



Review article

A new framework for teachers' professional development

Raziye Sancar^{a, *}, Deniz Atal^b, Deniz Deryakulu^b^a Department of Computer and Instructional Technology Education, Kirsehir Ahi Evran University, 40100, Kirsehir, Turkey^b Department of Computer and Instructional Technology Education, Ankara University, 06590, Ankara, Turkey

HIGHLIGHTS

- Reviewed literature on teacher's PD to uncover best practices.
- Found that teachers' PD extends from teacher's college to retirement.
- PD is affected by teachers' traits, materials, and pedagogies.
- Effective PD is attentive to reforms, context, curriculum, and collaboration.
- The components of the PD process are interrelated and interdependent.

ARTICLE INFO

Article history:

Received 1 October 2020

Received in revised form

9 January 2021

Accepted 3 February 2021

Available online 15 February 2021

Keywords:

Teacher education

Teaching profession

Professional development

Professional development components

ABSTRACT

Teachers' professional development (PD) is crucial to improving student outcomes. Because PD involves a multidimensional structure and changes across a teacher's professional life, defining PD is complicated, and existing studies fail to meaningfully define it. To offer a working framework for optimal PD, we reviewed existing articles on the subject in four key journals in teacher education. We found that effective PD is attentive to assessment, research scale, duration, comprehensiveness, dissemination, context, support and control, and collaboration. We situate this conceptual framework as a new take on pre-existing definitions of PD that advises how to more effectively apply PD.

© 2021 Elsevier Ltd. All rights reserved.

Contents

1. Introduction	2
2. Methodology	2
2.1. Data sources and sample	2
2.2. Data analysis	3
2.3. Researcher positionality and credibility	3
3. Results	3
3.1. Definition of PD	3
3.2. Variables attributed to PD	5
4. Discussion and conclusions	7
4.1. The conceptual framework for PD	8
4.2. The pathway for designing effective PD process	9
4.3. Considerations for designing an effective PD process	9
Funding	10
Declaration of competing interest	10
References	10

* Corresponding author.

E-mail address: raziye.sancar@ahievran.edu.tr (R. Sancar).

1. Introduction

For years, the literature on education has engaged in a debate about whether “teacher quality is the most important school variable influencing student achievement and improving the quality of school” (Desimone, 2009, 2011; Kang, Cha, & Ha, 2013; Macià & García, 2016). Along these lines, educational leaders, theorists, and researchers have focused on how to best enhance the quality of teaching to improve student learning and achievement. Every year, countries invest millions of dollars in improving the quality of their teachers’ skills and qualifications by developing their opportunities for professional development (PD) (DeMonte, 2013; Desimone, Smith, & Ueno, 2006; Guskey & Yoon, 2009).

Bubb (2004) claims that rapid change in the educational landscape, demand for high pedagogical standards, and the need for high-quality education have raised expectations for teacher skills and professionalism. On the other hand, teachers’ own expectations of themselves have also heightened with the knowledge society’s intensification of new ways of thinking and educational innovations (Collinson et al., 2009). Certainly, there is a need for teachers to constantly learn. Note that this process of continuous improvement requires them to encounter new expertise, receive strong support, and have access to new opportunities (Al-Hinai, 2007; Collinson et al., 2009). To facilitate these conditions, many policies have been put in place to encourage teachers’ colleges and other educational organizations related to teacher training to develop teachers’ existing knowledge and practices to enhance student outcomes and school quality (Borko, Jacobs, & Koellner, 2010; Desimone, 2011). Given that teacher PD tends to enhance student learning and achievement, it has as noted above, received considerable critical attention (Desimone, 2009; Desimone, Porter, Garet, Yoon, & Birman, 2002; Evans, 2014; Kuijpers, Houtveen, & Wubbels, 2010). To better understand how individuals develop professionally, it is necessary to unpack the various dimensions of PD (Evans, 2011). On the other hand, before starting the PD process, it is important to define what PD is, explain how it affects teacher and student outcomes, and describe the contextual factors impacting it (Kang et al., 2013). While existing research maps an increasing demand for teacher PD (Hill, 2009), it demonstrates a lack of knowledge of what PD actually is and what effective PD really entails. According to Komba and Mwakabenga (2019), researchers have not yet presented a proper understanding of the concept, scope, and features of teacher PD. Although the theoretical backgrounds, focuses, and contexts of existing studies differ, many have been conducted without a clear definition of PD and without a sense of its particular characteristics and frameworks (Garet, Porter, Desimone, Birman, & Yoon, 2001). For instance, Sales, Traver, and García’s (2011) study on teacher PD did not define PD. Similarly, Bett and Makewa (2018) conducted a study on how to improve teacher PD without identifying it or its dimensions. On the other hand, Evans (2014) argues that existing models of the features and models of PD (see, for example, Kuijpers et al., 2010) fail to holistically examine the concept as a whole.

As Clarke and Hollingsworth (2002, p. 947) note, “If we are to facilitate the professional development of teachers, we must understand the process by which teachers grow professionally and the conditions that support and promote that growth.” Understanding these conditions, Korthagen (2017) underlined that when designing the PD process, there is a need to focus on teachers’ needs, focuses, prospects, emotions, motivations, and dreams. As such, the multidimensional structure and practical development of PD complicate the process through which it is applied but does not render it impossible. Therefore, to provide a meaningful and holistic perspective of PD, a comprehensive framework is needed.

Based on this, we consider it possible to put forward a holistic framework of PD by integrating existing studies. Therefore, to address the gap in the existing research reflecting different theoretical perspectives and approaches around the definition of effective teacher PD, we designed a study to identify the key features of teacher PD to present a holistic framework thereof that captures its complex and interactive nature. Without such insight, the limited knowledge of teacher PD that currently exists will prevent PD from achieving its desired goals. Thus, we sought to take a step toward revealing numerous the variables and structures that affect the teacher PD process to make it more effective. Moreover, we provide suggestions and road maps for future studies to clarify the incomplete and insufficient dimensions of PD. To ensure this, we systematically reviewed articles on teacher PD in the literature as a basic interpretive study. Accordingly, our main research questions were as follows:

1. How do expressions of teacher PD in existing research define and treat professionalism?
2. Which variables do existing studies attribute to teacher PD?

2. Methodology

Our study was a basic interpretive study, the most common form of qualitative research. Basic interpretive studies are often used in applied fields of practice such as education, administration, health, social work, counseling, and business, and focus on understanding and interpreting the meaning of a phenomenon for those involved. Furthermore, basic interpretive studies typically use interviews, observations, and document analysis as data collection methods (Merriam, 2009, p. 22).

2.1. Data sources and sample

The Scopus search engine (<http://www.scopus.com>) was used to retrieve a list of journals and articles related to our topic. The inclusion criteria for our journals were that they (i) must be included in the Social Sciences Citation Index (SSCI), (ii) must use “teacher education” in the journal title, (iii) and must be non-specialized. Although many education-oriented journals specialized in different subject areas meet our criteria, we paid attention to the expression “teacher education” in the journal title. Thus, four major teacher education journals were selected for analysis, namely the *Asia-Pacific Journal of Teacher Education*, *European Journal of Teacher Education*, *Journal of Teacher Education*, and *Teaching and Teacher Education*. Two researchers with years of experience carrying out studies in this area were asked to filter the PD studies published by these 4 journals from the 10,483 papers included in them. The inclusion criteria for papers included at this stage were that they were (i) published between 2009 and 2019, (ii) written in English, (iii) included “professional development” in their titles, and (iv) identified as either an article or a review. After filtering the papers and addressing any inconsistencies, 156 articles concerning PD were selected. Table 1 shows the total number of papers analyzed in each journal.

The studies focused on different subject areas such as primary education, technical education, language education, and science and mathematics education. The studies’ sample populations were diverse. Participants frequently and variously included students, teacher candidates, teachers, teacher educators, school principals, in-service trainers, and government officials. In addition, qualitative, quantitative, and mixed research methods were used. In general, studies that explored a particular PD process looked at PD processes with durations of less than one year; however, some

Table 1
Definitions of professional development in existing pedagogical research.

Name of Journal	Total Number of Papers
Teaching and Teacher Education (T&TE)	97
Journal of Teacher Education (JTE)	30
European Journal of Teacher Education (EJTE)	19
Asia-Pacific Journal of Teacher Education (APJTE)	10
Total	156

studies did conduct long-term investigations (e.g., between 1 and 4 years and for more than 4 years).

2.2. Data analysis

Our research analysis focused on all aspects of the 156 studies. The units of analysis of our research are the sentences in the design, structure, and implementation processes of these studies. In these studies, we examined what, how, with whom, and for how long each was conducted. In other words, we analyzed these studies to uncover their purposes, subject matter, participants, methodologies, and PD processes. Specifically, we investigated how PD was defined, dealt with, associated with, the focus and contexts of these studies, and what conclusions they reached.

Since we adopted an inductive approach throughout the analysis process, we did not use a specific code, category, or theme at the beginning. Our data analysis process involved four levels. Two researchers separately analyzed the articles during the first three steps. Throughout these steps, we organized the articles into smaller segments and assigned key points as codes to summarize our ideas. Below, the coding process is explained in detail.

1st step.

“Pathways is faculty PD designed to develop instructors’ knowledge, beliefs, skills, and practices for teaching mathematics in the context of Statway or Quantway.” (Edwards, Sandoval, & McNamara, 2015)

When we coded this sentence, first, we defined its relation to professional knowledge, beliefs, skills, and practice.

“Drawing on interviews with a diverse sample of teachers, this study used the frame of professional identity to interpret the heterogeneities present in teachers’ perceptions of PD.” (Noonan, 2019)

When we coded this sentence, first, we defined its relation to professional identity.

“Most important, given the focus of the article, we argue that participation in design-based improvement cycles has the potential to (a) increase teacher knowledge, beliefs, and skills about the value of literacy in math learning; and (b) evolve their

classroom practices to better integrate the activities of literacy centers into their routines.” (Gomez et al., 2015)

When we coded this sentence, first, we defined its relation to professional knowledge, beliefs, and skills.

2nd step. After coding these sentences for all articles, we checked the codes and set the categories. We called them categories directly related to the profession.

3rd step. We created the theme as teacher characteristics including professional features and individual features.

Last step. Next, the same two researchers compared their categories and cross-checked their work to ensure that codes were not repeated in different categories before grouping similar categories into themes (Fig. 1).

Table 2 details the data analysis process. First, we defined the unit of analysis and its relationship with open codes (e.g., professional knowledge, beliefs, skills, identities, practice). Next, we directly related the open codes to the categories related to the profession and to the theme of teacher characteristics.

2.3. Researcher positionality and credibility

The researcher’s personal familiarity with the research field impacts all phases of the research process including data analysis and interpretation (Berger, 2015). The fact that all three researchers who conducted the current study have publications on teacher education and PD evidences their competency in conducting research on this subject. Working in a department of teacher training is considered to demonstrate prolonged engagement with and persistent observation of the field, and reflexivity, prolonged engagement, and persistent observation consolidate a researcher’s credibility. Moreover, the themes created by the two authors with peer debriefing in the first analysis phase were examined by a third expert, who provided feedback at the final stage of the analysis as a confirmability audit. Transferability, which is equivalent to external validity in qualitative research, is the ability to transfer research findings or methods from one group to another and the applicability of the findings of a particular inquiry for other contexts or other subjects/participants (Lincoln & Guba, 1985). In this research, detailed descriptions were given at all stages—from determining the problem to the design of the research process; from the analysis of the data to the writing of the results—to ensure their transferability.

3. Results

Based on our research aims, we looked at how the studies we systematically analyzed defined PD. Below, we describe the results of our analysis for each study category.

3.1. Definition of PD

We found that the majority of the 156 articles examined in this

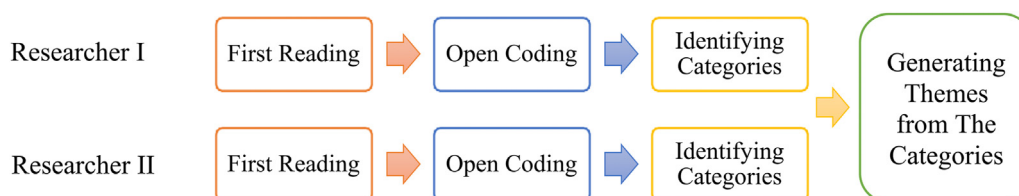


Fig. 1. The data analysis process.

Table 2
Examples of the analytical process.

Unit of Analysis	Codes	Categories	Themes
Pathways is faculty PD designed to develop instructors' knowledge, beliefs, skills, and practices for teaching mathematics in the context of Statway or Quantway. (Edwards et al., 2015)	Professional knowledge, beliefs, skills, and practice	Directly related to the profession	Teacher characteristics
Most important, given the focus of the article, we argue that participation in design-based improvement cycles has the potential to (a) increase teacher knowledge, beliefs, and skills about the value of literacy in math learning; and (b) evolve their classroom practices to better integrate the activities of literacy centers into their routines. (Gomez et al., 2015)	Professional knowledge, beliefs, and skills		
Drawing on interviews with a diverse sample of teachers, this study used the frame of professional identity to interpret the heterogeneities present in teachers' perceptions of PD. (Noonan, 2019)	Professional identities		

research did not define PD; however, some studies used existing definitions in the literature as the bases for their variables and research processes. The 156 reviewed articles can be divided into 3 in terms of usage of PD definition:

- Articles defining PD based on traditional approaches
- Articles defining PD based on new approaches
- Articles without a definition of PD

Table 3 includes PD definitions and related research that we came across in the relevant literature.

Articles defining PD based on traditional approaches. The vast majority of articles have used existing definitions based on the traditional approach as the bases for their variables and research processes. According to definitions based on the traditional approach, PD is mostly described as processes and activities arranged to improve teachers' professional knowledge, skills, and attitudes to enhance students' learning (Guskey, 2003). Similarly, Day and Sachs (2004) interpret PD as "all the activities in which teachers engage during the course of a career which are designed to enhance their work." According to Desimone's (2009) definition, PD is a process involving the interaction of teacher knowledge and beliefs, in-class teaching practices, and student learning outcomes. The most striking point in the abovementioned traditional definitions is that PD is seen as a teaching process/activity focusing on increasing teacher learning and changing teacher classroom practices to improve student outcomes (e.g., Coldwell, 2017; Fischer et al., 2018). On the other hand, also notable is that the PD process is considered a complex, interactive, formal, informal, manageable, and measurable activity (Desimone et al., 2002).

In the reviewed literature, most studies using the traditional approach have structured the process based on Desimone's definition (e.g., Coldwell, 2017; de Groot-Reuvekamp et al., 2018;

Table 3
Definitions of PD in the literature.

Author and Year	Definition
Meissel, Parr, & Timperley. (2016) Coldwell (2017) de Groot-Reuvekamp, Ros, and van Boxtel (2018) Fischer et al. (2018) Vermunt, Vrikki, van Halem, Warwick, and Mercer (2019) Opfer and Pedder (2011) Gore et al. (2017) Yurkofsky, Blum-Smith, and Brennan (2019) Moussay, Flavier, Zimmermann, and Méard (2011) Kabilan (2013) Wang (2018)	PD is teachers' knowledge and skills that relate to changes in instructional practice, which increase students' learning and achievement (Desimone, 2009).
Higgins and Parsons (2009) Mushayikwa and Lubben (2009) de Vries, Jansen, and van de Grift (2013)	PD is considered an essential mechanism for deepening teachers' content knowledge and developing their teaching practices (Desimone et al., 2002). PD has the ability to move teachers toward a more professional stance in their contributions and understandings as future practicing teachers (Sutherland, Howard, & Markauskaite, 2010). Effective PD has been identified as a critical factor in improving professional practice and student outcomes and the development of school-based conditions for sustainability (Timperley, Wilson, Barrar, & Fung, 2007).
	Professional development is taken as the process of accumulating skills, professional knowledge, values and personal qualities that enables teachers to continually adapt within the educational system (Vonk, 1991).

Meissel, Parr, & Timperley, 2016; Noonan, 2019; Opfer & Pedder, 2011). For instance, de Groot-Reuvekamp et al. (2018) considered PD within the framework of Desimone's definition and focused on successful PD programs to improve students' understanding of historical time. Similarly, Opfer and Pedder (2011) focused on three influences on the effectiveness of teacher PD for improving schools based on Desimone's definition. However, apart from the definition of Desimone, there are also structured studies based on other traditional definitions (e.g., de Vries et al., 2013).

Articles defining PD based on new approaches. Although PD programs based on traditional approaches are popular forms of frequently used PD, a criticism is that these programs do not sufficiently focus on individual characteristics, needs, competencies, participation, and prior knowledge (Craft, 2000; Neil & Morgan, 2003). Beyond traditional PD, the situative perspective has provided new approaches to define PD, which focus more on the individual (Neil & Morgan, 2003). Using these new alternative PD approaches, some reviewed articles focused on improving teachers' learning and teaching practices with their individual, social, and occupational dimensions in a collaborative, inquisitive, and self-directed learning environment (e.g., Borko et al., 2010; Derri, Vasiliadou, & Kioumourtzoglou, 2015; Fraser, Kennedy, Reid, & Mckinney, 2007; Hung & Yeh, 2013; Mushayikwa & Lubben, 2009). For instance, Derri et al. (2015) discussed PD as a part of teachers' lifelong learning, which was influenced by social constructivist and inquiry-based approaches. Similarly, defining PD as the process of accumulating skills, professional knowledge, values, and personal qualities, Mushayikwa and Lubben (2009) developed a model for self-directed professional development in their research.

Articles that do not define PD. Many studies structured the research process without applying a definition and framework of PD (e.g., Gallagher, Griffin, Parker, Kitchen, & Figg, 2011; Holdway & Hitchcock, 2018; Lopes & Cunha, 2017; Zhang, Lundeberg, Koehler, & Eberhardt, 2011). Although PD is not defined in the research, Gallagher et al. (2011) outlined the professional development of

pre-tenure teacher educators through the establishment of a self-study group. Zhang et al. (2011) examined the affordances and challenges of video-cases in a problem-based learning professional development program without providing a definition of PD.

3.2. Variables attributed to PD

Most of the reviewed studies directly define PD, and all were conducted using similar variables and research process structures. To address our second research question, we investigated what variables in these studies were attributed to teacher PD. To determine these variables, we analyzed the studies' research questions, methods, designs, and procedures. We tried to organize the similarities and differences that emerged in these studies. For example, Richter, Kunter, Klusmann, Lüdtke, and Baumert (2011) examined teachers' formal and informal learning opportunities across their professional lives. In this example, we called this variable supportive activities. In another example, Guberman and Mcdossi (2019) focused on teacher educators for teachers' PD. Considering other studies focusing on teacher educators and the teacher training process, we identified teacher education as an important variable for the PD process. Table 4 provides all the variables constituting the PD process obtained from the analysis.

The variables detailed in the following titles should be considered constituent parts of the PD process.

Teacher Education. Some studies that relate Teacher Education to PD generally focus on:

- The teacher training process,
- Internship and school applications,
- Academics/teacher educators, and
- The connection between theory and practice.

For instance, the articles by Guberman and Mcdossi (2019) and Tack, Valcke, Rots, Struyven, and Vanderlinde (2018) deal with teacher educators' characteristics and state that these characteristics are reflected in long-term sustainable PD processes and affect teachers' in-class PD practices. Similarly, Brown and Weber (2016) conducted research based on teacher educators' insight into PD processes, and propounded that this insight crucially provides ideas about how best to transform PD practices.

On the other hand, some researchers observed a gap between PD theory and in-class teaching practice, and accordingly emphasized the need to link theory and practice in PD frameworks for growth-oriented teaching and learning. One way to do this is to support discussion among colleagues. For instance, Koc, Peker, and Osmanoglu (2009) argue that effective theory–practice links by fostering discussions between teaching colleagues focused on explaining and reflecting on teaching experiences will make PD processes more effective.

Teacher Characteristics. Teacher Characteristics are at the heart of both PD processes and the benefits obtained from these processes. According to Antoniou and Kyriakides (2013), there is a need to transform our sense that teachers naturally become more effective and develop their cognitive skills without training that addresses their specific requirements. Teachers' characteristics comprise both.

- Teachers' professional features, and
- Teachers' individual features.

Noteworthy here is that some teachers' characteristics are directly related to the profession, such as professional experience, attitude, anxiety, perspective, commitment, competence, knowledge/skills, identity, leadership, experience, value, motivation,

Table 4
Constituent parts of the PD process.

Themes	Categories	Codes
Professional Development	Teacher Education	<ul style="list-style-type: none"> • The teacher training process • Internship and school applications • Academics/teacher educators • The connection between theory and practice
	Classroom Practices	<ul style="list-style-type: none"> • Teachers' professional features • Teachers' individual features • Content knowledge • Pedagogical content knowledge • Teaching strategies • Teaching activities • Teaching knowledge • Students' Outcomes • Academic achievement • Sociocultural development
External Variables	Collaboration	<ul style="list-style-type: none"> • Educational needs • Peer communication • Learning and research community
	Supportive Activities	<ul style="list-style-type: none"> • Coaching/Mentoring • Coursing • Informal support services
	School Context	<ul style="list-style-type: none"> • Physical resources (hardware, software) • Contextualities • Multiculturalism • School goals • Interactions with school leaders
	Curriculum	<ul style="list-style-type: none"> • Curriculum materials • Curricula across different contexts • Curriculum implementation
	Reforms and Policies	<ul style="list-style-type: none"> • Practical effectiveness • Key features

belief, request, satisfaction, self-efficacy, and confidence. For instance, Fischer et al. (2018) note that teachers' years of teaching experience substantially influence and shape their classroom instruction. Another study by Prenger, Poortman, and Handelzalts (2017) emphasizes that teachers' motivation plays a fundamental role at all levels of their PD. Other studies have sought to prove that teachers' characteristics can be altered throughout an applied PD process (Girvan, Conneely, & Tangney, 2016; Gomez et al., 2015; Mellom, Straubhaar, Balderas, Ariail, & Portes, 2018; Noonan, 2019; Prestridge, 2010; Richter, Kleinknecht, & Gröschner, 2019). According to Hung and Yeh (2013), PD process design meaningfully shapes the diversity of teacher characteristics. Similarly, Girvan et al. (2016) note that PD processes can be designed to support teachers both emotionally and practically in improving their pedagogies, eliminating their anxieties, and increasing their motivations. We also found an argument that in any PD process, teachers should be allowed to take part in constructive dialogue about how best to transform professional beliefs and practices (Prestridge,

2010) and how best to attain attractive and user-friendly curriculum materials and clear instructional strategies (de Groot-Reuvekamp et al., 2018). According to Kyriakides, Christoforidou, Panayiotou, and Creemers (2017), the PD process should be organized to satisfy teachers' individual requirements while engaging them in a systematic and directed process. Moreover, it has been argued that situated and practice-based PD programs will increase teachers' confidence levels and competencies (Ní Ríordáin, Paolucci, & O' Dwyer, 2017).

On the other and, some teachers' characteristics are directly related to their individual particularities such as their unique requirements, preferences, and skills (e.g., language use skills and higher-order thinking skills such as questioning, reflective thinking, and critical thinking). Teachers' language use skills have been improved by PD processes centered on their own discussions about their in-class teaching experiences. Specifically, we noticed that some research on designing an effective PD environment enabled teachers to use language more effectively in their daily teaching practices (Beisiegel, Mitchell, & Hill, 2018; Penner-Williams, Diaz, & Gonzales Worthen, 2019). According to Kintz, Lane, Gotwals, and Cisterna (2015), it is possible to enhance teachers' critical inquiry and reflective thinking skills by considering three basic features of the PD process, namely clarity of purpose, interrogative coaching, and the link between theory and practice. Willemse, ten Dam, Geijsel, van Wessum, and Volman (2015) revealed that an inquiry-based PD process stimulates teachers to (re)consider their practices from different perspectives to develop classroom practices and adapt their curricula to student needs.

What to Teach. Several studies on teachers' PD aimed to support and deepen their knowledge of What to Teach (Buczynski & Hansen, 2010; Elliott et al., 2009; Liu & Phelps, 2019; Murchan, Loxley, & Johnston, 2009). What to Teach includes both.

- Content knowledge, and
- Pedagogical content knowledge.

According to Ní Ríordáin and colleagues (2017), teachers who are not subject matter experts demonstrate deficiencies in content knowledge as well as conceptual errors related to the curriculum they teach. This research emphasizes that while teachers' confidence generally lies in their content knowledge, this is not enough to properly apply that content knowledge to any teaching condition because of different student profiles, classroom environments, and periods. Furthermore, such difficulties are directly reflected in teachers' in-class teaching experiences. For instance, the PD process designed by Higgins and Parsons (2009) enables teachers to expand their content knowledge, modify their in-class teaching practices, and enhance their motivations in line with their students' learning requirements. According to Frey and Fisher (2009), it is possible to deepen teachers' content knowledge, provide revised assessment decisions, link their assessments and teachings, and facilitate their PD by establishing content standards in a PD process.

How to Teach. How to Teach refers to both possessing knowledge and practical teaching experience. It is focused on:

- Teaching strategies,
- Teaching activities, and
- Teaching knowledge.

Every PD process concerns how teachers should behave in their classrooms to enhance their students' learning capacities. According to Antoniou and Kyriakides (2013), effective teaching behavior requires cognitive awareness of the content knowledge and events occurring in the classroom, as well as appropriate decisions and

strategies in these contexts. Moreover, Derri et al. (2015) implied that teachers' in-class behaviors are related to their students' participation in the learning process. As a result, improving a teacher's ability to teach is the cornerstone of PD processes designed for systemic reform efforts. Girvan et al. (2016) emphasize that teachers' in-class teaching behavior and practices are improved by reflection on, observation of, and discussion about their experiences.

Students' Outcomes. The analyzed literature reveals that teachers' PD is directly associated with Students' Outcomes. Reporting on carrying out the PD process, Higgins and Parsons (2009) underlined that such processes must improve student achievement to be successful. Students' outcomes could be explained in terms of:

- Academic achievement,
- Sociocultural development, and
- Educational needs.

For example, evaluating differences between measurements made at the beginning and end of a semester, Antoniou and Kyriakides (2013) determined that the applied PD process had an impact on increasing student achievement. According to Girvan et al. (2016), the changes directly observed in student outcomes and behavior are the fundamental motivators for teachers. They observed that positive student outcomes can be a useful mediator to initially engage teachers in pedagogical innovation and motivate them to implement such advancements in their own classroom teaching (Girvan et al., 2016). Similarly, several studies found that teachers' in-class instructional behaviors were associated with student learning gains and engagement (de Groot-Reuvekamp et al., 2018; Derri et al., 2015). Accordingly, focusing on student outcomes plays a significant role in enhancing teachers' teaching knowledge and skills (Prenger et al., 2017).

Collaboration. Collaboration is a priority in PD processes in the teaching profession. It comprises:

- Peer communication, and
- Learning and research community

Specifically, good collaboration links theory and practice, embraces peer communication and interaction, and cultivates a learning and research community that builds generative associations. Along these lines, some researchers have considered PD processes to include professional associations, PD societies, local or foreign teachers' communities, and study related to in-class instruction (Chang, Yeh, Chen, & Hsiao, 2011). In these studies, PD is no longer considered an individual effort, but a phenomenon influenced by the others with whom teachers interact and the quality of these interactions. Therefore, it is considered necessary for a teacher to interact with a variety of people with whom they have different qualified relationships in a collaborative network (Van Waes et al., 2016).

In the literature, some research focusing on collaboration in PD processes has shown that student learning, teachers' pedagogical skills, teaching practices, risk-taking skills, and courage could be supported with a PD process. For instance, Hadar and Brody (2010) focused on teaching practices via interdisciplinary collaboration to improve student learning, enhance pedagogical skills, and adapt to new teaching methods. Spiteri and Chang Rundgren (2017) showed that teachers' collaborative efforts encourage them to support one another and make them more eager to take risks when accommodating new practices. Therefore, continuous PD should provide teachers the opportunity to practice collaboratively and to reflect and gain feedback from each other. In addition, Willemse et al.

(2015) mention the importance of focusing the PD process on teachers' daily practices and concerns to enable them to systematically examine their teaching practices within the collaborative process. Because collaboration and communication contribute to teacher satisfaction, school leaders should ensure that teachers are equipped with the knowledge, skills, common goals, leadership style, structured activities (Gallo-Fox & Scantlebury, 2016; Prenger et al., 2017), and space and time necessary to communicate and share their experiences with each other (Spiteri & Chang Rundgren, 2017).

Supportive Activities. Supportive Activities are another important component in the PD process. These activities consist of:

- Coaching/mentoring,
- Coursing, and
- Informal support services.

According to Coldwell (2017), a PD process designed to aid teachers must contain both formal and informal support and activities. There is an urgent requirement to transform from traditional PD activities to a focus on teachers' in-class practice in the teacher training process. In this regard, the reviewed studies discuss different supportive activities. For instance, Batt (2010) aimed to improve teaching practices in the classroom, demonstrating that cognitive coaching added significant value to traditional training activities. Moreover, this research also found that teachers struggling to implement new instructional strategies gain substantial advantage from cognitive coaching. According to Moussay et al. (2011), any new form of PD should be enhanced by including interaction, collaborative mentoring, reflexive analysis of in-class teaching, and group and interactive resources to help teachers expand their agencies. On the other hand, Bett and Makewa (2018) debate the use of social media platforms for informal PD activities, which enable easily accessing, sharing, and discussing experiences. These are considered beneficial for teachers' PD because they offer teachers the opportunity to discuss issues related to their daily in-class teaching practice.

School Context. The analyzed studies indicate that teachers' PD is directly associated with the School Context. Specifically, the school context includes:

- Physical resources (hardware, software),
- Contextualities,
- Multiculturalism,
- School goals, and
- Interactions with school leaders.

According to Fischer et al. (2018), in-class instruction and student learning are rooted in their local contexts and contextual features; for example, the level and affluence of a school can influence teachers' in-class instruction. Similarly, the article by Heydon and Stooke (2012) narrated the effect of a school's physical resources on PD processes and debated whether teachers' choices, classroom management, and in-class teaching implementation are restricted by limited access to teaching materials.

Another dimension related to the school context in the PD process concerns the contextualities dimension in the school. For instance, in Hung and Yeh (2013), teachers tend to value applied knowledge founded in their own school contexts. Regarding the interaction between teachers and school leaders, we found that the literature states that cooperation provides teachers with many ways to experience meaningful and authentic PD within their school context (see the *Collaboration* title). In addition, according to Gallo-Fox and Scantlebury (2016), these interactions encourage constant discussion and reflection on in-class teaching practices,

draw attention to and yield new curricular resources, enhance collaboration across classrooms, and encourage teachers to extend their roles as school leaders and teacher educators.

Curriculum. The curriculum, especially as product implementation training, is the reshaping of the PD process required for implementation. In this research, the concept of curriculum in the PD process is discussed based on the following dimensions:

- Curriculum materials,
- Curricula across different contexts, and
- Curriculum implementation.

Notably, we found that some studies focused on educational curriculum materials (e.g., de Groot-Reuvekamp et al., 2018; Fishman et al., 2013) and others on the application of curricula across different contexts (Choi & Shin, 2016; Fishman et al., 2013; Ní Ríordáin et al., 2017; Willemse et al., 2015). These studies concluded that the specific knowledge content of a curriculum should respond to the particularities of the in-class teaching process.

According to Murchan et al. (2009), since curriculum implementation is different from curriculum development, it varies significantly between teachers and across subjects. Therefore, practitioners should be given adequate opportunities and space to differentiate PD processes. Along these lines, initiatives aimed at supporting curriculum implementation should consider the types of target conflicts teachers face, the uncertainty they create for them, and the space required for necessary innovation and risk-taking (e.g., Allen & Penuel, 2015).

Reforms and Policies. Papers also emphasize the importance of Reforms and Policies in PD processes that seek to alter the landscape of teacher education (Brown & Weber, 2016; Florian, 2012; Kintz et al., 2015). These focus on:

- Practical effectiveness, and
- Key features.

Important in the literature was the focus on the practical effectiveness of reforms and decisions in several countries. In this regard, many studies sought to evaluate the implementation of reforms and policies. In particular, the reviewed literature highlighted improving educational practices, enhancing the quality of education, teachers' authority, and school transformation as priority issues for reforms and policies. For instance, one paper is concerned with the evaluation of teacher education reforms striving to introduce innovative and inclusive processes to prepare teachers to take responsibility for their students' learning and success (Florian, 2012). On the other hand, other studies focus on the reforms needed to ensure continuing PD. In particular, Tack et al. (2018) highlighted the need for institutional support, resources, alignment with overall requirements, remuneration, and documentation; the establishment of learning communities including local practice communities; and transformation of managerial thinking about continuing PD.

4. Discussion and conclusions

This study analyzed articles focused on teachers' PD to reveal the main features of the PD process. Given that the quality of students' educational outcomes depends on the quality of their teacher's PD, it is crucial for both researchers and policymakers to understand the components influencing teachers' qualifications (Soine & Lumpe, 2014). We suggested that the primary problem hindering teachers' PD was not a lack of programming or content

for effective professional development, but the absence of a holistic approach that arises, reviews, and interprets all components of the process. A better understanding of the core components of the process is crucial for designing an effective, efficient, inclusive, and continuous PD process for teachers. Furthermore, the most remarkable finding of the research is related to defining what PD means for teachers. According to our results, PD is generally defined as a process that begins with teachers' college; continues throughout a teacher's professional life; and is affected by a teacher's characteristics, teaching contents (what they teach), and teaching strategies/methods/approaches (how they teach). Notably, we found that the literature suggests that the PD process directly influences student outcomes, and that related reforms, school contexts, curricula, collaborations, and formal/informal supporting activities are integral parts of the PD process.

4.1. The conceptual framework for PD

Based on the findings revealed in the analyzed studies, we established a comprehensive conceptual framework to define PD. Fig. 2 details our conceptual framework.

The conceptual framework shows that PD is a process that begins with a teacher education program and continues throughout a teacher's professional life. Trying to express PD as an ongoing process with a definite beginning, we employed an arrow in the conceptual framework. Including classroom practices at the end of the arrow emphasizes an ongoing activity. According to our findings, classroom practices surrounded a teacher's personal characteristics, teaching contents (what they teach), teaching methods/approaches (how they teach), and student learning. In addition, based on the studies examined, we set out a direct and indirect interaction between these variables. Other variables derived from these studies are reforms and policies, school context, curriculum, collaboration, and formal/informal supportive activities. According to their interrelation with each other and PD, these variables have been used in terms of PD throughout the process.

According to Desimone's (2009) model, PD is a relation between the major properties of PD, teachers' characteristics including knowledge and beliefs and in-class teaching practice, and student learning outcomes. However, the conceptual framework we present is much more comprehensive and detailed than Desimone's (2009) definition. Unlike Desimone's (2009) model, the conceptual framework we attribute to PD involves it primarily as a process that continues from teachers' college to retirement, and it is

dynamic and flexible. For example, Desimone (2009) advises that the two basic characteristics of a teacher are knowledge and beliefs. We extended this idea, expanding the characteristics of a teacher to include their own individual and professional qualities including those related to the PD process. We emphasized that teachers' characteristics are directly related to the profession, such as professional experience, attitude, anxiety, perspective, commitment, competence, knowledge/skills, identity, leadership, experience, value, motivation, belief, request, satisfaction, self-efficacy, and confidence.

Notably, Desimone et al. (2002) situate PD as an essential mechanism for deepening teachers' content knowledge and developing their teaching practices. Similarly, other researchers introduced a second-generation definition of PD, which focuses on teachers' personal, social, and occupational dimensions. We called our conceptual framework a "third-generation framework" for PD—or PD 3.0—because teachers' process-related characteristics both affect and are affected by the PD process. According to Korthagen (2017), teachers' thoughts, feelings, wishes, ideas, potentials, inspirations, and goals play motivating roles in the PD process. Importantly, expert knowledge alone is not enough to increase teachers' enthusiasm about their development process, and this is emphasized in PD 3.0. The new generation of PD design is responsive to the unique needs of each teacher and structured in response to their individual concerns, strengths, and missions in their real school contexts. Our results revealed that the PD process is affected by teachers' personal characteristics (e.g., age, socio-economic status, cultural and moral background), professional characteristics (e.g., expertise, experiences, willingness to commit, collaboration, role perception, professional awareness, professional sensitivity, professional satisfaction), and process-related characteristics (e.g., voluntary and effective participation in the process, belief and trust in the process, expectations, openness to innovation and change). According to Guskey (1995), individual differences will always be an essential factor in the PD process. Furthermore, the same PD process can differently influence different teachers as a result of their diverse cognitive, emotional, and motivational properties. When teachers feel as if the main purpose of the PD process is to reinforce and value their individual characteristics, their motivation may increase. Moreover, the more teachers embrace the process, the more enthusiastic they may become about trying new applications in their classrooms (Hunzicker, 2011). Our findings imply that adopting and maintaining a development process responsive to teachers' process-related characteristics is critical. On the other hand, the PD process might be inadequate for teachers who are professionally inadequate, experience role confusion, and are undecided or reluctant to pursue the profession. Therefore, it should be considered that even these characteristics may influence the PD process. Postholm (2012) observed that some teachers are eager to handle cases/problems/events, engage in in-class teaching experiences, and define their own learning goals. Such teachers self-direct the improvement of their in-class teaching applications.

Another important point we want to highlight is that understanding PD as holistic emphasizes that the components of the PD process are interrelated in many ways and not independent. For example, it is not possible to consider the development and implementation of policies apart from the school context or curriculum. Furthermore, what and how teachers teach is not differentiated from teachers' professional or individual characteristics. In parallel, Postholm (2012) proposes that both teachers' characteristics and organizational components influence their PD. However, to date, there is not enough emphasis on gathering whole contextual factors together, such as policies, curriculum, cooperation, context, and supportive activities. In response to this gap in

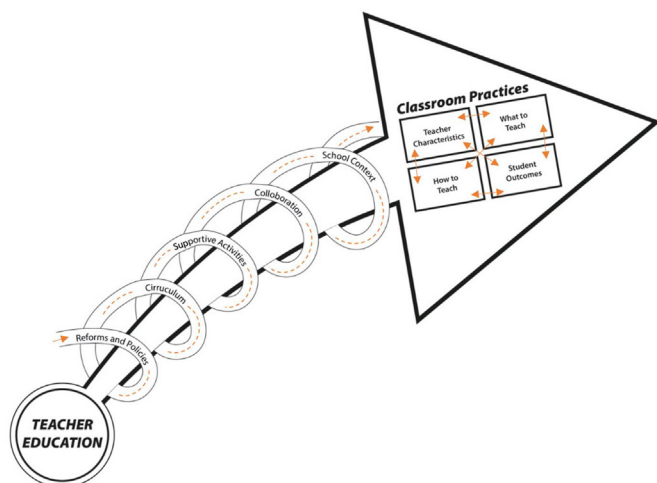


Fig. 2. A conceptual framework of teacher professional development.

the scholarship, we hope to present a third-generation framework of PD that is teacher-centric and addresses all process variables from a holistic perspective (see Fig. 2). Collinson et al. (2009) contended that it is not possible for teachers to change and develop without institutional and systemic alteration, and the transformation of schooling this century is based on educational policies supported by collaborative, diversified models to increase teacher participation in the educational policymaking process, more consistent policies among institutions, and continuing PD. Identifying the features of effective PD is crucial in understanding the achievement or deficiency of many education reforms (Desimone, 2009). As a result, effective PD could be a cornerstone of systemic reform efforts designed to enhance teachers' abilities to teach to high standards (Smith & O'Day, 1991).

4.2. The pathway for designing effective PD process

Considering PD as a holistic process, another important point is the need to create a roadmap for what should be implemented and regulated by assessing the effective, efficient, and continuous PD process at hand. According to Garet et al. (2001), the structural and procedural components of the PD process affect teachers' knowledge of content and in-class teaching applications. As mentioned earlier, all components in the process naturally affect and are affected by the composition of the process at large and thus by each other. Here, our main aim is to elaborate the components that most notably affect and are affected by the designed PD process and to identify what parts of the process are most important to consider (Fig. 3).

As mentioned, one of the variables affecting the PD process is the environment in which the PD is applied. Here, the PD climate is an integral part of the PD process. Considering that the physical-technical characteristics and institutional structure and culture of schools (e.g., responsibilities given to teachers by the school administrator; and interactions between administrators and teachers, teachers and teachers, and teachers and students) impact teachers' PD, a common vision and qualified relationship between colleagues and administrators is a necessity for effective teacher

PD. In addition, a sense of togetherness and cooperation among teachers creates a supportive work environment that naturally influences teachers' PD (Lawrence & Chong, 2010). Another important variable for effective PD is related to the design of the PD process itself. Although the significance of teachers and institutional characteristics is emphasized in the literature, the facilities in which PD is practiced (e.g., budget, materials, technical support) and the content, methods, techniques, and technologies used in the process (e.g., online discussion groups, video cases, reflective tools, Web 2.0 tools) cannot be ignored. According to Postholm (2012), some research mentions that teachers evaluate some types of material employed in the PD process in terms of how they can facilitate better teaching. Furthermore, Korthagen (2017) emphasizes that different approaches would work for different teachers or for different communities of practice, individual or group coaching relationships, and peer coaching relationships. Some teachers may use informal online communities and networks to take part in shared learning, reflect on their in-class teaching processes, and receive emotional encouragement (Macià & García, 2016). Moreover, the main focus of an effective PD process design should be to enhance teachers' knowledge and practices and students' learning outcomes, rather than on activities/materials (e.g., workshops, study groups, reflection process, or discussions) (Desimone, 2009; Desimone et al., 2002).

It is crucial to remember that the PD process influences teachers (teachers' individual characteristics and their teaching skills) and student learning outcomes. The majority of studies on this topic have been conducted based on the various outcomes of an effective PD process for student achievement (de Groot-Reuvekamp et al., 2018; Derri et al., 2015; Girvan et al., 2016; Higgins & Parsons, 2009; Prenger et al., 2017). Moreover, many second-generation definitions of PD highlight that student outcomes and achievements are directly related to an effective PD process (Desimone, 2009; Desimone et al., 2002; Timperley et al., 2007).

4.3. Considerations for designing an effective PD process

Although much work has been done on PD, more research is

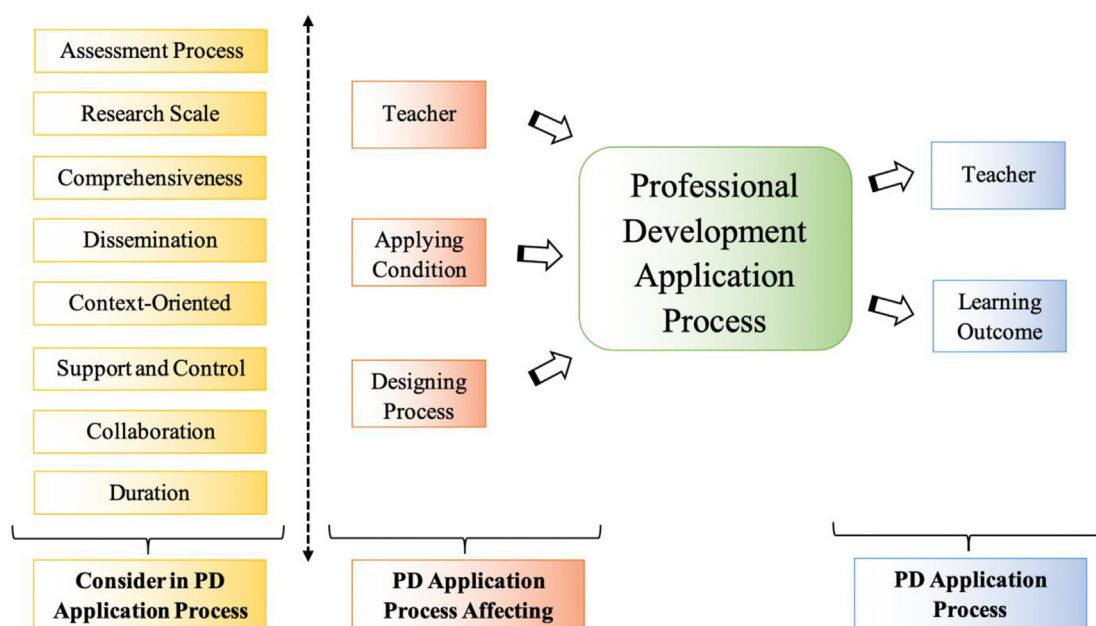


Fig. 3. Considerations when designing a PD application process.

needed on how to encourage effective, efficient, and continuous PD. Wei, Darling-Hammond, and Adamson (2010) confirm that much remains to be learned about teachers' PD. Based on the studies examined herein, below we present suggestions about what issues should be considered in the PD process:

- the formative assessment process
- large-scale research processes
- diversification of the scope of research processes, especially across individual, institutional, and governmental levels
- dissemination for applying the PD process
- long-term process-oriented research over short-term research
- collaboration between individuals, institutions, and organizations
- context-oriented adjustments
- long-term support and supervision

Notably, the assessment process has been thought of as a key feature of designing the PD process. To determine whether PD practices accomplish their purpose, formative assessments such as surveys and group interviews should be used from the beginning of the process. Here, more sensitive and appropriate forms of assessment for effective PD processes are needed (Kang et al., 2013). Similarly, Antoniou and Kyriakides (2013) underline that sensitive and convenient assessments are central to designing an effective PD process. By improving and generalizing formative assessment processes for PD, we can use such assessments to gain insight into how PD may best help teachers deepen content knowledge and enhance their own PD (Frey & Fisher, 2009). No definite judgments should be made about the applicability of any kind of data collection methods/techniques or tools for this purpose. Rather, PD directors should be encouraged to use high-quality approaches that best fit the context and goals at hand (Desimone, 2009).

While the development process linked to teachers' learning should continue for a while, it is not possible to get a once-and-for-all sense of the ideal duration of this process (Postholm, 2012). Long-term studies should be conducted to observe the impact of any PD programs on student achievement. More long-term and repetitive studies are now needed to extend the archive beyond short-term and one-shot applications. In particular, policymakers and program developers should conduct larger-scale research to ensure the prevalence, continuity, and permanence of professional development practices. While conducting a PD program, it is critical to consider the process from a comprehensive perspective, considering all the variables that affect and are affected by the process. According to Crowley (2017), there is a need to devote great effort to prevent the PD process from being reduced to applying or using specific hardware and software. Even though existing PD processes provide strong opportunities for teachers, it is not easy to apply one PD process effectively across contexts. Perhaps the main challenge related to the PD process is how to successfully disseminate it (Gomez et al., 2015). As such, it is necessary to ensure that PD programs are generalized for applicability beyond the context of the school or region in which they were originally implemented. This would enable more teachers to benefit from the program. Designing a context-oriented PD process can improve school-based conditions and sustainability (Timperley et al., 2007). Moreover, to optimize the sustainability of the PD process, it is crucial to measure how long the effects of a PD process last in a particular climate, as the existing literature offers limited insight into how long PD remains effective. Of course, after a while, teachers will forget what they learned, which means that the effect of the applied process decreases (Liu & Phelps, 2019).

According to Brown, Edmonds, and Lee (2001, p. iv) PD is more

effective when teachers are able to choose and direct their own PD process. Therefore, the analysis and design of the PD process should involve collaboration with all stakeholders including teachers. Many studies confirm the importance of collaboration in the PD process (Chang et al., 2011; Gallo-Fox & Scantlebury, 2016; Hadar & Brody, 2010; Spiteri & Chang Rundgren, 2017; Van Waes et al., 2016; Willemse et al., 2015). Going forward, however, it is important to emphasize the cooperation between institutions and organizations, rather than as in the past, the cooperation of teachers. To avoid wasting time, labor, and money, all stakeholders in the PD process should act together. In this regard, the cooperation between institutions and organizations should be emphasized rather than the cooperation of teachers. In other words, while we mention the cooperation of policymakers, teacher educators, and schools, we argue that all stakeholders affecting the PD process should act together to avoid wasting time, labor, and money. Along these lines, Hung and Yeh (2013) highlight the value of teacher educators and school partnerships and urgently call on teacher educators in Taiwan to work with teachers to design alternative PD processes.

This study has several limitations that may impact the interpretation of its results. Mainly, the documents under study were published in four journals indexed by the SSCI. Although many journals focus on teachers' PD, we only included four that included "teacher education" in the journal title. All were concerned with the relationship between teachers' PD and the quality of education. We found that more research is needed to holistically determine the relationships between PD and its constitutive components such as student outcomes, teacher characteristics, reforms and policies, school context, curriculum, and collaboration. In addition, research design related to PD should be strictly based on the monitoring and evaluation of in-class teaching, rather than on the teacher's self-assessment to identify changes in content and application.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

The authors have no competing interests to declare.

References

- Al-Hinai, A. M. (2007). The interplay between culture, teacher professionalism and teachers' professional development at times of change. In T. Townsend, & R. Bates (Eds.), *Handbook of teacher education: Globalisation, standards and professionalism in times of change* (pp. 41–52). Dordrecht, Netherlands: Springer.
- Allen, C. D., & Penuel, W. R. (2015). Studying teachers' sensemaking to investigate teachers' responses to professional development focused on new standards. *Journal of Teacher Education*, 66(2), 136–149. <https://doi.org/10.1177/0022487114560646>
- Antoniou, P., & Kyriakides, L. (2013). A dynamic integrated approach to teacher professional development: Impact and sustainability of the effects on improving teacher behaviour and student outcomes. *Teaching and Teacher Education*, 29(1), 1–12. <https://doi.org/10.1016/j.tate.2012.08.001>
- Batt, E. G. (2010). Cognitive coaching: A critical phase in professional development to implement sheltered instruction. *Teaching and Teacher Education*, 26(4), 997–1005. <https://doi.org/10.1016/j.tate.2009.10.042>
- Beisiegel, M., Mitchell, R., & Hill, H. C. (2018). The design of video-based professional development: An exploratory experiment intended to identify effective features. *Journal of Teacher Education*, 69(1), 69–89. <https://doi.org/10.1177/0022487117705096>
- Berger, R. (2015). Now I see it, now I don't: Researcher's position and reflexivity in qualitative research. *Qualitative Research*, 15(2), 219–234. <https://doi.org/10.1177/1468794112468475>
- Bett, H., & Makewa, L. (2018). Can facebook groups enhance continuing professional development of teachers? Lessons from Kenya. *Asia-Pacific Journal of Teacher Education*, 48(2), 132–146. <https://doi.org/10.1080/1359866X.2018.1542662>
- Borko, H., Jacobs, J., & Koellner, K. (2010). Contemporary approaches to teacher

- professional development. *International Encyclopedia of Education*, 7(2), 548–556. Retrieved from https://www.researchgate.net/profile/Jennifer_Jacobs8/publication/242071048_Contemporary_approaches_to_teacher_professional_development/links/59fc9517458515d0706501b3/Contemporary_approaches-to-teacher-professional-development.pdf.
- Brown, S., Edmonds, S., & Lee, B. (2001). *Continuing professional development: LEA and school support for teachers*. Slough, UK: NFER.
- Brown, C. P., & Weber, N. B. (2016). Struggling to overcome the state's prescription for practice: A study of a sample of early educators' professional development and action research projects in a high-stakes teaching context. *Journal of Teacher Education*, 67(3), 183–202. <https://doi.org/10.1177/0022487116636452>
- Bubb, S. (2004). *The insider's guide to early professional development: Succeed in your first five years as a teacher*. London, UK: Routledge Falmer.
- Buczynski, S., & Hansen, C. B. (2010). Impact of professional development on teacher practice: Uncovering connections. *Teaching and Teacher Education*, 26(3), 599–607. <https://doi.org/10.1016/j.tate.2009.09.006>
- Chang, J. C., Yeh, Y. M., Chen, S. C., & Hsiao, H. C. (2011). Taiwanese technical education teachers' professional development: An examination of some critical factors. *Teaching and Teacher Education*, 27(1), 165–173. <https://doi.org/10.1016/j.tate.2010.07.013>
- Choi, Y., & Shin, E. K. (2016). Rethinking the hermit kingdom: US social studies teachers' cross-cultural professional development in South Korea. *Asia-Pacific Journal of Teacher Education*, 44(2), 188–202. <https://doi.org/10.1080/1359866X.2015.1066490>
- Clarke, D., & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education*, 18(8), 947–967. [https://doi.org/10.1016/S0742-051X\(02\)00053-7](https://doi.org/10.1016/S0742-051X(02)00053-7)
- Coldwell, M. (2017). Exploring the influence of professional development on teacher careers: A path model approach. *Teaching and Teacher Education*, 61, 189–198. <https://doi.org/10.1016/j.tate.2016.10.015>
- Collinson, V., Kozina, E., Kate Lin, Y. H., Ling, L., Matheson, I., Newcombe, L., et al. (2009). Professional development for teachers: A world of change. *European Journal of Teacher Education*, 32(1), 3–19. <https://doi.org/10.1080/02619760802553022>
- Craft, A. (2000). *Continuing Professional Development. A practical guide for teachers and schools*. London, UK: Routledge Falmer.
- Crowley, C. B. (2017). Professional development as product implementation training. *Teaching and Teacher Education*, 67, 477–486. <https://doi.org/10.1016/j.tate.2017.07.015>
- Day, C., & Sachs, J. (2004). Professionalism, performativity and empowerment: Discourses in the politics, policies and purposes of continuing professional development. In C. Day, & J. Sachs (Eds.), *International handbook on the continuing professional development of teachers* (pp. 3–32). Maidenhead, UK: Open University Press.
- DeMonte, J. (2013). *High-quality professional development for teachers: Supporting teacher training to improve student learning*. Center for American Progress. July. Retrieved 23 April 2020, from <http://www.tapsystem.org/publications/tap-info-center-for-american-progress-high-quality-teacher-professional-development.pdf>.
- Derri, V., Vasilidiou, O., & Kioumourtzoglou, E. (2015). The effects of a short-term professional development program on physical education teachers' behaviour and students' engagement in learning. *European Journal of Teacher Education*, 38(2), 234–262. <https://doi.org/10.1080/02619768.2014.947024>
- Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher*, 38, 181–200. <https://doi.org/10.3102/0013189X08331140>
- Desimone, L. M. (2011). A primer on effective professional development. *Phi Delta Kappan*, 92(6), 68–71. <https://doi.org/10.1177/003172171109200616>
- Desimone, L. M., Porter, A. C., Garet, M. S., Yoon, K. S., & Birman, B. F. (2002). Effects of professional development on teachers' instruction: Results from a three-year longitudinal study. *Educational Evaluation and Policy Analysis*, 24(2), 81–112. <https://doi.org/10.3102/01623737024002081>
- Desimone, L. M., Smith, T. M., & Ueno, K. (2006). Are teachers who need sustained, content-focused professional development getting it? An administrator's dilemma. *Educational Administration Quarterly*, 42(2), 179–215. <https://doi.org/10.1177/0013161X04273848>
- Edwards, A. R., Sandoval, C., & McNamara, H. (2015). Designing for improvement in professional development for community college developmental mathematics faculty. *Journal of Teacher Education*, 66(5), 466–481. <https://doi.org/10.1177/0022487115602313>
- Elliott, R., Kazemi, E., Lesseig, K., Mumme, J., Carroll, C., & Kelley-Petersen, M. (2009). Conceptualizing the work of leading mathematical tasks in professional development. *Journal of Teacher Education*, 60(4), 364–379. <https://doi.org/10.1177/0022487109341150>
- Evans, L. (2011). The 'shape' of teacher professionalism in England: Professional standards, performance management, professional development and the changes proposed in the 2010 White Paper. *British Educational Research Journal*, 37(5), 851–870. <https://doi.org/10.1080/01411926.2011.607231>
- Evans, L. (2014). Leadership for professional development and learning: Enhancing our understanding of how teachers develop. *Cambridge Journal of Education*, 44(2), 179–198. <https://doi.org/10.1080/0305764X.2013.860083>
- Fischer, C., Fishman, B., Dede, C., Eisenkraft, A., Frumin, K., Foster, B., et al. (2018). Investigating relationships between school context, teacher professional development, teaching practices, and student achievement in response to a nationwide science reform. *Teaching and Teacher Education*, 72, 107–121. <https://doi.org/10.1016/j.tate.2018.02.011>
- Fishman, B., Konstantopoulos, S., Kubitskey, B. W., Vath, R., Park, G., Johnson, H., et al. (2013). Comparing the impact of online and face-to-face professional development in the context of curriculum implementation. *Journal of Teacher Education*, 64(5), 426–438. <https://doi.org/10.1177/0022487113494413>
- Florian, L. (2012). Preparing teachers to work in inclusive classrooms: Key lessons for the professional development of teacher educators from Scotland's inclusive practice project. *Journal of Teacher Education*, 63(4), 275–285. <https://doi.org/10.1177/0022487112447112>
- Fraser, C., Kennedy, A., Reid, L., & Mckinney, S. (2007). Teachers' continuing professional development: Contested concepts, understandings and models. *Journal of In-Service Education*, 33(2), 153–169. <https://doi.org/10.1080/13674580701292913>
- Frey, N., & Fisher, D. (2009). Using common formative assessments as a source of professional development in an urban American elementary school. *Teaching and Teacher Education*, 25(5), 674–680. <https://doi.org/10.1016/j.tate.2008.11.006>
- Gallagher, T., Griffin, S., Parker, D. C., Kitchen, J., & Figg, C. (2011). Establishing and sustaining teacher educator professional development in a self-study community of practice: Pre-tenure teacher educators developing professionally. *Teaching and Teacher Education*, 27(5), 880–890. <https://doi.org/10.1016/j.tate.2011.02.003>
- Gallo-Fox, J., & Scantlebury, K. (2016). Coteaching as professional development for cooperating teachers. *Teaching and Teacher Education*, 60, 191–202. <https://doi.org/10.1016/j.tate.2016.08.007>
- Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal*, 38(4), 915–945. <https://doi.org/10.3102/00028312038004915>
- Girvan, C., Conneely, C., & Tangney, B. (2016). Extending experiential learning in teacher professional development. *Teaching and Teacher Education*, 58, 129–139. <https://doi.org/10.1016/j.tate.2016.04.009>
- Gomez, K., Gomez, L. M., Rodela, K. C., Horton, E. S., Cunningham, J., & Ambrocio, R. (2015). Embedding language support in developmental mathematics lessons: Exploring the value of design as professional development for community college mathematics instructors. *Journal of Teacher Education*, 66(5), 450–465. <https://doi.org/10.1177/0022487115602127>
- Gore, J., Lloyd, A., Smith, M., Bowe, J., Ellis, H., & Lubans, D. (2017). Effects of professional development on the quality of teaching: Results from a randomised controlled trial of Quality Teaching Rounds. *Teaching and Teacher Education*, 68, 99–113. <https://doi.org/10.1016/j.tate.2017.08.007>
- de Groot-Reuvekamp, M., Ros, A., & van Boxtel, C. (2018). A successful professional development program in history: What matters? *Teaching and Teacher Education*, 75, 290–301. <https://doi.org/10.1016/j.tate.2018.07.005>
- Guberman, A., & Mcdossi, O. (2019). Israeli teacher educators' perceptions of their professional development paths in teaching, research and institutional leadership. *European Journal of Teacher Education*, 42(4), 507–522. <https://doi.org/10.1080/02619768.2019.1628210>
- Guskey, T. R. (1995). Professional development in education: In search of the optimal mix. In T. R. Guskey, & M. Huberman (Eds.), *Professional development in education: New paradigms & practices* (pp. 114–132). New York: Teacher College Press.
- Guskey, T. R. (2003). What makes professional development effective? *Phi Delta Kappan*, 84(10), 748–750.
- Guskey, T. R., & Yoon, K. S. (2009). What works in professional development? *Phi Delta Kappan*, 90(7), 495–500.
- Hadar, R., & Brody, D. (2010). From isolation to symphonic harmony: Building a professional development community among teacher educators. *Teaching and Teacher Education*, 26(8), 1641–1651. <https://doi.org/10.1016/j.tate.2010.06.015>
- Heydon, R., & Stooke, R. (2012). Border work: Teachers' expressions of their literacy-related professional development needs in a First Nations school. *Teaching and Teacher Education*, 28(1), 11–20. <https://doi.org/10.1016/j.tate.2011.08.009>
- Higgins, J., & Parsons, R. (2009). A successful professional development model in mathematics: A system-wide New Zealand case. *Journal of Teacher Education*, 60(3), 231–242. <https://doi.org/10.1177/0022487109336894>
- Hill, H. C. (2009). Fixing teacher professional development. *Phi Delta Kappan*, 90(7), 470–476.
- Holdway, J., & Hitchcock, C. H. (2018). Exploring ideological becoming in professional development for teachers of multilingual learners: Perspectives on translanguaging in the classroom. *Teaching and Teacher Education*, 75, 60–70. <https://doi.org/10.1016/j.tate.2018.05.015>
- Hung, H. T., & Yeh, H. C. (2013). Forming a change environment to encourage professional development through a teacher study group. *Teaching and Teacher Education*, 36, 153–165. <https://doi.org/10.1016/j.tate.2013.07.009>
- Hunzicker, J. (2011). Effective professional development for teachers: A checklist. *Professional Development in Education*, 37(2), 177–179. <https://doi.org/10.1080/19415257.2010.523955>
- Kabilan, M. K. (2013). A phenomenological study of an international teaching practicum: Pre-service teachers' experiences of professional development. *Teaching and Teacher Education*, 36, 198–209. <https://doi.org/10.1016/j.tate.2013.07.013>
- Kang, H. S., Cha, J., & Ha, B. W. (2013). What should we consider in teachers' professional development impact studies? Based on the conceptual framework of Desimone. *Creative Education*, 4(4), 11–18. <https://doi.org/10.4236/ce.2013.44A003>

- Kintz, T., Lane, J., Gotwals, A., & Cisterna, D. (2015). Professional development at the local level: Necessary and sufficient conditions for critical collegiality. *Teaching and Teacher Education*, 51, 121–136. <https://doi.org/10.1016/j.tate.2015.06.004>
- Koc, Y., Peker, D., & Osmanoglu, A. (2009). Supporting teacher professional development through online video case study discussions: An assemblage of pre-service and inservice teachers and the case teacher. *Teaching and Teacher Education*, 25(8), 1158–1168. <https://doi.org/10.1016/j.tate.2009.02.020>
- Komba, S. C., & Mwakabenga, R. J. (2019). Teacher professional development in Tanzania: Challenges and opportunities. In H. Senol (Ed.), *Educational leadership*. IntechOpen. <https://doi.org/10.5772/intechopen.90564>
- Korthagen, F. (2017). Inconvenient truths about teacher learning: Towards professional development 3.0. *Teachers and Teaching*, 23(4), 387–405. <https://doi.org/10.1080/13540602.2016.1211523>
- Kuijpers, J. M., Houtveen, A. A. M., & Wubbels, T. (2010). An integrated professional development model for effective teaching. *Teaching and Teacher Education*, 26(8), 1687–1694. <https://doi.org/10.1016/j.tate.2010.06.021>
- Kyriakides, L., Christoforidou, M., Panayiotou, A., & Creemers, B. P. M. (2017). The impact of a three-year teacher professional development course on quality of teaching: Strengths and limitations of the dynamic approach. *European Journal of Teacher Education*, 40(4), 465–486. <https://doi.org/10.1080/02619768.2017.1349093>
- Lawrence, C. A., & Chong, W. H. (2010). Teacher collaborative learning through the lesson study: Identifying pathways for instructional success in a Singapore high school. *Asia Pacific Education Review*, 11(4), 565–572. <https://doi.org/10.1007/s12564-010-9103-3>
- Lincoln, Y., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.
- Liu, S., & Phelps, G. (2019). Does teacher learning last? Understanding how much teachers retain their knowledge after professional development. *Journal of Teacher Education*. <https://doi.org/10.1177/0022487119886290>
- Lopes, J. B., & Cunha, A. E. (2017). Self-directed professional development to improve effective teaching: Key points for a model. *Teaching and Teacher Education*, 68, 262–274. <https://doi.org/10.1016/j.tate.2017.09.009>
- Macià, M., & García, I. (2016). Informal online communities and networks as a source of teacher professional development: A review. *Teaching and Teacher Education*, 55, 291–307. <https://doi.org/10.1016/j.tate.2016.01.021>
- Meissel, K., Parr, J. M., & Timperley, H. S. (2016). Can professional development of teachers reduce disparity in student achievement? *Teaching and Teacher Education*, 58, 163–173. <https://doi.org/10.1016/j.tate.2016.05.013>
- Mellom, P. J., Straubhaar, R., Balderas, C., Ariail, M., & Portes, P. R. (2018). "They come with nothing:" How professional development in a culturally responsive pedagogy shapes teacher attitudes towards Latino/a English language learners. *Teaching and Teacher Education*, 71, 98–107. <https://doi.org/10.1016/j.tate.2017.12.013>
- Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco, CA: John Wiley & Sons.
- Moussay, S., Flavien, E., Zimmermann, P., & Méard, J. (2011). Pre-service teachers' greater power to act in the classroom: Analysis of the circumstances for professional development. *European Journal of Teacher Education*, 34(4), 465–482. <https://doi.org/10.1080/02619768.2011.587117>
- Murchan, D., Loxley, A., & Johnston, K. (2009). Teacher learning and policy intention: Selected findings from an evaluation of a large-scale programme of professional development in the Republic of Ireland. *European Journal of Teacher Education*, 32(4), 455–471. <https://doi.org/10.1080/02619760903247292>
- Mushayikwa, E., & Lubben, F. (2009). Self-directed professional development—Hope for teachers working in deprived environments? *Teaching and Teacher Education*, 25(3), 375–382. <https://doi.org/10.1016/j.tate.2008.12.003>
- Neil, P., & Morgan, C. (2003). *Continuing professional development for teachers. From introduction to senior management*. London, UK: Kogan Page.
- Ní Ríordáin, M., Paolucci, C., & O' Dwyer, L. M. (2017). An examination of the professional development needs of out-of-field mathematics teachers. *Teaching and Teacher Education*, 64, 162–174. <https://doi.org/10.1016/j.tate.2017.02.001>
- Noonan, J. (2019). An affinity for learning: Teacher identity and powerful professional development. *Journal of Teacher Education*, 70(5), 526–537. <https://doi.org/10.1177/0022487118788838>
- Opfer, V. D., & Pedder, D. (2011). The lost promise of teacher professional development in England. *European Journal of Teacher Education*, 34(1), 3–24. <https://doi.org/10.1080/02619768.2010.534131>
- Penner-Williams, J., Diaz, E. I., & Gonzales Worthen, D. (2019). Sustainability of teacher growth from professional development in culturally and linguistically responsive instructional practices. *Teaching and Teacher Education*, 86. <https://doi.org/10.1016/j.tate.2019.102891>. Article 102891.
- Postholm, M. B. (2012). Teachers' professional development: A theoretical review. *Educational Research*, 54(4), 405–429. <https://doi.org/10.1080/00131881.2012.734725>
- Prenger, R., Poortman, C. L., & Handzelzalts, A. (2017). Factors influencing teachers' professional development in networked professional learning communities. *Teaching and Teacher Education*, 68, 77–90. <https://doi.org/10.1016/j.tate.2017.08.014>
- Prestridge, S. (2010). ICT professional development for teachers in online forums: Analysing the role of discussion. *Teaching and Teacher Education*, 26(2), 252–258. <https://doi.org/10.1016/j.tate.2009.04.004>
- Richter, D., Kleinknecht, M., & Gröschner, A. (2019). What motivates teachers to participate in professional development? An empirical investigation of motivational orientations and the uptake of formal learning opportunities. *Teaching and Teacher Education*, 86. <https://doi.org/10.1016/j.tate.2019.102929>. Article 102929.
- Richter, D., Kunter, M., Klusmann, U., Lüdtke, O., & Baumert, J. (2011). Professional development across the teaching career: Teachers' uptake of formal and informal learning opportunities. *Teaching and Teacher Education*, 27(1), 116–126. <https://doi.org/10.1016/j.tate.2010.07.008>
- Sales, A., Traver, J. A., & García, R. (2011). Action research as a school-based strategy in intercultural professional development for teachers. *Teaching and Teacher Education*, 27(5), 911–919. <https://doi.org/10.1016/j.tate.2011.03.002>
- Smith, M. S., & O'Day, J. (1991). Systemic school reform. In S. Fuhrman, & B. Malen (Eds.), *The politics of curriculum and testing* (pp. 233–267). Bristol, PA: Falmer.
- Soine, K. M., & Lumpe, A. (2014). Measuring characteristics of teacher professional development. *Teacher Development*, 18(3), 303–333. <https://doi.org/10.1080/13664530.2014.911775>
- Spiteri, M., & Chang Rundgren, S. N. (2017). Maltese primary teachers' digital competence: Implications for continuing professional development. *European Journal of Teacher Education*, 40(4), 521–534. <https://doi.org/10.1080/02619768.2017.1342242>
- Sutherland, L., Howard, S., & Markauskaite, L. (2010). Professional identity creation: Examining the development of beginning preservice teachers' understanding of their work as teachers. *Teaching and Teacher Education*, 26(3), 455–465. <https://doi.org/10.1016/j.tate.2009.06.006>
- Tack, H., Valcke, M., Rots, I., Struyven, K., & Vanderlinde, R. (2018). Uncovering a hidden professional agenda for teacher educators: A mixed method study on Flemish teacher educators and their professional development. *European Journal of Teacher Education*, 41(1), 86–104. <https://doi.org/10.1080/02619768.2017.1393514>
- Timperley, H., Wilson, A., Barrar, H., & Fung, I. (2007). *Teacher professional learning and development: Best evidence synthesis iteration*. Wellington, New Zealand: Ministry of Education.
- Van Waes, S., Moolenaar, N. M., Daly, A. J., Heldens, H. H., Donche, V., Van Petegem, P., et al. (2016). The networked instructor: The quality of networks in different stages of professional development. *Teaching and Teacher Education*, 59, 295–308. <https://doi.org/10.1016/j.tate.2016.05.022>
- Vermunt, J. D., Vrikk, M., van Halem, N., Warwick, P., & Mercer, N. (2019). The impact of Lesson Study professional development on the quality of teacher learning. *Teaching and Teacher Education*, 81, 61–73. <https://doi.org/10.1016/j.tate.2019.02.009>
- Vonk, H. (1991). Some trends in the development of curricula for the professional preparation of primary and secondary school teachers in Europe: A comparative study. *British Journal of Educational Studies*, 39(2), 117–137. <https://doi.org/10.1080/00071005.1991.9973879>
- de Vries, S., Jansen, E. P., & van de Grift, W. J. (2013). Profiling teachers' continuing professional development and the relation with their beliefs about learning and teaching. *Teaching and Teacher Education*, 33, 78–89. <https://doi.org/10.1016/j.tate.2013.02.006>
- Wang, F. Y. (2018). An expert EFL reading teacher's readers club: Reader identity and teacher professional development. *European Journal of Teacher Education*, 41(4), 517–528. <https://doi.org/10.1080/02619768.2017.1416084>
- Wei, R. C., Darling-Hammond, L., & Adamson, F. (2010). *Professional development in the United States: Trends and challenges* (Vol. 28). Dallas, TX: National Staff Development Council.
- Willemsse, T. M., ten Dam, G., Geijssels, F., van Wessum, L., & Volman, M. (2015). Fostering teachers' professional development for citizenship education. *Teaching and Teacher Education*, 49, 118–127. <https://doi.org/10.1016/j.tate.2015.03.008>
- Yurkofsky, M. M., Blum-Smith, S., & Brennan, K. (2019). Expanding outcomes: Exploring varied conceptions of teacher learning in an online professional development experience. *Teaching and Teacher Education*, 82, 1–13. <https://doi.org/10.1016/j.tate.2019.03.002>
- Zhang, M., Lundeberg, M., Koehler, M. J., & Eberhardt, J. (2011). Understanding affordances and challenges of three types of video for teacher professional development. *Teaching and Teacher Education*, 27(2), 454–462. <https://doi.org/10.1016/j.tate.2010.09.015>