
9	Matewos 2019	Qualitative	Individual interviews; Observations	Western
10	Nochumson 2020	Mixed	Individual interviews; Other; Self-perceived questionnaire	Hybrid (Western, Middle Eastern, Asian, etc.)
11	Özyildirim 2024	Qualitative	Individual interviews; Document analysis; Self-perceived questionnaire	Hybrid (Western, Middle Eastern, Asian, etc.)
12	Solheim 2018	Qualitative	Focus group interviews, Reflection writing	Western
13	Schipper 2018	Mixed	Individual interviews; Observation; Pre and post-test survey	Western
14	Taddese 2023	Qualitative	Focus group interviews; Individual interviews	African
15	ThantSin 2023	Mixed	Individual interviews; Self-perceived questionnaire	Eastern (Asian)
16	vanSchaik 2019	Qualitative	Individual interviews	Western
17	Walters 2020	Qualitative	Individual interviews; Field notes; Observations	Western
18	Wang 2024	Quantitative	Self-perceived questionnaire	Eastern (Asian)

Informal PL approaches encompass lesson studies, peer collaboration, mentorship, professional learning communities, and self-directed learning. These methods range from structured activities like action research to more flexible interactions, such as online communities and reflective dialogues.

Thematic analysis of the theoretical framework of the studies exploring informal PL of in-service teachers indicated that mainly in-service teachers perceive broad professional growth ($n = 6$), and practice and application ($n = 5$), indicating the growth in the domain of practice ($n = 8$), the salient outcome ($n = 1$), and the reflection at all levels of growth ($n = 2$). Informal PL of in-service teachers contributed to the improvement of their self-efficacy

($n = 5$), and skill development ($n = 3$) contributing to the personal domain of self-perceived professional growth ($n = 7$).

Table 2. Informal PL and teachers' self-perceived professional growth.

N	Study ID	Theory	Informal PL Type	Outcome (Self-Perceived)	Professional Growth
1	Akiba 2019	Teacher professional learning communities	Lesson study	Improved self-efficacy	Personal domain
2	Culajara 2023	Continuous School Learning Action Cell	Continuous PD: informal learning elements; School-based PL: informal learning elements	Practice and application	Domain of practice
3	Geeraerts 2018	Intergenerational teacher learning, Social constructivism	Mentorship; peer collaboration	Broad professional growth	Domain of practice
4	Huang 2023	Sociocultural theory; Reflection	Peer collaboration; Self-directed learning; Reflections, reflective dialogue; Other: communication with students	Improved self-efficacy	Personal domain
5	Jhang 2020	Cognitive consistency theory	Lesson study	Broad professional growth	Salient outcome
6	Kowalczyk-Waledziak 2023	Teacher professional learning communities	Professional learning communities	Broad professional growth	Reflection at all levels of growth
7	LoriHernandez 2024	Self-efficacy	Action research; Blended PL	Improved self-efficacy	Personal domain
8	Lund 2020	Teacher collaboration, teacher reflection, social constructivism	Professional learning communities; Action research; School-based PL: informal learning elements	Practice and application	Domain of practice
9	Matewos 2019	Teacher learning, instructional changes, reflective practice	Curriculum learning	Broad professional growth	Reflection at all levels of growth
10	Nochumson 2020	Adult learning theory	Social media and online communities	Broad professional growth	Domain of practice
11	Özyildirim 2024	Learning at workplace	School-based PL: informal learning elements; Social media and online communities	Skill development	Personal domain
12	Solheim 2018	Adaptive teaching; Self-efficacy	Lesson study	Improved self-efficacy	Personal domain

Table 2. Cont.

N	Study ID	Theory	Informal PL Type	Outcome (Self-Perceived)	Professional Growth
13	Schipper 2018	Collective and individual learning	School-based PD: informal learning elements; Self-directed learning; Reflections, reflective dialogue	Practice and application	Domain of practice
14	Taddese 2023	Guiding theory	Professional learning communities; Peer collaboration; School-based PL: informal elements of learning	Skill development	Personal domain
15	ThantSin 2023	Mentoring theory	Mentorship; School-University Partnership	Broad professional growth	Domain of practice
16	vanSchaik 2019	Collaborative learning; Constructivism	Professional learning communities; Peer collaboration; Other: Partnership	Practice and application	Domain of practice
17	Walters 2020	Social constructivism	Mentorship	Practice and application	Domain of practice
18	Wang 2024	Person-centered perspective	School-based PL: informal learning elements; Other: work-based learning	Improved self-efficacy	Personal domain

The analysis of studies across contexts reveals distinct approaches and outcomes of informal professional learning (PL) experiences. In the Western context, studies emphasize a wide range of informal learning practices, such as lesson studies (Akiba et al., 2019; Solheim et al., 2018), action research (Hernandez et al., 2024; Lund, 2020), professional learning communities (PLCs) (Lund, 2020), peer collaboration (Geeraerts et al., 2018), mentorships and school-university partnerships (Geeraerts et al., 2018; van Schaik et al., 2019), curriculum learning (Matewos et al., 2019), and school-based informal learning (Schipper et al., 2018). These approaches are rooted in collaborative and reflective theories, including social constructivism, reflective practices, self-efficacy, and collective and individual learning. Teachers engaging in these studies report increased self-efficacy, improved practices, and reflection-driven growth, demonstrating the effectiveness of these theories in fostering professional development.

In hybrid contexts, informal PL experiences also span diverse practices, including lesson studies (Jhang, 2019), PLCs (Kowalczyk-Waledziak & Underwood, 2023; Nochumson, 2020), and school-based informal learning (Özyildirim et al., 2024). These studies uniquely integrate individual and systemic frameworks, such as cognitive consistency theory, workplace learning, and adult learning theory. Teachers participating in hybrid context studies report significant personal development, practice improvement, salient outcomes, and reflective professional growth.

In contrast, non-Western contexts predominantly focus on collaborative learning methods, such as continuous school-based informal learning (Culajara, 2023; Wang et al., 2024), peer collaboration (Huang et al., 2023), PLCs (Taddese, 2023), and mentorship combined with university-school partnerships (Thant Sin, 2023). These studies are grounded in

community-centered theories, including the mentoring theory and sociocultural perspectives. Teachers in these contexts emphasize domain-specific growth, improved self-efficacy, and community engagement, reflecting the importance of collective learning in professional development.

Improved self-efficacy and broad professional growth are the primary benefits of informal PL. The studies also emphasize the social, collaborative, and flexible nature of these learning opportunities. Furthermore, the repeated use of mentorship, professional learning communities, and lesson studies suggests that these methods are particularly effective for fostering reflective and applied professional development.

3.2. Formal Professional Learning and Teacher Growth

The overall number of studies exploring the effect of the formal PL is 12 (Table 3). Researchers examine the formal PL mainly using qualitative methods ($n = 6$). The majority of the studies were conducted in the Western context ($n = 6$), incorporating pre-post surveys and reflective tools like observation and reflection writing for richer qualitative insights (Dhiorbháin et al., 2024; Lee & Vongkulluksn, 2023), and individual interviews (Friedrichsen et al., 2021; Hope et al., 2022). The three studies conducted in a non-Western context include both quantitative (Jiang et al., 2023) and qualitative (Mohamad Nasri et al., 2023), both (McChesney & Aldridge, 2021) research designs, employing pre-post questionnaires and individual interviews, mainly focusing on the measurable outcomes of professional development interventions and the teachers' experiences of learning. The studies conducted in a hybrid context use a mix of quantitative, qualitative, and mixed methods (Ayvaz-Tuncel & Çobanoğlu, 2018; Chung, 2023; Shal et al., 2025). Data collection methods include self-perceived questionnaires, individual interviews, reflection writing, and focus group interviews.

Table 3. Principal features of examined studies on formal professional learning.

N	Study ID	Study Design	Data Collection Instruments	Context of the Study
1	AislingNiDhiorbhain 2024	Qualitative	Pre- and post-interviews; Observations	Western
2	Ayvaz-Tuncel 2018	Quantitative	Self-perceived questionnaire	Hybrid (Western, Middle Eastern, Asian, etc.)
3	Chung 2023	Qualitative	Individual interviews; Reflection writing	Hybrid (Western, Middle Eastern, Asian, etc.)
4	Friedrichsen 2021	Qualitative	Individual interviews	Western
5	Hope 2022	Qualitative	Individual interviews	Western
6	Jiang 2023	Quantitative	Pre-post survey	Eastern (Asian)
7	Lee 2023	Mixed	Pre- and post-test survey; Reflection writing	Western
8	Ludecke 2022	Both	Self-perceived questionnaire	Western
9	McChesney 2021	Both	Individual interviews; Self-perceived questionnaire	Middle Eastern
10	MohamadNasri 2023	Qualitative	Individual interviews	Eastern (Asian)
11	Damianidou 2024	Qualitative	Individual interviews	Western
12	Shal 2024	Mixed	Focus group interviews; Self-perceived questionnaire	Hybrid (Western, Middle Eastern, Asian, etc.)

The overall number of teachers who participated in the studies exploring the effect of formal PL is 494, and, on average, these studies involved 110 teachers. Studies mainly involved teachers with different lengths of experience ($n = 6$), but many studies did not specify it ($n = 5$). Most studies did not specify the subjects taught by teachers ($n = 6$). The level of schools of teachers participating was mainly mixed ($n = 5$) or unspecified ($n = 4$). The location of the schools was not specified ($n = 11$), and one study was conducted in both rural and urban settings ($n = 1$).

Table 4 presents formal PL studies' theories, types of formal PL, self-perceived outcomes and their impact on the teachers' professional growth. Diverse theories underpin the studies, ranging from constructivist theories (Jiang et al., 2023; McChesney & Aldridge, 2021), to andragogical principles (Ayvaz-Tuncel & Çobanoğlu, 2018) focusing on adult learning. Notably, self-determination theory (Damianidou, 2024) and symbolic power (Ludecke et al., 2021) explore autonomy and power dynamics.

Table 4. Formal PL and teachers' self-perceived professional growth.

N	Study ID	Theory	Formal PL Type	Outcome (Self-Perceived)	Professional Growth
1	AislingNiDhiorbhain 2024	An explicit-inductive approach	Intervention; Collaborative PD seminars	Practice and application	Reflection at all levels of growth
2	Ayvaz-Tuncel 2018	Lifelong learning theory; Andragogy	Induction programs	Mixed or contradictory outcomes	External domain (no changes)
3	Chung 2023	Dialogical reflection; Sociocultural perspective; Critical reflection	Seminars, workshops	Practice and application	Reflection at all levels of growth
4	Friedrichsen 2021	Interconnected model of professional growth	Seminars, workshops	Practice and application	Salient outcome
5	Hope 2022	Coaching; Reflective practice	Coaching models	Broad professional growth	Domain of practice
6	Jiang 2023	Constructivism; Cognitive psychology	Intervention	Broad professional growth	Domain of practice
7	Lee 2023	Situated learning theory	Context-based PL	Improved self-efficacy	Personal domain
8	Ludecke 2022	Symbolic power	Coaching models	Skill development	Personal domain
9	McChesney 2021	Constructing grounded theory	Reform-based PD	Mixed or contradictory outcomes	External domain (no changes)
10	MohamadNasri 2023	Interconnected model of professional growth	Collaborative PD seminars	Practice and application	Reflection at all levels of growth
11	Damianidou 2024	Self-determination theory	Online PD courses; Seminars, workshops; Other: obligatory PD courses	Mixed or contradictory outcomes	External domain (no changes)
12	Shal 2024	Constructing grounded theory	Seminars, workshops	Skill development	Personal domain

The types of formal PL highlighted across the studies also reflect a wide range of strategies. Collaborative models use seminars and workshops to encourage shared learning and reflective practice (Dhiorbháin et al., 2024; Chung, 2023; Mohamad Nasri et al., 2023). Other studies like those by Hope et al. (2022) and Ludecke et al. (2021) focus on coaching and mentoring, which are more individualized and reflective. This approach is shown to foster deeper personal growth, helping teachers develop skills that translate to increased

self-efficacy and confidence. Additionally, the reform-based or context-based PL model is tailored to specific institutional or situational needs (Lee & Vongkulluksn, 2023).

The self-perceived outcomes from the in-service teachers vary considerably. Some studies report mixed or contradictory outcomes (Ayvaz-Tuncel & Çobanoğlu, 2018; McChesney & Aldridge, 2021; Damianidou, 2024). These results suggest that not all PL models fit seamlessly into every professional setting, possibly due to institutional constraints or limited adaptability to the in-service teachers' personal needs. Intervention-based and coaching-based types of PL and PD seminars with emphasis on collaborative and reflective learning consistently observe practice and application outcomes and broad professional growth (Dhiorbháin et al., 2024; Chung, 2023; Friedrichsen et al., 2021; Hope et al., 2022; Jiang et al., 2023; Mohamad Nasri et al., 2023). However, the studies exploring the effects of induction programs (Ayvaz-Tuncel & Çobanoğlu, 2018), reform based professional learning (McChesney & Aldridge, 2021), and online obligatory professional development seminars (Damianidou, 2024) indicated mixed or contradictory outcomes.

The contextual differences in the studies exploring the effects of formal professional learning experiences reveal distinct patterns and outcomes across settings. Western context studies predominantly investigate the impact of collaborative PD seminars (Dhiorbháin et al., 2024), coaching models (Hope et al., 2022), and context-based professional learning (Lee & Vongkulluksn, 2023) grounded in frameworks such as explicit-inductive approaches (Dhiorbháin et al., 2024), reflective practices (Hope et al., 2022), and situated learning theory (Lee & Vongkulluksn, 2023). Notably, studies employing collaborative PD seminars, guided by explicit-inductive approaches and the interconnected model of professional growth, reported a significant professional development across all levels and salient outcomes (Dhiorbháin et al., 2024; Friedrichsen et al., 2021).

Hybrid context studies focus on the effects of the induction programs (Ayvaz-Tuncel & Çobanoğlu, 2018), seminars, and workshops (Chung, 2023; Shal et al., 2025), leveraging diverse frameworks that blend self-directed learning with collaborative practices. These studies highlight the adaptability of professional learning approaches to culturally and systematically varied environments.

Non-Western context studies explore interventions (Jiang et al., 2023), collaborative PD seminars (Mohamad Nasri et al., 2023), and reform-based PD (Lee & Vongkulluksn, 2023), which are tailored to address systemic needs. These approaches frequently result in practical and domain-specific professional growth (Jiang et al., 2023; Mohamad Nasri et al., 2023), though some studies report mixed outcomes due to systemic challenges or implementation barriers (McChesney & Aldridge, 2021).

3.3. Both Formal and Informal Learning Studies

The overall number of studies that explored both informal and formal learning was eight (Table 5). Researchers examined the effect of both informal and formal PL mainly using qualitative ($n = 3$) and mixed ($n = 3$) research designs. The context of the studies varied, as they were conducted in Eastern ($n = 2$), Middle Eastern ($n = 2$), Western ($n = 2$), African ($n = 1$), and Post-Soviet ($n = 1$) contexts. The majority of the studies were conducted in non-Western contexts (Abakah, 2023; Avidov-Ungar et al., 2023; Koul et al., 2024; Kyureghyan, 2023; Sertel & Yucel-Toy, 2023; X. Zhang & Wong, 2021), which employ qualitative and mixed methods approaches using interviews, questionnaires, observations, and culturally relevant tools, like lesson plan analysis and document reviews. One study used a design-based approach (Brown et al., 2020). Studies conducted in the Western context employ design-based and both qualitative and quantitative approaches to examine the effects of informal and formal learning experiences on the self-perceived growth of teachers (Brown

et al., 2020; Halvorsen et al., 2021). The studies in the Western context rely on observations, pre-post surveys, and reflective tools such as lesson plans and reflection writing.

Table 5. Principal features of examined studies on both informal and formal professional learning.

N	Study ID	Research Design	Data Collection Methods	Context
1	Abakah 2023	Qualitative	Individual interviews; Observations	African
2	Avidov-Ungar 2023	Mixed	Self-perceived questionnaire; Individual interviews	Middle Eastern
3	Brown 2020	Design based approach	Observations; Pre-post survey	Western
4	Halvorsen 2021	Both	Individual interviews; Other: Lesson plans; Self-perceived questionnaire; Reflection writing	Western
5	Koul 2024	Mixed	Individual interviews; Observations; Self-perceived questionnaire	Eastern (Asian)
6	Kyureghyan 2023	Qualitative	Individual interviews; Self-perceived questionnaire	Post-Soviet non-European
7	SertelAltun 2023	Mixed	Focus group interviews' Other: lesson plan analysis	Middle Eastern
8	Zhang 2021	Qualitative	Individual interview; Observation; Other: Documents	Eastern (Asian)

The overall number of teachers who participated in the studies exploring the effect of both informal and formal PL is 1007, and on average these studies involved 282 teachers. The majority of the studies involved all or mixed length of experience ($n = 4$). Most studies did not specify the subjects taught by the teachers ($n = 5$). The teachers' school level was not specified ($n = 4$) and included all or mixed school levels ($n = 2$) and primary ($n = 2$) schools. The location of the schools needed to be specified ($n = 6$), and only one study was conducted in a rural setting (Halvorsen et al., 2021).

Table 6 summarizes findings from several studies focused on both informal and formal PL and its effects on the teachers' self-perceived professional growth. Each study grounds its analysis in specific theories of teacher learning, reflecting diverse perspectives. This diversity suggests a multidimensional approach to PL, where professional learning is enriched by the theories that address both individual and collaborative aspects of teacher development. Each study incorporates both formal (e.g., workshops, seminars) and informal (e.g., peer collaboration, mentorship) elements, indicating that effective PL often spans structured and organic learning environments. Abakah (2023) and Avidov-Ungar et al. (2023) highlight self-directed learning, whereas Brown et al. (2020) and L. Zhang et al. (2024) focus on collaborative structures. This balance suggests that while individual initiative is essential, collective learning experiences support professional growth. The emphasis on mentorship (Koul et al., 2024; Kyureghyan, 2023) and collaborative learning communities (Brown et al., 2020; Halvorsen et al., 2021; Kyureghyan, 2023) shows that relational support is critical in PL, enhancing both formal and informal learning dimensions. As a result of all these professional learning experiences and the combination of both informal and formal learning, in-service teachers perceived broad professional growth ($n = 8$), which leads to professional growth in the domain of practice ($n = 5$), salient outcome ($n = 1$), and reflection at all levels ($n = 2$).

Table 6. Informal and formal PL and teachers' self-perceived professional growth.

N	Study ID	Theory	Informa and Formal PL Types	Outcome (Self-Perceived)	Professional Growth
1	Abakah 2023	Sociocultural perspective of teacher learning	Self-directed learning; Continuous PD: informal elements of learning; Continuous PD: only formal	Broad professional growth	Domain of practice
2	Avidov-Ungar 2023	Self-regulated learning	Peer collaboration; Self-directed learning; School-based PD: seminars, workshops	Broad professional growth	Domain of practice
3	Brown 2020	Design-based cycle	Collaborative design-based learning; Collaborative PD seminars	Broad professional growth	Reflection at all levels
4	Halvorsen 2021	Situated learning	Professional learning communities; Lesson study; Seminars, workshops	Broad professional growth	Reflection at all levels
5	Koul 2024	Self-efficacy; Job demands-resources theory; Theory of change; Mentor role theory	Informal and formal mentorship	Broad professional growth	Domain of practice
6	Kyureghyan 2023	Social constructivist theory	Professional learning communities; Mentorship; Reflections, reflective dialogue; Other: Research project; Reform based PL	Broad professional growth	Domain of practice
7	SertelAltun 2023	School-based PD	School-based PL: seminars, workshops; Coaching models; Other: Reflections	Broad professional growth	Salient outcome
8	Zhang 2021	Teacher collaboration	Action research; School-based PL: informal learning elements; School-based PD: seminars, workshops	Broad professional growth	Domain of practice

In the Western context, studies emphasize collaborative and reflective learning practices supported by structured frameworks. For example, collaborative design-based learning and PD seminars (Brown et al., 2020), as well as professional learning communities (PLCs), lesson studies, and workshops (Halvorsen et al., 2021) are common approaches. Theoretical foundations such as the design-based cycle (Brown et al., 2020) and situated learning theory (Halvorsen et al., 2021) guide these studies. Outcomes frequently include broad professional growth and reflection at all levels.

In the non-Western context, studies emphasize culturally embedded and community-driven practices. Professional learning often incorporates self-directed learning, peer collaboration, mentorship, school-based PL, action research, and reform-based PL (Abakah, 2023; Avidov-Ungar et al., 2023; Koul et al., 2024; Kyureghyan, 2023; Sertel & Yucel-Toy, 2023; X. Zhang & Wong, 2021). Theoretical frameworks, such as sociocultural perspectives, self-regulated learning, constructivist theory, and job demands-resources theory, guide these approaches. These studies frequently aim to align professional learning practices with systemic and cultural needs, fostering broad professional growth, domain-specific application, and improved self-efficacy.

3.4. Summary of Findings

In this review, we examined studies conducted within the range of 2018 to 2024 exploring the self-perceived professional growth of in-service teachers as the result of professional learning experiences. Overall, 38 studies were identified following the review inclusion and exclusion criteria. Studies were mainly conducted using a qualitative approach and mainly in Western, East Asian and Hybrid contexts. Studies involved different subject teachers with various teaching experiences, teaching at primary, middle and high schools. In combination, in recent years, researchers focus on exploring the effects of informal PL ($n = 18$), and a combination of both informal and formal PL ($n = 8$) on teacher development.

4. Discussion

This systematic review has focused on answering the following research question: How do the in-service teachers' experiences with informal and formal professional learning impact their self-perceived growth? The findings indicate that, compared to formal PL, informal PL experiences fostered, according to the in-service teachers' self-perceived growth, mainly practice and application, but also broader professional growth leading to improved practices, salient outcomes, and reflective professional growth. Combined PL approaches appear most beneficial, synthesizing the strengths of both informal and formal elements to support broad professional growth.

The findings of this review reaffirm the notion that professional growth is a complex, multi-dimensional process. As Clarke and Hollingsworth's interconnected model emphasizes, teacher growth stems from reflective participation and action across the domains of personal knowledge, practice, and external stimuli (Clarke & Hollingsworth, 2002). Similarly, Taylor's (2023) framework of complex thinking situates professional growth within a recursive, adaptive process, shaped by context-dependent interactions between the teachers' motivations, their professional environments, and their socio-political conditions. This study's findings illustrate how both formal and informal PL contribute to these dimensions of growth, albeit through distinct mechanisms.

Formal PL experiences, including structured workshops, interventions, and seminars, primarily support skill development and practice improvement. In the Western contexts, collaborative PD models grounded in frameworks like explicit-inductive approaches (Dhiorbháin et al., 2024), situated learning theory (Lee & Vongkulluksn, 2023), and reflective practices (Hope et al., 2022) effectively foster broad professional growth and reflection at all levels. These findings align with the literature, emphasizing formal PL as a top-down, content-driven approach aimed at enhancing professional expertise through structured learning opportunities (Sancar et al., 2021; Njenga, 2023).

However, formal PL often yields mixed or contradictory outcomes, particularly in the non-Western contexts, where systemic constraints or mismatched priorities limit its adaptability to the local needs (Ayvaz-Tuncel & Çobanoğlu, 2018; McChesney & Aldridge, 2021). The review corroborates Sancar et al.'s conceptualization of formal PL as a process influenced by teacher characteristics, institutional policies, and school environments (Sancar et al., 2021). While formal PL provides valuable opportunities for structured learning, its impact is constrained when it fails to address the teachers' specific contexts or promote sustained engagement.

Informal PL, such as mentorship, peer collaboration, and professional learning communities, supports growth in the personal and practice-oriented domains by encouraging reflection and adaptability. These informal structures align with self-directed and collaborative learning, fostering enhanced self-efficacy and a deeper connection with professional communities. The teachers in the Western and non-Western contexts consistently report

improved self-efficacy, broad professional growth, and community engagement, reflecting the effectiveness of informal PL in fostering domain-specific and collaborative learning.

These findings reflect [Boylan et al.'s \(2018\)](#) characterization of PL as a non-linear process influenced by the teachers' beliefs, practices, and contexts. Informal PL provides sustained, practice-oriented learning through teacher agency and collaboration, addressing critiques of traditional formal PL as overly rigid or irrelevant ([Ayvaz-Tuncel & Çobanoğlu, 2018](#)). However, recent innovations in formal PL—such as coaching programs ([Hope et al., 2022](#); [Ludecke et al., 2021](#)), collaborative professional development ([Dhiorbháin et al., 2024](#); [Mohamad Nasri et al., 2023](#)), and context-based PL ([Lee & Vongkulluksn, 2023](#))—have begun to address these critiques, incorporating elements of teacher agency and collaboration into structured learning frameworks.

Combined PL, which integrates formal structures with the informal, collaborative opportunities, yields the most comprehensive growth. This model allows for structured learning while also promoting autonomy and community support, fostering outcomes like reflective practice and practical application across various domains of growth. This integration reflects [Taylor's \(2023\)](#) emphasis on the adaptability and interconnectedness of professional growth and [Clarke and Hollingsworth's \(2002\)](#) recognition of reflection and enactment as mediators across domains of growth.

Hybrid PL models are particularly effective in accommodating diverse teacher characteristics, including variations in experience levels, subject specializations, and professional motivations. Additionally, studies exploring the effects of combined formal and informal PL were predominantly conducted in non-Western contexts. These contexts, often characterized by rapidly evolving educational reforms and resource constraints, benefit significantly from tailored PL approaches that address the specific needs of teachers. The hybrid model provides a robust framework for fostering growth in these settings by combining the structure of formal PL with the flexibility and contextual relevance of informal learning.

Limitations

This systematic review, while comprehensive, has several limitations that may impact the generalizability and depth of its findings. The limitations of the study are connected to its focus. First, it focuses on teachers' self-perceived growth. While valuable, self-perceived data is inherently subjective and may be influenced by teachers' current job satisfaction, expectations, or cultural norms, which could bias the reported effectiveness of professional learning experiences. Another limitation is that the review may be affected by publication bias, as it primarily includes studies published in peer-reviewed journals. Studies with null or negative findings may be underrepresented, potentially leading to an overestimation of the positive impact of professional learning programs. Furthermore, indexed journal articles have limitations on the language of publication and less publications from less developed countries.

5. Conclusions

This review highlights the need for a balanced approach to in-service teacher professional learning, where both informal and formal learning environments are utilized to address the teachers' multifaceted needs. Informal PL's self-directed, collaborative nature complements the structured knowledge frameworks of formal PL, and together, they promote a holistic growth model. These findings suggest that educational institutions should consider adopting hybrid PL models to better support teacher development and adaptability.

Future research could explore specific combinations of PL activities that maximize the teachers' professional growth across diverse educational contexts. These limitations suggest

that future research should aim to include broader geographical contexts, consider mixed study designs, and examine both short- and long-term effects of professional learning on in-service teachers. Addressing these limitations can contribute to a more comprehensive understanding of the diverse factors influencing teacher development globally.

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

Appendix A

Study design

1. Quantitative study
2. Qualitative study
3. Mixed methods study
4. Other

Data collection

1. Self-perceived questionnaire
2. Pre and post-test survey
3. Individual interview
4. Focus group interview
5. Reflection writing
6. Pre and post interview
7. Observation
8. Other

Participants

Population description _____

Teacher experience

1. Novice
2. Middle career
3. Experienced

4. All or mixed
5. Not specified

Subjects taught

1. STEM
2. Social science, Arts and Humanities
3. Generalist
4. All or mixed
5. Not specified

Level of teaching

1. High school
2. Middle school
3. Primary
4. All or mixed
5. Not specified

Total number of participants _____

Intervention

Informal PD

1. Professional learning communities
2. Mentorship
3. Peer collaboration
4. Action research
5. Lesson study
6. Social media and online communities
7. Self-directed learning
8. Peer-observation and feedback
9. Attending informal sessions or conferences
10. Continuous PD: informal learning elements
11. School based PD: informal learning elements
12. Reflections, reflective dialogue
13. Other

Comparison

Type of intervention or outcome

1. Informal PD
2. Formal PD
3. Both

Formal PD

1. Reform based PD
2. School based PD: seminars, workshops
3. Continuous PD: only formal PD
4. Intervention
5. Induction programs
6. Coaching models
7. Certification programs
8. Online PD courses
9. Seminars, workshops
10. Collaborative PD seminars
11. Other

Outcome

Self-perceived professional growth, improvement or growth

1. Improved pedagogical skills
2. Improved subject-specific knowledge
3. Improved understanding of certain skills or concepts
4. Improved teaching practice
5. Improved self-efficacy
6. Improved other skills as communication and other
7. No changes or improvement
8. Other

Study setting _____

Context of the study

1. African
2. Central Asian
3. Eastern (Asian)
4. Indigenous and Aboriginal
5. Latin American
6. Middle Eastern
7. Western
8. Hybrid (Western, Middle Eastern, Asian, etc.)
9. Comparative

Study setting

1. Rural schools
2. Urban schools
3. Not specified
4. Other

What aspect of professional growth following Clarke and Hollingsworth is explored in the study?

1. External source of information or stimulus (PD, or another external stimulus)
2. Personal domain (change in beliefs, understanding, attitudes)
3. Domain of practice (tries new activity)
4. Salient outcome
5. Reflection
6. Other

What is the environment? (school, country context) _____

What is the result or finding of the study? _____

Appendix B

Thematic analysis of self-perceived professional growth

Study ID	Teachers' Self-Perceived Outcome	Category	Description
1 AislingNíDhiorbháin 2024	"Improved pedagogical skills; Improved subject-specific knowledge; Improved teaching practice"	Practice and application	Emphasized improving through the practical application of skills in classrooms, working with students, lesson planning, etc.; understanding and applying certain skills or concepts
2 Akiba 2019	"Improved subject-specific knowledge; Improved self-efficacy"	Self-efficacy	Focuses on individual's beliefs in their capabilities, which can impact performance and resilience, gaining confidence
3 Ayvaz-Tuncel 2018	"Improvement of pedagogical skills; No changes or improvement"	Mixed or contradictory outcomes	Responses indicate mixed or contradictory outcomes in terms of improvement. There is evidence of some improvement (e.g., pedagogical skills), alongside reports of no change or uncertainty (e.g., "No changes" or "Other: mixed").
4 Avidov-Ungar 2023	"Improved pedagogical skills; Improved understanding of certain skills or concepts; Improved teaching practice; Improved other skills as communication and other"	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
5 Abakah 2023	"Improved pedagogical skills; Improved subject-specific knowledge; Improved understanding of certain skills or concepts; Improved teaching practice"	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
6 Brown 2020	"Improved pedagogical skills; Improved subject-specific knowledge; Improved understanding of certain skills or concepts; Improved teaching practice; Improved other skills as communication and other"	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
7 Culajara 2023	"Improved understanding of certain skills or concepts; Improved teaching practice; Other: well-being in the profession"	Practice and application	Emphasized improving through the practical application of skills in classrooms, working with students, lesson planning, etc.; understanding and applying certain skills or concepts
8 Chung 2023	"Improved understanding of certain skills or concepts; Improved teaching practice; Other: refresher minds of what they learnt during the teacher training program"	Practice and application	Emphasized improving through the practical application of skills in classrooms, working with students, lesson planning, etc.; understanding and applying certain skills or concepts

Study ID	Teachers' Self-Perceived Outcome	Category	Description	
9	Damianidou 2021	"Improved pedagogical skills; No changes or improvement; Other: mixed"	Mixed or contradictory outcomes	Responses indicate mixed or contradictory outcomes in terms of improvement. There is evidence of some improvement (e.g., pedagogical skills), alongside reports of no change or uncertainty (e.g., "No changes" or "Other: mixed").
10	Friedrichsen 2021	"Improved pedagogical skills; Improved subject-specific knowledge; Improved understanding of certain skills or concepts; Improved teaching practice"	Practice and application	Emphasized improving through the practical application of skills in classrooms, working with students, lesson planning, etc.; understanding and applying certain skills or concepts
11	Jiang 2023	"Improved pedagogical skills; Improved subject-specific knowledge; Improved self-efficacy; Improved other skills as communication and other"	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
12	Jhang 2020	"Improved pedagogical skills; Improved subject-specific knowledge; Improved teaching practice; Improved other skills as communication and other"	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
13	Geeraerts 2018	"Improved pedagogical skills; Improved subject-specific knowledge; Improved understanding of certain skills or concepts; Improved teaching practice; Improved other skills as communication and other"	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
14	Halvorsen 2021	"Improved pedagogical skills; Improved subject-specific knowledge; Improved understanding of certain skills or concepts; Improved teaching practice; Improved other skills as communication and other"	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
15	Hope 2022	"Improved understanding of certain skills or concepts; Improved teaching practice; Improved other skills as communication and other"	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
16	Huang 2023	"Improved self-efficacy"	Self-efficacy	Focuses on individual's beliefs in their capabilities, which can impact performance and resilience, gaining confidence

Study ID	Teachers' Self-Perceived Outcome	Category	Description	
17	Kyureghyan 2023	"Improved pedagogical skills; Improved subject-specific knowledge; Improved understanding of certain skills or concepts; Improved teaching practice; Improved other skills as communication and other"	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
18	Kowalczyk-Waledziak 2023	"Improved pedagogical skills; Improved understanding of certain skills or concepts; Improved teaching practice; Improved other skills as communication and other"	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
19	Koul 2024	"Improved pedagogical skills; Improved understanding of certain skills or concepts; Improved teaching practice; Improved self-efficacy"	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
20	Lee 2023	"Improved teaching practice; Improved self-efficacy"	Self-efficacy	Focuses on individual's beliefs in their capabilities, which can impact performance and resilience, gaining confidence
21	LoriHernandez 2024	"Improved self-efficacy; Improved other skills as communication and other"	Self-efficacy	Focuses on individual's beliefs in their capabilities, which can impact performance and resilience, gaining confidence
22	Ludecke 2022	Improved understanding of certain skills or concepts	Skill-development	Focused on building or enhancing specific skills that can be applied practically.
23	Lund 2020	"Improved understanding of certain skills or concepts; Improved teaching practice"	Practice and application	Emphasized improving through the practical application of skills in classrooms, working with students, lesson planning, etc.; understanding and applying certain skills or concepts
24	McChesney 2021	"Improvement of pedagogical skills; No changes or improvement"	Mixed or contradictory outcomes	Responses indicate mixed or contradictory outcomes in terms of improvement. There is evidence of some improvement (e.g., pedagogical skills), alongside reports of no change or uncertainty (e.g., "No changes" or "Other: mixed").
25	Matewos 2019	"Improved pedagogical skills; Improved understanding of certain skills or concepts; Improved teaching practice; Improved self-efficacy"	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills

Study ID	Teachers' Self-Perceived Outcome	Category	Description	
26	MohamadNasri 2023	“Improved understanding of certain skills or concepts; Improved teaching practice”	Practice and application	Emphasized improving through the practical application of skills in classrooms, working with students, lesson planning, etc.; understanding and applying certain skills or concepts
27	Nochumson 2020	“Improved pedagogical skills; Improved teaching practice; Improved other skills as communication and other”	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
28	Özyildirim 2024	“Improved other skills as communication and other; Improved understanding of certain skills or concepts;”	Skill-development	Focused on building or enhancing specific skills that can be applied practically.
29	Schipper 2018	“Improved pedagogical skills; Improved self-efficacy”	Self-efficacy	Focuses on individual's beliefs in their capabilities, which can impact performance and resilience, gaining confidence
30	SertelAltun 2023	“Improved pedagogical skills; Improved understanding of certain skills or concepts; Improved teaching practice; Improved self-efficacy; Improved other skills as communication and other”	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills
31	Shal 2024	“Improved pedagogical skills; Improved other skills as communication and other”	Skill-development	Focused on building or enhancing specific skills that can be applied practically.
32	Solheim 2018	“Improved pedagogical skills; Improved teaching practice”	Practice and application	Emphasized improving through the practical application of skills in classrooms, working with students, lesson planning, etc.; understanding and applying certain skills or concepts
33	Taddese 2023	“Improved pedagogical skills; Improved other skills as communication and other”	Skill-development	Focused on building or enhancing specific skills that can be applied practically.
34	ThantSin 2023	“Improved pedagogical skills; Improved subject-specific knowledge; Improved understanding of certain skills or concepts; Improved teaching practice; Improved self-efficacy; Improved other skills as communication and other”	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills

Study ID	Teachers' Self-Perceived Outcome	Category	Description
35	vanSchaik 2019	Practice and application	Emphasized improving through the practical application of skills in classrooms, working with students, lesson planning, etc.; understanding and applying certain skills or concepts
36	Wang 2024	Self-efficacy	Focuses on individual's beliefs in their capabilities, which can impact performance and resilience, gaining confidence
37	Walters 2020	Practice and application	Emphasized improving through the practical application of skills in classrooms, working with students, lesson planning, etc.; understanding and applying certain skills or concepts
38	Zhang 2021	Broad professional growth	Involves growth in multiple areas or holistic development beyond specific skills, combined skills

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