EFFECTIVE ONLINE PROFESSIONAL LEARNING AND
DEVELOPMENT FOR IN-SERVICE TEACHERS: A CONCEPTUAL
FRAMEWORK OF DESIGN CONSIDERATIONS

A thesis submitted by

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Abstract

Teachers work in an ever-evolving and increasingly complex context, which requires them to continually refresh, extend, and develop their knowledge, skills, and abilities. To achieve this, teachers undertake professional learning and development (PLD) to support their professional growth. Thus, effective PLD is important for teachers, and much research has been conducted to determine the elements of effective in-person PLD, but those for online PLD remain elusive. With the increasing availability of online PLD, the elements of its effectiveness need to be determined in order to support the design of these opportunities. While the literature has identified that technology is a key difference between in-person and online PLD, it is more complex than simply the addition of technology. The very foundation of online PLD is different: the online environment has significantly different affordances and challenges that must be considered. Accordingly, the elements of effective online PLD differ to those for in-person PLD. In this research, the central aim is twofold: to advance the understanding of what constitutes effective online PLD and to support the delivery of this through identifying what should be considered.

Three iterative phases of data collection were undertaken to determine what the empirical literature reports about effective online PLD and what teachers perceive and experience as effective when undertaking online PLD. A systematic literature review was used to investigate the empirical literature, and its findings informed the development of an online survey developed to investigate teachers' preferences, practices, and perceptions of online PLD. The findings from these two data collection phases informed the questions prompts in the semi-structured online focus groups. The findings from the three data collection phases were triangulated, synthesised, and analysed to support the development of the conceptual framework of design considerations for effective online PLD.

The conceptual framework developed through this research presents what constitutes effectiveness in online PLD according to the empirical literature and teachers' perceptions and experiences. It comprises three areas: informing factors, constant design considerations, and variable design considerations. The four informing factors (content, context, purpose, participant) describe the environment

within which the online PLD is being undertaken. These informing factors provide information that is used to determine the level of importance and impact of each of the design considerations. The constant design considerations of savings and technology are stable and have a baseline level determined by the informing factors below which teachers consider it to be less effective. The variable design considerations (flexibility, communication, content, human connection, and community) have an overall hierarchy of importance but vary within that according to the informing factors.

The conceptual framework embodies three assertions about online PLD: it is different; it is complex; and it supports teacher agency. The conceptual framework illustrates that online PLD differs significantly to in-person PLD and is a complex, nuanced environment that requires careful consideration of all components. Furthermore, it presents an approach to designing and developing online PLD for effectiveness that deeply embeds the established elements of effective in-person PLD. It also supports teacher agency as a key affordance of the online environment, which further supports effectiveness in PLD.

Thesis certification page

This Thesis is the work of Trisha Poole except where otherwise acknowledged, with the majority of the authorship of the papers presented as a Thesis by Publication undertaken by the Student. The work is original and has not previously been submitted for any other award, except where acknowledged.

Principal Supervisor: Associate Professor Angela Fitzgerald

Associate Supervisor: Dr Chris Dann

Student and supervisors' signatures of endorsement are held at the University.

The articles produced from this research were a joint contribution of the researchers. The details of the contribution of each researcher are provided below.

- **Publication 1: Presentation of the findings from the systematic literature review of empirical literature reporting on effective online PLD programs**

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The overall contribution of **Trisha Louise Poole** was 100% to the concept development, data extraction, analyses, interpretation, drafting, and revising the final submission.

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List of abbreviations

AITSL	Australian Institute for Teaching and School Leadership
COVID-19	Coronavirus disease 2019
OECD	Organisation for Economic Co-operation and Development
PhD	Doctor of Philosophy
PISA	Programme for International Student Assessment
PLD	Professional learning and development
SLR	Systematic literature review

Chapter 1: Introduction

1.1. Introduction to the research

This research is presented as a PhD by publication, which comprises a series of three publications prepared as journal articles with supporting discussions that form the narrative of the research journey. The publications have been prepared and submitted based on the research undertaken during the PhD candidature period in the field of professional learning and development (PLD) for in-service teachers. The purpose of this narrative is to document the research journey and connect the publications as one cohesive research project.

This introductory chapter contextualises the research personally as well as within the field, and it includes the research aims, objectives, and significance. The research process is presented identifying the research questions and contextualising them within the overall research project. Then, the significance and contributions of the research are presented to demonstrate the importance of this work. An overview of the journal articles and authorship is also provided to situate them within the overall context of the research. A guide to the narrative structure and the embedded vignettes is also provided. The chapter concludes by introducing the first publication.

1.2. Personal contextualisation

> *My story*
>
> *My passion is helping others learn new things and challenging their thinking. Beginning as a trainer and tutor, my career has progressed to being a teacher, a visiting professor, a teacher educator, and now an academic developer. Throughout my career, I've seen firsthand how technology can divide people: from those who have it and those who don't, through to those who embrace it and those who don't. I have also seen how technology can support and transform people's ability and desire to engage with opportunities that may otherwise be limited or inaccessible to them. My passion has evolved to fully embrace technology-enhanced learning, particularly when the affordances of the online environment are used to their fullest capacity and designed with purpose. I believe that providing positive and effective online experiences is central to improving the perceptions of the benefits that the online environment can provide. Added to this is my professional growth from being a teacher to being a teacher educator, and further expanding this into teacher professional learning and development (PLD). These two parts of my identity have combined, and my desire is to support teachers in their teaching through providing online PLD opportunities that support and extend their knowledge, skills, and abilities. However, these online PLD opportunities should be designed effectively with the teacher-participant in mind. My research journey has supported my career progression and passion in identifying what makes PLD effective for in-service teachers and what should be considered when designing online PLD for effectiveness.*

My story provides insight into the motivations behind this research and why this research has personal significance. Throughout my career, I have interacted with innumerable teachers from different and occasionally opposing contexts who struggle with the same problems around PLD: it is not as effective as they want and need it to be, and it does not allow them sufficient agency in their professional growth. Too many times I have encountered teachers who groan at the thought of yet another PLD session or day. I, too, am guilty of this. However, I understand the importance of PLD and how it is central to professional growth and engaged, effective teachers in all contexts. Designing and developing PLD that supports teachers to be more engaged and continue to grow as a professional, together with timely support for their teaching, is part of the multifaceted role of being a teacher educator and academic developer. An even more pressing issue facing teacher educators and academic developers is how to present effective PLD in the online

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environment. The recent explosion of online PLD available indicates that there is a demand for this PLD approach. However, the scarcity of literature around effective online PLD hampers online PLD designers and developers in their efforts to support teachers effectively through this mode. As a teacher educator and academic developer, I want to design and develop online PLD for effectiveness, not simply "ticking a box" or meeting an arbitrary requirement. This research has supported my desire to better understand effective online PLD: what the literature says (or does not say), what the teachers perceive and experience as effective, and what should be considered when designing online PLD for effectiveness.

1.3. A brief note on professional learning and development terminology

In the literature, the term 'professional development' has been used extensively to refer to the ongoing processes of continuing to grow and learn as a professional and within the profession as it advances and changes over time. However, there has been a move away from this term as it implies that something is being 'done' to participants as an external process rather than 'with' participants as an internal process (Labone & Long, 2016; Mayer & Lloyd, 2011; Overstreet, 2017; Timperley, 2011). The term 'professional learning' is being favoured because it has an inherent meaning of this professional growth being accomplished with participants, and it can represent an internalisation of the activities. Professional learning is considered to develop professional knowledge on a topic or knowledge area through interaction with this information in ways that challenges assumptions, changes perceptions, and creates new meanings (Kennedy, 2016). Mayer and Lloyd (2011) stated that "[t]he shift in terminology away from professional development, as noted in jurisdictions across Australia, may well reside in these perceptions and the presumed 'baggage' associated with poorly conceived, fragmented, one-shot and de-contextualised 'in-service workshops'" (p. 3). Overstreet (2017) supports this perception of professional development being associated with "passive, one-time experiences" (p. 200) and further elaborates on professional learning as being "job-embedded, linked to school or district goals and high standards, relevant to participants, ongoing, promotes teacher empowerment and collaboration, and focuses on content and student learning" (p. 200). Therefore, the underpinning notion of professional learning is more active, more personalised, and more effective than professional development.

While there has been a move away from the term 'professional development', the term 'professional learning' remains to become the standard term. In many cases, particularly in Australia, the terms 'professional development' and 'professional learning' are used interchangeably to refer to the learning and development that is undertaken by professionals (Hunter, 2017). Therefore, throughout this narrative and the associated journal articles, the term 'professional learning and development' (PLD) is used to encapsulate both the professional learning and the professional development of teachers. Through using this inclusive term, there is acknowledgement of the changing perspectives of each individual term and of the understanding that development and learning are often intertwined and cannot be completely separated from each other. As noted by Hunter (2017), "the term professional development is the activity, the process and experience teachers engage in, in order to develop their professional learning" (para. 7). Thus, combining these terms allows the full conceptualisation of growth, development, and learning as a professional within a profession to be encapsulated and utilised.

1.4. Research background

Across the world, in-service teachers are required to undertake PLD activities on a regular basis in order to maintain their registration as a teacher (Australian Institute for Teaching and School Leadership, 2018a; Kennedy, 2016; OECD, 2019c; Zhang et al., 2019). Therefore, it follows that the PLD of in-service teachers is the subject of government policies both within Australia and internationally. Furthermore, leading international agencies such as World Bank articulate the importance of teacher PLD and embed it into their teacher development frameworks: Béteille and Evans (2019) expand this to state "professional development opportunities in these countries [East Asia's top-performing education systems] focus on helping teachers continuously update their skills, no matter how effective they [teachers] are." (p. 16). This is exemplified in Singapore where teachers take a pledge to continue to learn, and this is underpinned by the Ministry of Education embedding lifelong professional development into their Teacher Education Module for the 21st Century (Ministry of Education, 2021; Rajandiran, 2021). In Finland, which consistently ranks in the top five countries for education according to the OECD Programme for International Student Assessment (PISA) (OECD, 2019b), teachers begin their professional development journeys during their teacher

education and are assigned teacher mentors to receive early career support (Liuski, 2021). In New Zealand, it is stated in policy that teachers must demonstrate satisfactory engagement in professional development during the three years leading up to renewing their teacher registration (Teaching Council of Aotearoa New Zealand, 2021). In the *Australian Professional Standards for Teachers* (Australian Institute for Teaching and School Leadership, 2018b), the Australian Institute for Teaching and School Leadership (AITSL) identifies engaging in professional learning as a standard in Professional Engagement Domain. This evidences the importance of PLD for in-service teachers and its embeddedness within policy and teacher education practice. While the current research does not focus on the policy aspects of teacher PLD but rather the teacher voice, experience, and perspective, it is important to recognise that policy underpins the requirements for teachers to engage with PLD, which then provides an impetus for teachers to continue to undertake PLD.

In Australia, which is the context of this research, the state- and territory-based teacher regulatory authorities have clear statements about the PLD expectations for registered teachers, and these activities are typically described using a specific number of hours or specific activities that teachers must undertake each year in order to maintain their teacher registration. For example, the Queensland College of Teachers requires teachers who teach 20 days or more per calendar year to undertake a minimum of 20 hours of PLD (Queensland College of Teachers, 2020). Therefore, providing appropriate, timely, and effective PLD opportunities for in-service teachers is critical in supporting them to meet their professional responsibilities and maintain their registration. In many instances, these PLD activities occur in real-time, in-person contexts, often with the teachers' educational institute providing the opportunity, either as a mandated or optional activity (Kennedy, 2016; Sandholtz & Ringstaff, 2020; Valiandes & Neophytou, 2018). There is much literature on what supports effective PLD for in-person offerings, and the elements of effective in-person PLD are well established (Desimone & Garet, 2015; Kennedy, 2016; Quinn et al., 2019; Valiandes & Neophytou, 2018), with the understanding that effectiveness is determined by change in teacher practice and student learning (Desimone & Garet, 2015; Kennedy, 2016; Quinn et al., 2019). However, with the increasing availability of online PLD opportunities, it is important that these are provided with effectiveness in mind. Currently, there is a lack of

reported empirical literature on effective online PLD, and the elements of effective in-person PLD cannot be simply transferred as the learning environment differs significantly (Quinn et al., 2019).

This doctoral research investigated what constitutes effective online PLD through examining the empirical literature and garnering in-service teachers' perspectives and experiences of online PLD. In this way, this research considers the key topic around what is effective in online PLD and uses both existing theory and emerging practice to support the investigation.

1.5. Research problem

With the increasing availability of online PLD, which has been amplified due to COVID-19, it is important that these opportunities are designed to be effective for the participants. Although the elements of effective in-person PLD have been clearly established, those for online PLD remain unclear. Therefore, the challenge within this research is to provide clarity around the components of effective online PLD that incorporates both the existing empirical literature and in-service teachers' perspectives and experiences. Through including both the empirical literature and the reality experienced and articulated by teachers, a more holistic and nuanced understanding of what comprises effective online PLD can be discovered.

1.6. Contextualising the research

Modern society is advancing at a rate never seen before and teachers are at the heart of preparing our future generations for a world that is yet to be seen, for jobs that do not yet exist, and for a society that is constantly evolving (Oddone et al., 2019; OECD, 2019a; Schleicher, 2020; Zhang et al., 2019). Teachers have the demanding work of ensuring that these future generations are as ready and capable as possible for this unknown future (United Nations, 2020). Therefore, it is essential to support teachers in their work through providing opportunities for them to maintain discipline and pedagogic currency; to enhance their knowledge, skills, and abilities; and to keep abreast of the ever-evolving world and society (Oddone et al., 2019; OECD, 2019c; Powell & Bodur, 2019). These opportunities, which are commonly framework-driven programs, are typified by access to PLD that encourages and supports teachers to refresh, develop, and extend their knowledge and to adapt to the ever-evolving context in which they are teaching. Providing appropriate and effective PLD for teachers has been recognised universally as a foundation for the

teaching profession across the world (DeMonte, 2013; Ní Shé et al., 2019; OECD, 2019c; Powell & Bodur, 2019; Schleicher, 2020; Timperley, 2011; United Nations, 2020), and research has been undertaken to identify effective methods of supporting teachers in their professional growth.

The importance of providing effective PLD for in-service teachers has been highlighted over the past two decades with significant research being undertaken to determine the elements of effective PLD (DeMonte, 2013; Desimone & Garet, 2015; Guskey, 2014; Mayer & Lloyd, 2011; Quinn et al., 2019). The research has consistently identified five key elements that are required for effective PLD: active learning, coherence, collaboration, content focus, and sustained duration (Darling-Hammond et al., 2017; DeMonte, 2013; Desimone & Garet, 2015; Quinn et al., 2019; Yoon et al., 2007). Recently, another element has emerged as a potential addition to these five: teacher agency (Calvert, 2016). This recent addition of teacher agency to the elements of effective in-person PLD has been accepted (Attard, 2017; Oddone et al., 2019; Wild et al., 2018), and it appears logical because it enables teachers to have a degree of ownership over their professional growth. This ownership results in greater engagement, self-direction, and motivation from the teacher-participants in their professional growth (Attard, 2017; Lopes & Cunha, 2017; Powell & Bodur, 2019; Wild et al., 2018). While the initial five elements of effectiveness are well established and recognised for in-person PLD, those for online PLD remain elusive (Quinn et al., 2019). Online PLD provides a different context and environment within which PLD is being undertaken by in-service teachers, and the elements of effective in-person PLD cannot be simply transferred to the online context (Bakir et al., 2016; Quinn et al., 2019). Often, teachers undertaking PLD online have different purposes and expectations of the PLD, and this means that online PLD must be understood as different and inherently more complex (Bakir et al., 2016; Kennedy, 2015; Ní Shé et al., 2019; Oddone et al., 2019). Furthermore, the affordances and challenges inherent within online PLD differ to those for in-person PLD (Ní Shé et al., 2019; Schleicher, 2020), and these differences impact what should be considered when designing for effectiveness.

The affordances that the online environment provides, together with their associated challenges, demands a different approach to online PLD: one that is more complex and nuanced than that which can be used when presenting PLD in-person (Ní Shé et al., 2019; Quinn et al., 2019; Schleicher, 2020). In this way, online PLD

differs to in-person PLD and should be considered as a nuanced field within teacher PLD. It has been recognised that a more complex and nuanced approach to online PLD is required to design in effectiveness (Quinn et al., 2019), yet a comprehensive understanding of what this might entail has remained elusive. Furthermore, understanding how online PLD can support teacher agency in ways that in-person PLD cannot remains unclear. Combining the notion that effective PLD is essential in supporting teachers to maintain currency with the increased availability of online PLD, it has become imperative that online PLD is designed for effectiveness and for teacher professional growth. While this is not a new statement (DeMonte, 2013; Desimone & Garet, 2015; Quinn et al., 2019), the importance of developing a set of design considerations specifically for effective online PLD has been amplified through the significant changes seen in the field of education in recent times.

The COVID-19 pandemic has positively impacted this research by further highlighting its importance as teachers worldwide were asked to adapt and change to online learning and teaching (Schleicher, 2020; Ziebell et al., 2020). They were given PLD opportunities to support this abrupt shift, and these were facilitated online (Schleicher, 2020; United Nations, 2020). Although online PLD opportunities were already increasing (OECD, 2019a; Quinn et al., 2019), the pandemic accelerated these and has resulted in significantly more opportunities being facilitated online. Therefore, with the increasing availability of online PLD, the importance of understanding what comprises effective online PLD has become even more significant and urgent.

Given the increasing importance of identifying the effective elements of online PLD, this research focused on understanding what should be considered when designing online PLD for effectiveness, from both theoretical and practical perspectives, as well as from the perspectives and experiences of in-service teachers who have participated in online PLD.

1.7. Research significance

While frameworks and models exist for designing and developing effective in-person PLD (see, for example, Boylan et al., 2018; Darling-Hammond et al., 2017) and for effective online learning (see, for example, Leslie, 2019; Redmond et al., 2018), a conceptual framework that presents the design considerations for online PLD has not yet been developed, although some literature has alluded to aspects of

online PLD that may impact effectiveness (see, for example, Powell & Bodur, 2019). Due to the significant differences between in-person and online PLD, such as the key differences in synchronous and asynchronous delivery modes (Bakir et al., 2016; Powell & Bodur, 2019) and flexibility (Bragg et al., 2021; Sandholtz & Ringstaff, 2020), it is important that a framework be developed specifically for online PLD offerings in order to embed effectiveness into the design from the start. Determining the elements of effective online PLD has become critical in the ever-evolving context and increasing availability of online PLD. Thus, it is important that these online PLD opportunities are designed for effectiveness from the teachers' perspectives and experiences, in concert with the established theory and literature. This research provides new insights into what is considered effective by in-service teachers when they undertake online PLD. Using the teachers' perceptions and experiences of online PLD to inform the conceptual framework of design considerations, combined with the reported empirical literature, provides new perspectives on effective online PLD and what should be considered when delivering PLD in this environment. Furthermore, through this approach, teacher agency can be designed into online PLD. The significance of this research beyond achieving its aim and objectives has three perspectives: theoretical, practical, and personal.

From a theoretical perspective, this research provides greater insight into online PLD in general, but then more specifically in the aspects of design that support effectiveness from the teacher-participants' perspectives. There is an abundance of literature on effective in-person PLD (Darling-Hammond et al., 2017; DeMonte, 2013; Desimone & Garet, 2015; Kennedy, 2016), but there is a scarcity in online PLD and what constitutes effectiveness in this environment (Quinn et al., 2019). The findings from this research and the resulting publications presented as part of this thesis advance this discussion through presenting new knowledge related to online PLD and effectiveness, with a particular focus on the design considerations that support in-service teachers to engage with effective online PLD.

The research has practical significance in that it presents a conceptual framework of design considerations for effective online PLD that is ready for immediate use. While frameworks exist for effective in-person PLD, this is the first to present design considerations that offer a practical way forward for online PLD designers and developers. Therefore, online PLD designers and developers are supported to construct online PLD opportunities that are designed for effectiveness.

This effectiveness has been articulated through the teacher experiences and empirical literature used in the foundations of the framework. Thus, using the conceptual framework of design considerations supports the development of effective online PLD.

From a personal perspective, this research has supported and will continue to support my work with academics (who are a type of teacher) in supporting their professional growth. Through undertaking this research, I have a greater understanding of what constitutes effectiveness in online PLD, and I can use this to support the design and development of online PLD opportunities, which has a central role in my daily work. Therefore, this research has also supported my professional growth and provided more opportunities to expand my professional knowledge.

The overall significance of this research is centred in the conceptual framework of design considerations developed through the research, and how it provides a foundation for online PLD designers and developers to construct these opportunities so that they are designed for effectiveness. This effectiveness has been articulated through the teacher experiences and empirical literature used in the foundations of the framework. Thus, using the conceptual framework of design considerations supports the development of effective online PLD in ways that other frameworks have not yet adequately done.

1.8. Aim and objectives

The aim of this research is to advance the understanding of what constitutes effective online PLD and to support the delivery of this through identifying what should be considered when designing and developing online PLD for effectiveness. In this way, when online PLD is designed and developed for in-service teachers, it can be effective in supporting their professional growth.

The objectives of this research were to:

- identify the elements of effective online PLD as discussed in the empirical literature;
- garner the perceptions, practices, preferences, and experiences of in-service teachers in relation to what makes online PLD effective; and
- develop a conceptual framework that supports the design and development of effective online PLD.

1.9. Research questions

To support the aim and objectives, the following three research questions were identified and posed to shape this research.

- What constitutes effective online professional learning and development for in-service teachers as identified in the empirical literature?
- What are in-service teachers' (a) understandings of, (b) behaviours concerning, and (c) perceptions and experiences of effective online professional learning and development?
- What should be considered when designing effective online professional learning and development for in-service teachers?

The three publications presented as part of this narrative address each question individually.

1.10.   Research process

Prior to beginning the research process, University human ethics clearance was obtained (H17REA275). To achieve the objectives and respond to the research questions presented above, the research progressed through three sequential and iterative phases of data collection using a social constructivism approach to developing learnings and analysing findings (Bruner, 1991; Piaget, 2013; vanOostveen et al., 2019; Vygotsky, 1978). The first data collection phase responded to RQ1; the second data collection phase responded to RQ2; and all three data collection phases were used to inform the response to RQ3. An overview of this process is presented in **Error! Reference source not found.** together with the connections to the publications. A more detailed description of the data collection phases is presented below the figure.
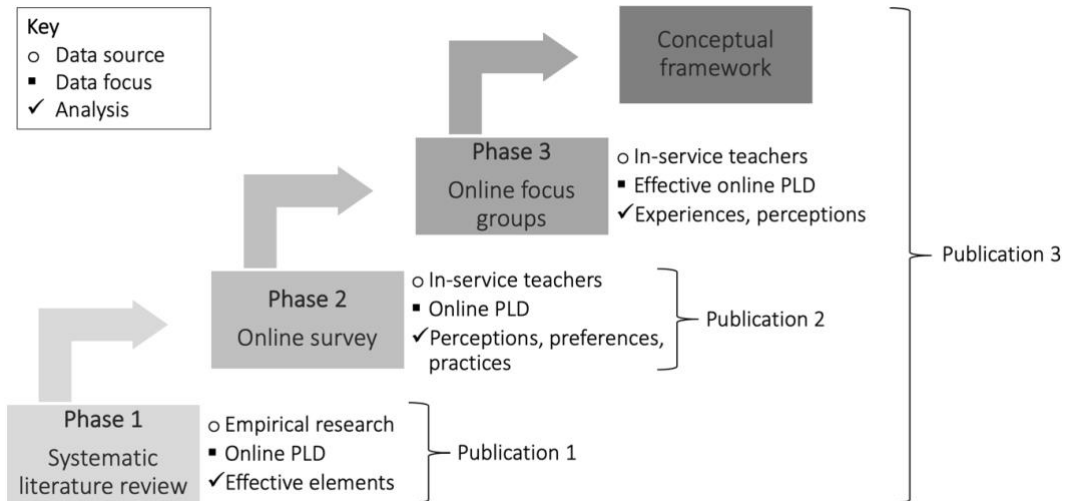
Figure 1.1. The three sequential and iterative phases of data collection with the associated publications.

The first data collection phase sought to identify the elements of effective online PLD as described in the empirical literature, which responds to the first research question. This was achieved through a systematic literature review (SLR) of the empirical literature using the Prisma workflow process (Gough et al., 2017; Moher et al., 2009). The findings were analysed using reflexive thematic analysis (Braun & Clarke, 2006; Braun et al., 2019; Clarke & Braun, 2018) to distil the key concepts and move deeper into the literature to identify the elements. This phase and its findings are presented in Chapter 2, which includes the accompanying publication.

Building on and using the findings of the SLR in the first phase, the second phase of data collection investigated in-service teachers' perceptions, practices, preferences, and experiences of online PLD through an online survey. The online survey used a combination of open-ended response questions and Likert scale response questions. The responses were analysed using a combination of semantic, descriptive, and thematic analyses (Cambria et al., 2017). The findings from this data collection were used to respond to the second research question. This data and its analysis are presented in Chapter 3: What are in-service teachers' (a) understandings of, (b) behaviours concerning, and (c) perceptions and experiences of effective online PLD? together with the accompanying publication.

The third and final phase of data collection was connected to the second: the participants in the online survey were asked if they wished to participate in an online focus group to further explore their perceptions and experiences of online PLD. The findings from the second phase of data collection guided the development of the semi-structured questions used in the online focus groups. Transcripts were created from the online focus groups, and this data was thematically analysed to provide further nuance and depth to the understanding of the elements of effective online PLD (Braun & Clarke, 2006; Clarke & Braun, 2018). This data collection phase is discussed in Chapter 4, and it provides the third data set that was used in the development of the conceptual framework of design considerations for effective online PLD, which is also presented in Chapter 4.

Using the three-phase approach to the data collection with the iterative analyses enabled the three data sets to be triangulated and synthesised to support and guide the development of the conceptual framework of design considerations, which is the heart of this research and responds to the third research question. The final publication, presented in Chapter 4, presents the conceptual framework developed through this research and details its development together with a discussion on how the identified design considerations provide greater depth and nuance in understanding effective online PLD.

1.11.   Overview of the narrative and publications

This thesis is structured to incorporate the publications with the narrative that is presented using the PhD by publication format. Chapter 2 responds to the first research question and presents the first publication. It is structured to provide narrative around the publication, and how it informed and impacted the subsequent research. Chapter 3 responds to the second research question and presents the second publication. It also provides a narrative around the publication, including how it informed and impacted the subsequent research. Chapter 4 responds to the third research question and presents the heart of this research: the conceptual framework of design considerations for effective online PLD. It is presented in the third publication, which has a supporting narrative describing how this impacted the research. The third data collection phase (online focus groups) is also presented within this chapter, as this data was triangulated with the first two data collections in order to inform and build depth in the response to the third research question.

Chapter 5 continues the PhD narrative with a discussion that connects the finding from the three research questions and that presents a standalone discussion of the overall research. It uses vignettes from the data collection phases to provide context for the three assertions made within the discussion. The narrative is concluded in Chapter 6 with an overview of the research questions and their responses, contributions to knowledge and practice, the limitations, future work, and recommendations from the research.

Table 1.1 below provides an overview of the publications presented as part of this narrative. The table notes the location of each publication, the research question that it addresses, the publication title, and the authorship contributions. Each publication is presented with a summary statement that discusses how the article informed and impacted the research, its significance, and its implications.

Table 1.1. Overview of the publications, the associated narrative chapter, their connections to the research questions, titles, and authorship.

Chapter	Research question	Publication title	Authorship
2	RQ1. What constitutes effective online professional learning and development for in-service teachers in the empirical literature?	Identifying elements of effective online professional learning and development for in-service teachers: A systematic review of the empirical literature	Trisha Poole (100%)
3	RQ2. What are in-service teachers' (a) understandings of, (b) behaviours concerning, and (c) perceptions and experiences of effective online PLD?	Effective online professional learning and development: Teacher perceptions, practices, and preferences	Trisha Poole (80%) Chris Dann (10%) Angela Fitzgerald (10%)
4	RQ3. What should be considered when designing effective online professional learning and development for in-service teachers?	A conceptual framework for effective online professional learning and development informed by in-service teachers and theory	Trisha Poole (80%) Angela Fitzgerald (10%) Chris Dann (10%)

1.12.   Summary

Through this narrative, the importance of identifying what makes online PLD effective for in-service teachers and subsequently developing a conceptual framework of design considerations is presented in connection with the research

questions and their responses. This provides a foundation for the developed conceptual framework and embeds it within both the empirical literature and teacher perspectives and experiences. The next chapter presents the first publication, which focuses on the research question of "What constitutes effective online professional learning and development for in-service teachers in the empirical literature?" The publication is presented together with a summary that provides contextual information and resultant actions.

Chapter 2: What constitutes effective online professional learning and development for in-service teachers in the empirical literature?

2.1 Introduction

This chapter responds to the first research question of "What constitutes effective online professional learning and development for in-service teachers in the empirical literature?" It provides an overview of the first publication, followed by the publication which was developed as a journal article. Additional findings from the systematic literature review (first data collection phase) that were not included in the publication are also outlined as they provided further contextual information that was used throughout the research. Finally, a brief summary of how the response to this research question informed the subsequent data collection phases and research questions is provided.

2.1 Publication overview

The following table provides an at-a-glance summary of the publication information. In this, it presents an overview of the publication details, including the research question, title, submitted journal and its statistics, publication status, data set used, methodology, findings, and authorship.

Table 2.1. Publication 1 overview.

Research question	What constitutes effective online professional learning and development for in-service teachers in the empirical literature?
Title	Identifying elements of effective online professional learning and development for in-service teachers: A systematic review of the empirical literature
Journal	Journal of Teacher Education Ranking: Q1 Impact factor: 3.600 Double blind peer review
Status	Under review (JTE-20-12-0080)
Data set	Phase 1 - Systematic literature review
Methodology	Systematic literature review (Prisma method) and reflexive thematic analysis
Findings	Four elements in effective online PLD: connection, communication, community, flexibility
Authorship	Trisha Poole (100%)

This is the first publication that forms part of this doctoral thesis, and it was written as journal article. The article presented the first phase of data collection and its analysis: the systematic literature review that followed the well-established Prisma method (Gough et al., 2017; Moher et al., 2009). This data was analysed using reflexive thematic analysis (Braun & Clarke, 2006; Braun et al., 2019; Clarke & Braun, 2018), and five themes were identified from the literature as being important for effective online PLD for in-service teachers, in order of prevalence: interaction, co-construction of knowledge, practicality, presence, and flexibility. These themes were synthesised into four key elements for effective online PLD (connection, communication, community, flexibility), which were used in the design of the second and third phases of data collection (the online survey and the online focus groups).

This article positioned effective online PLD as something that is becoming increasingly important, particularly in the context of the COVID-19 pandemic. It also identified that while the elements of effective in-person PLD are well known and recognised, those for online remain elusive. At a foundational level, online PLD has a different environment with different participant expectations, which results in

different design considerations that need to be identified and addressed. Beginning with a systematic review of the empirical literature from January 2000 to July 2019, this article set the stage for the remainder of the research project, which focused on identifying what is effective in online PLD for in-service teachers. It also identified that there is a scarcity of literature available on identifying what makes online PLD effective and that the literature on effective in-person PLD cannot be simply transferred to an online context. This notion of the inability for effective in-person PLD elements to be transferred to the online context is continued throughout the remaining two publications in this doctoral thesis because it is a critical aspect of understanding how to design effective PLD for online environments.

2.2 Publication 1

Identifying elements of effective online professional learning and development for in-service teachers: A systematic review of the empirical literature

Abstract

Increasing dissatisfaction with existing professional learning and development (PLD) and greater emphasis on improving student learning has resulted in the need to identify what constitutes effective PLD for in-service teachers. To date, research has primarily focused on in-person delivery modes for effective teacher PLD, rarely addressing the online modes. The increased availability and pervasiveness of online PLD opportunities, which has been accentuated during the COVID-19 pandemic, highlights the importance of effective online PLD. This paper presents the findings of a systematic review of empirical literature that enabled identification of the key elements underpinning effective online PLD for in-service teachers. The four design elements that inform effective online PLD are connection, communication, community, and flexibility. These elements are considered in conjunction with the theoretical literature on effective in-person PLD. Connections are made to future research opportunities to

transform this established knowledge into a framework of effective
online PLD for in-service teachers.

The increasing complexity and changing nature of teaching in modern society
places greater levels of importance on the role of teachers in the education of future
generations (Boloudakis et al., 2018; Oddone et al., 2019; OECD, 2019c). There is
much discussion in both media and education around preparing students for the
unknown future: jobs that do not yet exist, skills that will be required but are as yet
undefined, and the ever-changing demands of the workforce (Oddone et al., 2019;
OECD, 2019a, 2019c). This has been particularly evident during the recent COVID-
19 pandemic where there have been sudden and dramatic shifts in the way that the
world works, and the way in which learning and teaching is being undertaken
(Schleicher, 2020; United Nations, 2020; Ziebell et al., 2020). Against this backdrop,
teachers are positioned to have a significant and tangible impact on the future. Now
more than ever before, it is imperative to support teachers through professional
learning and development (PLD) to maintain their currency in and update their
knowledge, skills and abilities; to keep abreast of emerging content, issues and
perspectives; and to continue to develop and refine their practice (OECD, 2019a;
United Nations, 2020). This importance is recognised and reflected through the way
teacher PLD has been embedded into the regular work of teachers and the
expectations set by teacher accreditation and registration bodies worldwide (OECD,
2019c; Opfer & Pedder, 2011; Sandholtz & Ringstaff, 2020; Wambugu, 2018).
However, the literature also indicates that in-service teacher PLD is not as effective
as planned or desired (Calvert, 2016; Morris, 2019; OECD, 2019a; Timperley, 2011),
and PLD approaches have not evolved significantly to better support teachers and
their needs (Boylan et al., 2018; Calvert, 2016; DeMonte, 2013; Oddone et al., 2019;
OECD, 2019a; Timperley, 2011). There are regular calls for more productive and
engaging PLD opportunities, from both the participating in-service teachers and their
school leadership (Boylan et al., 2018; DeMonte, 2013; Morris, 2019; Timperley,
2011; United Nations, 2020). These calls also indicate that there is a need for greater

flexibility in the PLD content and delivery methods to better support teachers in their day-to-day activities and to allow for flexible engagement at times and places that better suit in-service teachers and their increasingly busy schedules (Beach, 2017; Calvert, 2016; Kennedy, 2016; OECD, 2019a; Yoon et al., 2007).

Considering the importance of PLD for teachers and students, the effectiveness of PLD is an ongoing concern in the literature, with effectiveness being understood as improvements in teaching practice and student learning (Desimone & Garet, 2015; Kennedy, 2016; Oddone et al., 2019). In general, the PLD literature agrees that the core features of effective PLD initially proposed by Hawley and Valli (1999) and later confirmed by (Yoon et al., 2007), and then further refined by Desimone (2009), Desimone and Garet (2015), and Guskey and Yoon (2009) are central to supporting changes in teaching practice and improvements in student learning outcomes. These features include active learning, coherence, content focus, sustained duration, and collective participation. However, these elements have been identified for in-person modes to the exclusion of other modes including online and blended, which have not been sufficiently considered in the literature (Quinn et al., 2019). This could partially result from the time in which these seminal studies were undertaken, but the dearth of literature (which is revealed through this study) that updates these elements for modern learning environments to include online and blended contexts signals that there is a need to review these features in light of the developments and advances of technologies, learning environments, teacher characteristics, and student learning needs. This study focuses on the online delivery mode that is now available via online learning environments with consideration of the high needs of time-poor, modern-day teachers and their ability to access learning at anytime from anywhere in any place (Beach, 2017; OECD, 2019a, 2019c). This need for greater understanding of effective online PLD has been particularly highlighted during the COVID-19 pandemic as much teacher PLD has been taken online due to the restrictions imposed as a result of the pandemic (Schleicher, 2020; United Nations, 2020; Ziebell et al., 2020).

The online learning literature indicates the online delivery mode has particular features that traditional in-person environments lack, and these features require specific consideration in order to offer engaging and effective learning experiences (Binmohsen & Abrahams, 2020; Edinger, 2020; Quinn et al., 2019). For example, the asynchronous nature of online learning indicates that there needs to be

greater teaching, social, and cognitive 'presence' so that learners do not feel isolated nor disengage from the learning (Armellini & De Stefani, 2016; Redmond et al., 2018). These notions of presence have been used as foundations for online learning frameworks and models, including the online engagement framework for higher education (Redmond et al., 2018), the fully online learning community model (Blayone et al., 2017), and the self-directed online learning model (Beach, 2017). These frameworks also indicate the importance of designing specifically for online learning and PLD in contrast to simply translating approaches used for in-person delivery modes. Although the online learning literature may provide multiple insights into effective online learning design, it should be used with caution as online PLD differs in its specific focus on enabling professional growth.

This study investigated the following research question: *What constitutes effective online professional learning and development for in-service teachers in the empirical literature?* Through a systematic literature review, the elements of effective online PLD were identified from the empirical literature. These elements are discussed in relation to the theoretical literature on teacher PLD. In order to limit and focus the scope of this study, the key terms of teacher professional learning and development programs, online delivery mode, and effectiveness are defined. Through clearly defining these key terms, the literature is bounded within the relevant field and focused on the research question, which directly influenced decision making in the systematic literature review process.

Defining the key terms

Teacher professional learning and development (PLD) programs

Throughout this paper, the term 'professional learning and development' is used to refer to activities that can be perceived as being professional development or professional learning. The ongoing discussion of these two terms and their differences, beginning with the seminal pieces by Timperley (2011) and Opfer and Pedder (2011), has resulted in a shift towards 'professional learning' (Boylan et al., 2018) and the combined term 'professional learning and development' (Quinn et al., 2019). Teacher PLD is focused on developing the knowledge, skills, and abilities that teachers require in order to continue improving their professional and classroom practice (Boylan et al., 2018; Quinn et al., 2019). It is a continual process of capacity building and professional growth through providing teachers with opportunities to experience new approaches to teaching, to develop new skills, to build knowledge,

and to create resources that will support them as they implement these new ideas and approaches in their teaching contexts (Holmes et al., 2011; OECD, 2019a). Within this scope, PLD programs provide an overall structure and sequence of learning activities, knowledge, and skill development that is time-bound (Karlberg & Bezzina, 2020; Kennedy, 2016; Opfer & Pedder, 2011; Quinn et al., 2019; Sandholtz & Ringstaff, 2020). Thus, for the purpose of this review, activities such as coaching, mentoring, and lesson study are not considered to be part of PLD programs. Mentoring and coaching focus on two-way relationships to build knowledge, skills, and abilities without the necessity of a formal sequence of learning activities and time-bound activities, although these aspects can be incorporated if desired (Salter, 2015). Lesson study uses a peer mentoring, coaching, and observation approach to PLD without the requirement of specific structure and sequence (Takahashi & McDougal, 2016). Furthermore, while formal credit-bearing courses can fit within this definition of PLD programs, they are not considered because they result in a formal qualification, which is beyond the scope of in-service teacher PLD.

Online delivery mode

In the literature, four delivery modes for PLD are commonly cited: face-to-face (in-person), blended, distance, and online. In the context of the 21st century where in-service teachers benefit from anytime, anywhere access to PLD (Beach, 2017; Blayone et al., 2017; Quinn et al., 2019), it is important to clearly define the online delivery mode for teacher PLD. Quinn et al. (2019) identify that online PLD retains much of the same characteristics as online learning, although online PLD focuses on "sustainable and desirable pedagogic change in schools that potentially supports teachers to enhance students' learning" (p. 406). The online delivery mode leverages the affordances that technologies provide in developing and presenting content, resources, learning activities, and interaction opportunities; it typically has the majority of content delivered online (Binmohsen & Abrahams, 2020; Quinn et al., 2019). It can include asynchronous and synchronous activities, text- and media-based content, interactive learning, gamification, and more. It can utilise specific tools and technologies such as learning management systems, video conferencing, and hypermedia. Within this understanding of online delivery is the notion that there is little or no opportunity for formal in-person interactions because this would indicate a blended mode of delivery. It is also important to note that the online delivery should be the primary source of content, learning activities, and interaction

opportunities such that it is not an add-on or optional extra to the learning experience (Binmohsen & Abrahams, 2020; Quinn et al., 2019). While this does not preclude informal, participant-initiated in-person activities based on the PLD program, these are not designed-in activities in the PLD program.

Effectiveness

Effectiveness can be understood in various ways depending on the context and purpose (Desimone & Garet, 2015; Opfer & Pedder, 2011; Quinn et al., 2019). This denotes that it requires defining before use in a specific context, and PLD is no exception, particularly because effectiveness is often interchanged with quality and impact in this field (Opfer & Pedder, 2011; Quinn et al., 2019). While Guskey (2014) has identified five levels at which PLD effectiveness should be evaluated, and some literature supports this (Binmohsen & Abrahams, 2020; Quinn et al., 2019), the literature typically describes two different understandings of what is considered effective in teacher PLD, which are presented below.

When reviewing the theoretical literature on teacher PLD, it is clear that the commonly accepted and used understanding of 'effectiveness' is related to student learning and achievement (Desimone & Garet, 2015; Quinn et al., 2019; Sandholtz & Ringstaff, 2020). That is, effectiveness is understood as the change in teaching practice and student learning as a result of the teacher's PLD activities. According to DeMonte (2013), effective PLD 'positively influence[s] teaching and improve student achievement' (p. 1). Guskey and Yoon (2009) also echo the focus on student achievement gains when they discuss the effectiveness of PLD for in-service teachers. Timperley (2011) similarly reinforces DeMonte's definition of effectiveness in relation to PLD, but she adds that it must have meaning for the teacher and make a difference for student outcomes. This perception of effective teacher PLD remains constant in the literature (Edinger, 2020; Quinn et al., 2019; Sandholtz & Ringstaff, 2020). These examples build a strong case for understanding effectiveness in terms of student learning outcomes.

From the theoretical literature, the understanding of effectiveness is focused on student learning outcomes (DeMonte, 2013; Sandholtz & Ringstaff, 2020; Timperley, 2011). However, in the empirical literature that has been the focus of this systematic review, what comprises 'effectiveness' has been defined according to the purpose and focus of the teacher PLD program and the research questions used in the studies. In the papers that were distilled during the systematic literature review

process described below, there are a variety of definitions and understandings of 'effectiveness' ranging from increased levels and quality of interaction (Hull & Saxon, 2009), to increase of skills in learning design (Boloudakis et al., 2018), and to teacher perceptions and engagement in the PLD activities (Holmes et al., 2011; Wambugu, 2018). In this systematic review, the understanding of 'effective' relies on the articulated definition within in the studies. That is, the authors identified effectiveness at a particular level (e.g., participant teachers, student learning) in relation to their research questions, and this was deemed to demonstrate effectiveness. Overall, the understanding of effectiveness in these papers focused on self-reported teacher learning and changes in teacher practice, as well as improvements in teacher engagement in the PLD. These levels of effectiveness align with the first two levels of effectiveness identified by Guskey (2014): participant reactions and participant learning.

Materials and method

A systematic review method was used to locate all relevant empirical literature regarding online teacher PLD for in-service teachers, after which a thematic analysis was conducted to draw themes from the included literature and clearly identify gaps in the current knowledge. The implemented method used drew from a range of methodologies connected with systematic reviews, the Prisma workflow model, and thematic analyses (Braun & Clarke, 2006; Clarke & Braun, 2018; Gough et al., 2017; Jesson et al., 2011; Maguire & Delahunt, 2017; Moher et al., 2009; Zawacki-Richter et al., 2020). In order to respond to the research question and identify the features of effective online PLD for in-service teachers, the body of literature was limited to empirical studies that presented findings and provided discussion of the approaches to online PLD that were considered effective due to the resulting teacher learning and changes in teacher practice. Using empirical literature provides foundations for what is effective in practice, which is important to both in-service teachers and PLD facilitators.

Identifying the body of literature

A robust systematic review strategy was employed using the Prisma workflow model (Moher et al., 2009; Zawacki-Richter et al., 2020) to identify all potential evidence relevant to the research question. Articles published in English from January 2000 to June 2019 were identified, screened, evaluated for eligibility, and then included if all inclusion criteria were met. This timeframe supported the

inclusion of research with currency when the review was conducted in July 2019. The initial inclusion criteria were that the articles focused on (1) in-service teachers, (2) professional learning and/or professional development, (3) empirical research, and included (4) identification and discussion of PLD components that resulted in effectiveness, while the PLD reported need to (5) have a minimum duration of 14 hours (Yoon et al., 2007), (6) use an online mode, and (7) be non-credit bearing. The following table provides the more detailed inclusion and exclusion criteria based on these seven core criteria.

Table 1. Detailed inclusion and exclusion criteria used in the systematic literature review.

Element	Inclusion	Exclusion
Publication details	Date range: January 2000 to June 2019 Publication type: Peer-reviewed (scholarly) articles Language: English Databases: Scopus, EbscoHost Megafile Ultimate Search fields: title, subject, abstract	Articles that do not meet these criteria
Keywords	professional learning, professional development, effective*, positive, teacher training, teacher education	
Empirical research	Reports on implemented PLD programs	Theoretical research, general PLD discussions, policy reviews and documents, meta-reports and meta-analyses of PLD activities
In-service teachers	In-service teachers, formal schooling (early childhood, primary school, middle school, high school)	Pre-service teachers, tertiary educators, teacher educators, teacher trainers
PLD programs	Includes PLD program structure, learning outcomes, learning activities, learning plan	Initial teacher education, mentoring, coaching, lesson study, action research, credit-

		bearing courses that lead to qualifications
Identification of components of effective PLD	Identification of PLD design components that support effectiveness	General discussion of effectiveness
Duration	Minimum 14 hours of planned PLD activity (in line with the findings of Yoon et al. (2007) that PLD with more than 14 hours exhibited a positive and significant effect for in-person PLD; PLD with less than 14 hours did not exhibit statistically significant effects)	Less than 14 hours of planned activity, unspecified length of planned activity
Mode	Online mode, majority of content online, online learning space with learning resources available anytime, can include synchronous sessions but most is asynchronous	In-person delivery, blended delivery, distance delivery, only synchronous online classes

The refinement of these inclusion criteria is discussed in the description of the workflow phases below. Using the Prisma model, the four workflow phases of identification, screening, eligibility, and inclusion were used. An overview of the phases and their results is presented in Figure 1.
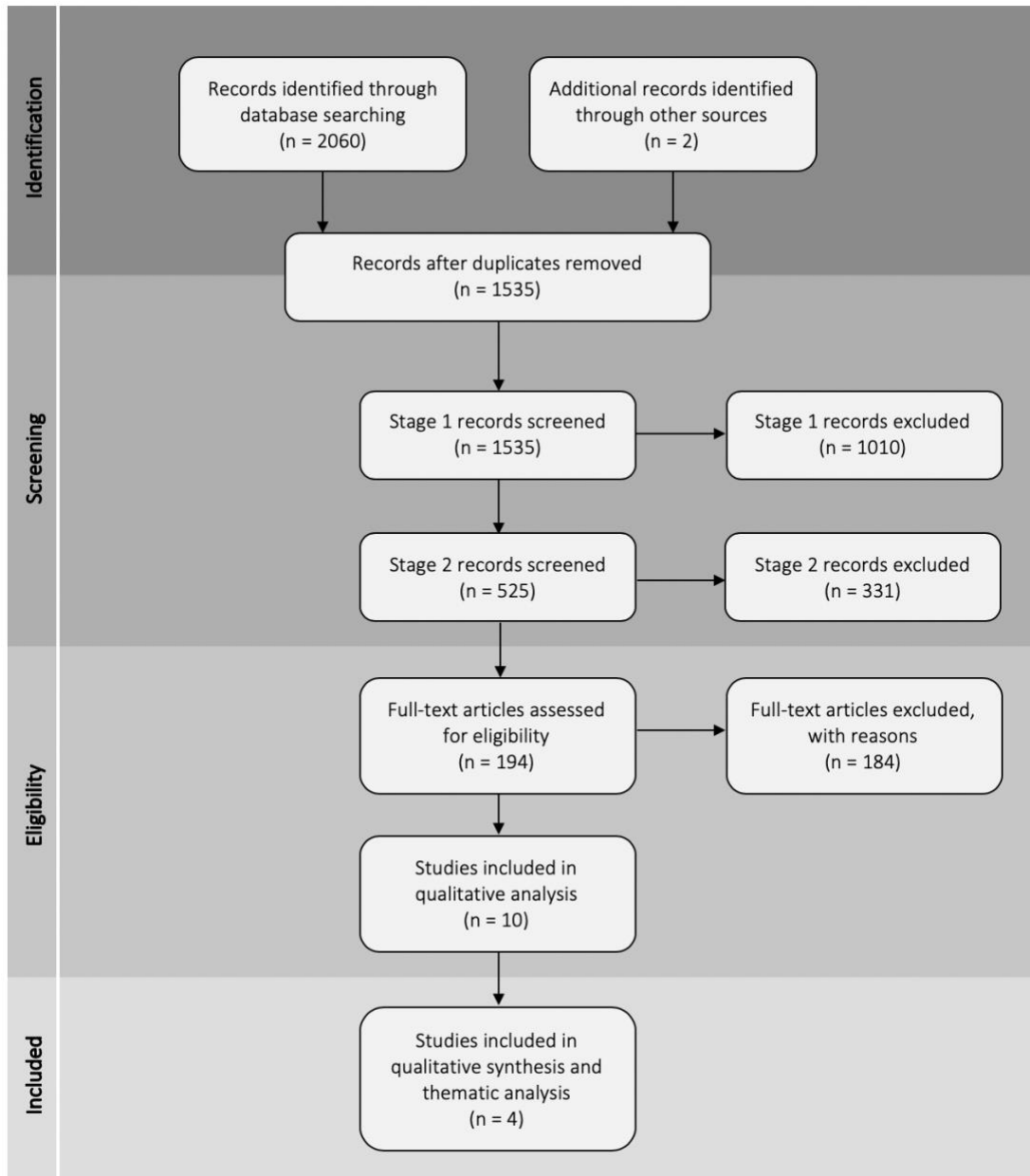
Figure 1. Prisma workflow phases and stages used in the systematic literature review.

In the first phase of identification, two source databases were used to identify potential articles: Scopus and EbscoHost Megafile Ultimate (including the ERIC, Education Resource Complete, ejournals, Academic Ultimate, and Sociology Source Ultimate databases). These databases were selected due to their coverage of key journals and scholarly work related to education and teacher PLD. These databases were searched using six specific keywords and phrases to broadly capture all potential articles and to allow for the diversity in terminology that is used to refer the concepts being searched in order to respond to the research question: *professional learning*, *professional development*, *effective**, *positive, teacher training*, and

teacher education. The specific search query was "("professional development" OR "professional learning") AND (effective* OR positive) AND ("teacher training" OR "teacher education")". The searches were limited to articles written in English; to the date range of January 2000 to June 2019; to peer-reviewed (scholarly) articles and reports; and to the fields of title, subject, and abstract. In total, 2060 articles were found in these databases, with an additional two articles included from Google Scholar alerts. The citations and abstracts were downloaded for these 2062 articles, and then the duplicates were removed, which resulted in 1535 unique articles at the conclusion of the identification phase.

The next phase of screening included two related stages: the first stage of broad refinement and a second stage of more explicitly narrowing the inclusion criteria to ensure only relevant articles were included in the third phase. The first stage involved taking the 1535 articles and scanning their titles and abstracts to determine which ones aligned with the inclusion criteria listed above. During this phase, the in-service teacher inclusion criterion was refined to those working in formal school settings, i.e., in early childhood through to high school contexts, and it excluded tertiary educators, teacher trainers, and similar roles; the location of these teachers was not limited except through the reporting of the research being in the English language. Furthermore, articles that only referred to PLD as an implication, rather than reporting on implemented PLD, were excluded. At the end of the first stage, 1010 articles were excluded and 525 remained included for the second stage of screening in this phase. The second screening stage focused on further refinement of the terms and more explicit identification of the components of the inclusion criteria. That is, the PLD program inclusion criterion was further refined to exclude activities that focused on mentoring, coaching, lesson study, action research, credit-bearing courses that lead to qualifications, and similar activities and approaches that had been broadly identified as PLD in the articles but did not align with the definition of a PLD program described above. During this process, a strategy of scanning key sections of the full articles to assess potential eligibility was undertaken. Through this process, 331 articles were excluded, and 194 articles were included for the third phase of the review.

In the third phase, the eligibility of the remaining 194 articles was further scrutinised through in-depth reading of each article to ensure that it focused on PLD, had a PLD program structure (as defined above), and contained more than 14 hours

or more of planned PLD activity. It was found that 29 articles had PLD activities of less than 14 hours, and 2 did not adequately describe the duration of the PLD activities, so they were excluded. Next, the remaining 163 articles were moded: that is, the reported PLD programs were classified into categories of in-person, blended, distance, and online modes of delivery. One article described a PLD program that was implemented four times across three modes (in-person, blended, and online), so it was moded into each of those three categories. Through this process, it was found that in-person was the most common PLD delivery mode reported in the literature with 121 articles reporting this delivery mode. Blended delivery was the next most common with 29 articles discussing PLD programs using this mode. The least common delivery mode was distance learning with five articles reporting on PLD programs delivered using this mode. This could reflect the shift during the investigated time frame from distance delivery to blended and online delivery. In the end, 10 articles described using an online delivery mode in the reported PLD programs.

In the fourth and final phase of the workflow, the remaining 10 articles were qualitatively analysed for inclusion. During this qualitative analysis, the inclusion criteria were further refined and solidified to ensure that the articles included could provide evidence to respond to the research question. In particular, four inclusion criteria were further refined: PLD programs, credit-bearing courses, online delivery, and effectiveness. Refining the PLD program inclusion criterion involved the article explicitly identifying the components that comprise a PLD program, e.g., learning outcomes, learning activities, learning plan. In further clarifying the exclusion of credit-bearing PLD programs, it was determined that if obtaining credit was an option but not compulsory, it did not exclude the PLD program. The online delivery mode criterion was refined to refer to more than synchronous online classes, i.e., there should be an online space where learning resources are stored and can be accessed by participants, as well as the online mode having the majority of content available online. When clarifying the effectiveness inclusion criterion, the articles needed to identify or discuss the PLD design components that were identified as supporting the effectiveness of the PLD. Through this qualitative analysis, the final number of articles that were included for thematic analysis was four: Boloudakis et al. (2018), Holmes et al. (2011), Hull and Saxon (2009), and Wambugu (2018). While this yield rate appears low (0.26%, 4 articles from an initial 1535), it is

acceptable in systematic literature reviews with strict inclusion and exclusion criteria (Zawacki-Richter et al., 2020, pp. x-xi).

Thematic analysis

Thematic analysis is a qualitative method that identifies, analyses, and reports patterns and themes in data (Braun & Clarke, 2006; Clarke & Braun, 2018). This approach enables the organisation of data into themes that describe rich data, and the interpretation of various aspects of the topic in relation to the research question. This contrasts with other analysis methods that may have lesser emphasis on interpretation and connection during the analysis, but rather leave this until after the analysis is complete. The power of using thematic analysis lies in its flexibility for researchers to synthesise and interpret connections in and between the data. Thematic analysis can be a valuable tool when using small but rich datasets, as in the case of this systematic literature review.

The four articles included in the thematic analysis and qualitative synthesis were analysed through multiple in-depth readings that involved extracting key data related to the research question. These readings enabled the identification and synthesis of the PLD program design components that were determined by the article authors as being effective. The theoretical underpinnings of each PLD program were also examined to identify the approaches used in the development of the PLD programs. Other data that were extracted included specifics about the authors' definitions of effectiveness, research questions, PLD program content focus, online delivery mode details, duration, geographic location, and PLD program evaluation results. The key extracted data were tabulated in a spreadsheet. This data was further analysed, synthesised, and interpreted to establish common themes and elements that comprise effective PLD programs. After the five primary themes were established from the raw data, they were further synthesised and reconceptualised using design principles into four elements to provide a more coherent presentation of the findings in relation to the design of online PLD programs. Some extracted data was used to provide a broader contextualisation for the overall discussion of the results, which are presented in the next section.

Results

Through analysis of the reported studies and their findings, five themes were identified with their constituting elements determined. These five themes in order of prevalence are interaction, co-construction of knowledge, practicality, presence, and

flexibility. Table 2 presents an overview of the four included studies and the themes of effective teacher PLD that were identified in each study. A full listing of the studies and their key features is presented in Appendix 1.

Table 2. Themes of effective teacher PLD from the studies identified in the systematic literature review.

	Boloudakis et al. (2018)	Holmes et al. (2011)	Hull and Saxon (2009)	Wambugu (2018)
Interaction	X	X	X	X
Co-construction of knowledge	X		X	X
Practicality	X	X		X
Presence		X	X	
Flexibility	X			X

During the reflexive thematic analysis, some features of effective PLD programs were identified that were specific to the context or content of the PLD program. These features did not align with a theme and may not be applicable more generally to online PLD programs. Therefore, these were not included in the themes. For example, the PLD program in Boloudakis et al. (2018) focused on designing a Moodle unit of learning using a specific tool to graphically represent the design. In their findings, they identified that this graphic representation significantly supported the effectiveness of the PLD program because it enabled participants to visualise their designed unit of learning and adapt the design to better suit the self-evaluation criteria and respond to peer feedback. They proposed that graphic representation is important in developing skills in learning design and using tools that support this increase the effectiveness of the PLD program (Boloudakis et al., 2018). Due to the specificity of this feature of effective PLD, it was not included in the themes.

Theme 1: Interaction

As is well documented throughout the literature in teacher PLD and online learning, interaction and interactivity are central to effective learning outcomes (Beach, 2017; Boloudakis et al., 2018; Holmes et al., 2011; Hull & Saxon, 2009; Redmond et al., 2018; Wambugu, 2018). This interaction and interactivity enable a shift from passive learning to active learning in online environments using various approaches including active learning design, facilitator and participant interaction, and other activities where the participant interacts or participates in the learning process rather than passively receiving information. This is considered central for

effective online teaching and learning activities (Beach, 2017; Garrison et al., 2010; Hull & Saxon, 2009; Quinn et al., 2019; Redmond et al., 2018). Therefore, it is unsurprising that the four studies in this systematic literature review identified that designed-in interactivity and participant interaction with their peers and the PLD facilitator were important to the experience and positive outcomes of the online PLD.

Boloudakis et al. (2018) found that the two core design features of their online PLD program focussing on supporting participants to share design ideas and to co-create units of learning were considered very valuable and resulted in more effective learning. The participants themselves found that working with their team members and the discussion and exchange of views in their team supported their learning and knowledge development around the PLD focus of learning design. Following this, Holmes et al. (2011) found that participant interactions with peers 'develop relationships that promoted learning' (p. 82) and '[p]articipants valued tools that promoted social networking and instant connections' (p. 83). These findings speak to the inherent value of interactions and interactivity, which Hull and Saxon (2009) further confirmed. In their findings, interaction was identified as vital because even 'a low level of instructor participation/interaction in group discourse… combined with different instructional phrases was sufficient to produce a difference in participant ability to move group processes beyond situated definition' (p. 636) and 'withdrawal of the [facilitator-led interactive questioning technique] after six weeks substantially lowered participation' (p. 634). In Wambugu (2018), in consultation with the participants, an online messaging tool was added to the PLD program to provide further interaction and interactivity between the participants and facilitators. After the inclusion of the messaging tool, the participants who accessed the messaging tool reported greater satisfaction and increased learning, which supported their evaluation that the PLD program was effective; in contrast, those participants who did not access the messaging tool were more likely to struggle and found it difficult to complete the PLD program.

Theme 2: Co-construction of knowledge

In socio-cultural theory (Vygotsky, 1978), the co-construction of knowledge is a key method through which learning occurs: that is, learning occurs through interactions with others and through these interactions knowledge is constructed together. In the context of PLD, the co-construction of knowledge is a collaborative and participatory process that requires participants to interact with others (peers,

teachers, or more knowledgeable others) to co-create meaning and knowledge based on guidance from the learning activities and facilitator (Edinger, 2020; Quinn et al., 2019; Sandholtz & Ringstaff, 2020).

The PLD program evaluated in Boloudakis et al. (2018) utilised a modified think-pair-share approach to the teaching and learning activities, which inherently included aspects designed to support the co-construction of knowledge among participants. In their evaluation, Boloudakis et al. (2018) identified that the process of participants eliciting, depicting, reflecting on, sharing ideas, and co-creating high-quality designs supported increases in participants' knowledge, skills, and abilities, which was a measure of effectiveness in the study. The participants also reflected this in their evaluations of the PLD program: the collaborative brainstorming and co-designing activities were identified as the two most helpful activities in the PLD process (Boloudakis et al., 2018, p. 1071). Hull and Saxon (2009) also embedded the process of co-constructing knowledge into their PLD program design in their use of precedent and intercedent probing questions. Using this questioning technique, the PLD facilitators supported the co-construction of knowledge and negotiation of meaning among participants. This particular questioning approach used to support their PLD program was deemed effective as the absence or removal of it resulted in lower evaluations, interactions, and reported application of knowledge by participants (Hull & Saxon, 2009). In Wambugu (2018), the participants reported that they 'were able to learn from one another and what they learnt [may] impact on their pedagogical skills' (p. 1153), which was interpreted as co-constructing knowledge to further develop the PLD target knowledges, skills, and abilities in a practical way. In this study, it was also identified that one motivation to learn was 'the peer review and interactions among the participants' (Wambugu, 2018, p. 1156), which also supported the effectiveness of the approach and importance of co-constructing knowledge through these activities.

Theme 3: Practicality

It is well known that in-service teachers engage with PLD opportunities when the material is relevant and personally meaningful (Beach, 2017; Oddone et al., 2019). Therefore, in their typically time-poor context, teachers are more motivated when PLD focuses on practical content and support that they can readily implement in their teaching context (Boloudakis et al., 2018; Herrington et al., 2009; Yoon et al., 2007). Therefore, when in-service teachers participate in a PLD program, it is

important that the practicality of the content, resources, and learning activities is visible with clear connections to their classroom context. While the practicality of the PLD programs may appear self-evident to those who design and facilitate them, the in-service teachers who undertake the PLD must also be able to see the relevance and practicality (Boloudakis et al., 2018; DeMonte, 2013; Guskey & Yoon, 2009; Holmes et al., 2011; Mayer & Lloyd, 2011; Timperley, 2011; Yoon et al., 2007). This has been identified in the literature as a key to supporting effective PLD that transfers to the classroom and impacts student learning (Desimone & Garet, 2015; Herrington et al., 2009; Mayer & Lloyd, 2011).

The PLD program presented and evaluated in Boloudakis et al. (2018) focused on developing practical skills for designing units of learning in Moodle (a learning management system). The study examined the development of these skills through supporting participants to design a Moodle unit of learning for their teaching context using tools that are available in their teaching context. The practicality of the content, resources, and learning activities, with the clear connection to the participants' contexts, supported the practical effectiveness of the PLD program, as assessed by an external evaluator of the participants' skill development. Holmes et al. (2011) evaluated the practicality of their PLD program through identifying the impact on teaching. In this evaluation, most participants responded that the content (88%) and resources (80%) had 'direct applications to the classroom instruction' (p. 81) during the program, and that they had new ideas (95%) and potential future uses (34%) for the content and resources presented. The participants also strongly agreed that the overall PLD program had a positive impact on their teaching, which can be correlated with the perceived practicality. The perceived practicality of the PLD program for use in their classrooms was also reflected in the participant feedback in Wambugu's (2018) study: 'over 97% indicated that they will significantly use the information obtained through the MOOC [massive open online course] in their work' (p. 1156).

Theme 4: Presence

The notion of presence was first articulated by Garrison et al. (2000) in their community of inquiry model and then further refined for the online learning environment (Blayone et al., 2017; Redmond et al., 2018). Presence is broadly defined as making visible the teaching, learning, and social aspects of a program; these are defined more distinctly for the three concepts in the community of inquiry

model: social presence, cognitive presence, and teaching presence (Armellini & De Stefani, 2016). Social presence, particularly for online programs, relates to the ability for a learner to identify, communicate purposefully, and develop interpersonal relationships within the group. Social presence is typically supported by the learning activities and direct instructional goals of the program. Cognitive presence refers to the processes embedded within a program that relate to practical activities that are distinguishable by the discourse and reflection designed to construct meaning and confirm understanding. Teaching presence focuses on the design, facilitation, and instruction within a program, and it often focuses on teacher presence, which is the visibility of the teacher within the program.

In Holmes et al. (2011) and Hull and Saxon (2009), presence was identified as a key aspect of the effectiveness of their PLD programs. Holmes et al. (2011) identified that all aspects of presence are important in online PLD but highlighted that 'social presence and teacher presence served as the greatest factors related to participants' learning and satisfaction' (p. 82) and that 'teacher presence plays a powerful role in online learning' (pp. 82-83). In their findings, Hull and Saxon (2009) identified that teacher presence is central to supporting effective online PLD through well-structured and supported discussion: 'online methods of instruction…appear to depend upon how well the teacher/instructor can establish a line of questioning that supports inclusion and targeted discussion' (p. 636). These two articles highlight the importance of presence, and in particular teaching and teacher presence, in online learning and professional development. This supports the literature's position that presence has a vital role in effective PLD, particularly in online contexts (Armellini & De Stefani, 2016; Beach, 2017; Blayone et al., 2017; DeMonte, 2013; Garrison et al., 2010; Holmes et al., 2011; Hull & Saxon, 2009; Redmond et al., 2018).

Theme 5: Flexibility

A key feature of online learning is the flexibility and adaptability that is an inherent affordance of the delivery mode. Flexibility can refer to the timing, content, or interaction of participants (Beach, 2017; Blayone et al., 2017; Mayer & Lloyd, 2011). Beach (2017) identified that flexibility through self-directed learning can be motivational for teachers and support their learning in PLD, and Calvert (2016) advanced this notion through identifying that flexibility supports teacher agency, which is also important in PLD effectiveness. The inherent flexibility of online

delivery modes is well recognised in the literature (Beach, 2017; Blayone et al., 2017; Redmond et al., 2018), and this can support teachers to have greater access to PLD.

Wambugu (2018) discussed the importance of flexibility in the PLD program to encourage greater participation and completion, which increased effectiveness of the program. Evaluation of the PLD program found that 'the self-regulated schedule with flexible start and stop dates' (p. 1156) increased motivation and positive participation and outcomes among participants. Boloudakis et al. (2018) also alluded to the importance of flexibility but did not clearly identify it as a key feature of effective PLD. The graphic representation tool provided flexibility to the participants during the learning design process, which enabled stronger skill development through iterative development of their learning designs.

Discussion

This discussion is presented in two parts that consider the findings of the systematic literature review. The first part focuses on articulating what constitutes effective online teacher PLD programs through synthesizing the themes into four elements. The second part discusses the relationship between the theoretical literature on effective PLD and the empirical literature identified in this review.

Elements of effective online teacher PLD programs

This review identified five themes of effective online PLD for in-service teachers from the empirical literature. These themes of interaction, co-construction of knowledge, practicality, presence, and flexibility highlight three key points about online PLD: (i) the importance of creating active learning and participatory environments within the learning space that enable communication and connection; (ii) alignment with participants' contexts; and (iii) provision of opportunities for flexibility, teacher agency, and self-directed learning. These three aspects of the learning environment echo the connectedness and practicality that teachers seek when undertaking PLD but provide greater insight and new understandings of how this may occur in online PLD. Teachers find value in networking with like-minded colleagues and in being able to implement their learning immediately in their own context (Oddone et al., 2019). That is, teachers do not typically undertake PLD to only learn more about the theory, but also to develop their knowledge and understanding through co-creation (Sandholtz & Ringstaff, 2020), participation in learning communities (Blayone et al., 2017), and discussion with more

knowledgeable others (Karlberg & Bezzina, 2020). Teachers start using these increased knowledges, skills, and abilities in their teaching practice to support their students' learning. Synthesizing the themes identified in this systematic review, the constituents of effective online PLD can be organised into four elements: connection, communication, community, and flexibility.

Element 1: Connection

Connection brings together two parts of the online PLD experience: connection with people and connection between content and context. The connection with people is created through the development of opportunities for interaction with peers and facilitators, as well as through activities that support the co-construction of knowledge and negotiation of meaning (Armellini & De Stefani, 2016; Oddone et al., 2019; OECD, 2019a). These interactions can be compared with four features of effective in-person PLD: active learning, collaboration, coherence, and content focus (Darling-Hammond et al., 2017; DeMonte, 2013; Desimone & Garet, 2015; Yoon et al., 2007). However, in the online context, the element of connection encompasses more than these features because it focuses on the connection to content, context, and other participants. Furthermore, teaching presence and social presence also support the development of connection among and between participants and facilitators, while cognitive presence strengthens the connection between the participant and the content being presented (Armellini & De Stefani, 2016; Garrison et al., 2010; Holmes et al., 2011). When connections between the content and context are provided, this can result in the practicality and usability of the online PLD. Through understanding the element of connection and teaching presence, support can also be provided for flexibility and self-directed learning.

Element 2: Communication

Tying together the themes of interaction, co-construction of knowledge, and presence is the common thread of communication between participants and facilitators. Taken further, communication is central to the processes of developing these three themes: it is required for interaction between participants, facilitators, and learning activities (Blayone et al., 2017; Boloudakis et al., 2018); it cannot be excluded from the co-construction of knowledge and negotiation of meaning (Hull & Saxon, 2009); and without it, presence is not possible (Armellini & De Stefani, 2016). Communication in online environments includes all aspects of communication from written to verbal, from design layouts to images and graphics,

from tone in word choice to emoji and GIF use. Particularly for online PLD programs, communication is a core element of effective PLD as the participants and facilitators are often in the learning environment at different times undertaking asynchronous activities, so the aspects of communication become more important as these are the only cues and clues that participants and facilitators have about each other (Blayone et al., 2017; Garrison et al., 2010; Redmond et al., 2018). This element differs to the features of effective in-person PLD as communication is more visible and critical in online PLD due to its more often asynchronous nature compared with the synchronous nature of in-person PLD. As facilitated learning is a relationship, communication in all its forms requires careful and purposeful design of the teaching and learning activities and experiences so that there is clear communication and instruction, opportunities for co-construction, negotiation, and interaction, and presence of teaching, social, and cognitive activities. Due to the asynchronous and non-physical nature of online PLD, which reduces opportunities for non-verbal cues that are available for in-person PLD, communication and presence are foundational elements when designing and implementing effective online PLD programs.

Element 3: Community

Garrison (2009) emphasises the importance of communities when discussing the notions of presence, and this has come through in the two themes of co-construction of knowledge and presence. It can also be interpreted from the theme of interaction that participants find participation in a learning community to be effective in their PLD activities. Community as an element of effective online PLD focuses on the relationships and connections that can be created in online environments to support interactions among participants and facilitators, development of professional networks within and outside the program, and professional learning communities (Blayone et al., 2017; Mayer & Lloyd, 2011). The teaching, social, and cognitive presences articulated in the community of inquiry model (Garrison et al., 2010) are the foundations of the sense of community that is important for effective online PLD. This sense of community can be supported through developing a community of inquiry based on the content focus of the online PLD, which may then become a community of practice outside of the program environment, although this is out-of-scope in this review. Community can also be built through opportunities to collaborate with others which, together with the content focus, indicates a connection

to the features of effective in-person PLD, but it encompasses more than those two features (as discussed above).

Element 4: Flexibility

The theme of flexibility is an element itself of effective online PLD programs as it is a key affordance of technologies and online PLD programs, and it can provide more tailored support to participants. Flexibility is related to two areas of online PLD programs: flexibility in timing and participation, and flexibility in content and learning pathways. This element is not present in the features of effective in-person PLD because online PLD programs can support the anytime, anywhere mode of learning, which can be effective for teachers who typically have limited time to engage in PLD (Beach, 2017; Karlberg & Bezzina, 2020; OECD, 2019a; Quinn et al., 2019). Designing in opportunities for synchronous and asynchronous participation also supports the variety of participant learning styles that can be present in an online PLD program. In addition to this, having flexible learning and content pathways enables personalisation and promotes teacher agency, which supports connection to participant contexts and interests, and further supports effectiveness in online PLD as identified through the systematic review. Overall, the element of flexibility allows for participants to attain greater agency and become self-directed learners that can be a motivational approach to PLD (Beach, 2017; Calvert, 2016; Mayer & Lloyd, 2011).

Relationship between the theoretical and empirical literature

This part discusses the relationship between the theoretical literature on effective teacher PLD and the empirical literature identified in this review. There are three areas of interest: the features of effective PLD, the determination of effectiveness, and the PLD context and content. The first two areas are of interest because they differ between the theoretical and empirical literature; the third area provides an observation on the reported effective online PLD.

Features of effective teacher PLD

While the four articles included in the qualitative synthesis and thematic analysis identified the themes of effective online PLD, only two articles (Holmes et al., 2011; Hull & Saxon, 2009) used a theoretical foundation to support the design and implementation of their online PLD programs. Holmes et al. (2011, p. 76) acknowledged that 'teacher inservice initiatives are most effective when informed by research, sustained over time, collaborative in nature, and focused on content and

instruction in the context of learning' (p. 76), but these features of effective PLD were not articulated in their description of the implemented online PLD program. Furthermore, Holmes et al. (2011) used the model of presence by Garrison et al. (2000) to support their online PLD implementation and evaluation of the effectiveness of the approach, and this has been reflected in the thematic analysis. Hull and Saxon (2009) designed their online PLD with Vygotsky's (1978) socio-cultural theory as the learning design foundation, and they attributed the effectiveness of their online PLD program in part to this approach. However, the remaining two articles (Boloudakis et al., 2018; Wambugu, 2018) did not explicitly identify a theoretical foundation to support their online PLD program design and implementation. Therefore, a question arises around the place of the seminal works in teacher PLD undertaken by Darling-Hammond et al. (2017), DeMonte (2013), Desimone and Garet (2015), Guskey and Yoon (2009), Hawley and Valli (1999), and Timperley (2011), to name a few, and their identification of the features of effective teacher PLD for in-person activities. The features identified in this literature include content focus, active learning, coherence, duration, and collective participation (Darling-Hammond et al., 2017; DeMonte, 2013; Desimone & Garet, 2015; Guskey & Yoon, 2009). While the themes of interaction and co-construction of knowledge identified through the qualitative synthesis and thematic analysis could be aligned with active learning and collaborative participation, respectively, it is concerning that the four articles did not include these elements as part of their design. It should be noted that one of the inclusion criteria was that the online PLD program had a duration of more than 14 hours sustained over a period of time (as identified by Yoon et al. (2007) as being a critical minimum duration), so this feature of effective PLD was inherent in the review. There is also opportunity to further explore the online learning literature, such as the frameworks proposed by Beach (2017), Blayone et al. (2017), and Redmond et al. (2018), in connection with effective online PLD to determine how these can inform and support the development of effective PLD design and development; however, this was out-of-scope in this review.

Determination of effectiveness

Another point of difference for the articles included in this review and the seminal works on effective PLD is the point at which effectiveness is determined. In the theoretical literature, the focus of the evaluations of effectiveness remains on student outcomes rather than teacher outcomes (Desimone & Garet, 2015;

Timperley, 2011; Yoon et al., 2007). This location of the effectiveness is one level removed from the participant in the PLD program and generally does not consider the five levels of evaluation presented by Guskey (2014), in which the student learning outcomes is the fifth level of effectiveness. In contrast, in the four empirical articles in this review, the determination of effectiveness was evaluated at the teacher level, i.e., their reactions and learning, not the student outcomes level. This may be attributed to the difference in stakeholder perspectives and who is determining what PLD has been effective. Much of the theoretical literature takes the perspective of a school or governing body rather than the individual teacher (see, for example, DeMonte, 2013; Desimone & Garet, 2015; Quinn et al., 2019). This results in effectiveness being determined at the student outcome level. However, in the four empirical articles, the perspective was on the teacher and their changes in knowledges, skills, and abilities. This identifies a tension in the literature between the stakeholder perspectives and understandings of what may be considered effective at which level.

PLD context and content

The theoretical literature emphasises the importance of tailoring and contextualising PLD for specific content focuses and teacher groups (DeMonte, 2013; Desimone & Garet, 2015; OECD, 2019a; Quinn et al., 2019). However, based on the empirical literature identified through this review, it appears as though the PLD context may have less importance when delivered using an online mode, although the PLD content in the included studies typically had a technology focus. The online PLD programs presented in the four articles were delivered in different countries and continents: two in the USA, one in Greece, and one in Kenya. This identifies that online PLD has international relevance and that the experiences and approaches to online PLD have similarities, as identified in the results. It also supports that effective online PLD has similar themes and elements regardless of the specific context, which indicates that these themes and elements are widely applicable. The PLD programs covered diverse content areas from designing online learning to contextualising mathematics in classroom teaching, from multicultural education to using open education resources. Three of the four studies had technology-related content and focuses with topics including online learning, using web-based resources, and integrating information and communication technologies in the classroom. The PLD content favoured technology and its use in different

content areas. This can be interpreted that using online delivery for technology-focused content is intrinsically constructively aligned because the participants are immersed in the environments that they are learning about. While none of the papers explicitly identified this as a design feature, it appears to be a feature that may support the effectiveness of the online PLD discussed in the four articles.

Conclusion

This systematic literature review investigated the question of *what constitutes effective online professional learning and development for in-service teachers in the empirical literature*. Based on the empirical literature uncovered using the systematic review method, five themes for effective online PLD were identified: interaction, co-construction of knowledge, practicality, presence, and flexibility. Further synthesis of these themes resulted in the identification of four elements of effective online PLD: connection, communication, community, and flexibility. However, there is a disconnect between the theoretical literature on effective in-person PLD and the empirical literature on effective online PLD. Therefore, while the online delivery mode has benefits for teachers and provides some unique affordances, it needs further research to uncover the relationships between the theory and practice of effective PLD in order to better design and support effective online PLD programs. Further understanding of the elements of effective online PLD could also provide insights for enhancing in-person PLD. It would also be beneficial to explore the potential connections between the online learning literature and the emerging online teacher PLD literature. Similarly, there is a need to investigate other forms of self-directed online PLD as the definition used in this systematic review may have limited the results. The need for effective online PLD has never been more apparent than it has been since the COVID-19 pandemic has fundamentally changed the way that teachers work, learn, and grow professionally.

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Appendix 1. Key features of identified studies.

Citation	Location	PLD focus	Theme*	Duration	Delivery mode	PLD design	Theoretical foundation
Boloudakis et al. (2018)	Greece	Learning design for online (Moodle) units of work	1, 2, 3, 5#	4 weeks	Online	Adapted Think-Pair-Share learning design	Not identified
Holmes et al. (2011)	USA	Various (including using web-based resources in specific disciplines, multicultural education, facilitating parental involvement)	1, 3, 4	5 weeks	Online	Interactive, asynchronous; provides opportunities for discussion, exploration, implementation, collaboration, and reflection with the instructor and colleagues online regarding the curriculum	Notions of teaching presence, social presence, and cognitive presence articulated by Garrison et al. (2010)
Hull and Saxon (2009)	USA	Mathematics within the context of real-world applications	1, 2, 4	13 weeks	Online	Use of precedent questions to start a weekly topic and intercedent questions to continue developing dialogue during the week	Vygotsky's social constructivism
Wambugu (2018)	Kenya	Using ICTs and open education resources (OERs) in the classroom	1, 2, 3, 5	4 weeks	Online with WhatsApp chat group	Massive open online course (MOOC) with regular instant messaging opportunities	Not identified

Note. 1: Interaction, 2: Co-construction of knowledge, 3: Practicality, 4: Presence, 5: Flexibility; #Identified but not explicitly discussed

2.3   Additional findings from the SLR

In the SLR, there were two notable findings that were not directly connected to the research question in focus. The first finding was the apparent lack of literature that discusses the theory around effective online PLD. The second was that most articles reported either using the in-person effective PLD components or traditional learning theories as their design foundation without considering the differences between in-person and online PLD environments. Furthermore, the SLR articles focused on specific instances of online PLD and did not extrapolate their findings in an attempt to create a broader understanding or framework of what constitutes effective online PLD. This reinforced the importance of posing the third research question that focuses on identifying the design considerations for effective online PLD as the answer to that question can inform the theory.

2.4   Summary

The first publication provided the foundation for the subsequent data collection activities and the overall research. It positioned the research focus of online PLD as one of increasing importance for in-service teachers, as well as solidifying the notion that there is a scarcity of literature in this field. The process of writing the journal article with its embedded critical analysis reinforced the notion that there is a significant gap in the literature around what constitutes effectiveness in online PLD. Through the SLR process, it was identified that only four of the initial 1535 articles addressed effectiveness in online PLD. This demonstrates that there is a significant gap and that this is a gap that needs to be addressed through research. Therefore, this publication sets the stage for the next data collection phases and the second publication, which focuses on in-service teachers' perceptions, practices, and preferences. The narrative continues in Chapter 3 with the second publication.

Chapter 3: What are in-service teachers' (a) understandings of, (b) behaviours concerning, and (c) perceptions and experiences of effective online PLD?

3.1 Introduction

This chapter responds to the second research question of "What are in-service teachers' (a) understandings of, (b) behaviours concerning, and (c) perceptions and experiences of effective online PLD?" It provides an overview of the second publication, followed by the publication presented as the submitted journal article. Then, additional findings from the online survey (second data collection phase) that were not included in the publication are presented as they provide further contextualisation of the responses. Finally, a brief summary of how the response to this research question informed the subsequent data collection phase and research question is provided.

3.2 Publication overview

The following table provides an at-a-glance summary of the publication information. In this, it presents an overview of the publication details, including the research question, title, submitted journal and its statistics, publication status, data set used, methodology, findings, and authorship.

Table 3.1. Publication 2 overview.

Research question	What are in-service teachers' (a) understandings of, (b) behaviours concerning, and (c) perceptions and experiences of effective online PLD?
Title	Effective online professional learning and development: Teacher perceptions, practices, and preferences
Journal	Teaching and Teacher Education Ranking: Q1 Impact factor: 2.686 Double blind peer review
Status	Under review (TATE-D-21-00033)
Data set	Phase 2 – Online survey
Methodology	Sentiment analysis, descriptive analysis, and reflexive thematic analysis
Findings	Five themes in effective online PLD: flexibility, human connection, content, savings, technology
Authorship	Trisha Poole (80%) Chris Dann (10%) Angela Fitzgerald (10%)

The second publication in this doctoral thesis focuses on effective online PLD from the perspective of in-service teachers, i.e., the participants in the online PLD. The developed journal article presented the second phase of data collection, which was an online survey open to all in-service teachers (including those who had teaching experience within the past two years). The data was analysed using a combination of sentiment analysis (Cambria et al., 2017; Yadollahi et al., 2017), descriptive analysis (Bhattacherjee, 2012), and reflexive thematic analysis (Braun & Clarke, 2006), as appropriate to the type of data collected, e.g., Likert scales, open text responses. The findings of the online survey were presented in three parts that were aligned with the research question. In brief, the findings were as follows.

- In-service teachers' understandings of online PLD focused on types of online PLD, e.g., webinars, online courses, and characteristics of online PLD, with flexibility clearly articulated as important in online PLD.

- In-service teachers' behaviours concerning online PLD were consistent: four out of five participants positively engaged with online PLD resources and opportunities in various aspects of their work and professional growth. They also indicated that they use online PLD resources and opportunities for various purposes ranging from learning a new teaching skill to better understanding a concept. The in-service teacher participants also identified that they use online PLD to support their teaching practice and pedagogical knowledge, while also engaging with professional learning communities and networks.

- In-service teachers' perceptions and experiences of effective online PLD were generally positive, but also mixed at times. While they enjoyed online PLD and found it effective, it remained not a clear preference for undertaking PLD. They also identified three advantages (flexibility, content choices, savings) and five disadvantages (lack of human connection, flexibility, content, technology, completion) of undertaking PLD online. After identifying these advantages and disadvantages, the in-service teachers also identified what made online PLD effective for them: flexibility, human connection, content, savings, and technology.

Through analysing and synthesising these findings, five elements that support effective online PLD were identified in order of importance: flexibility, human connection, content, savings, and technology. These findings were subsequently used in the third phase of data collection (i.e., the online focus groups) and to support the development of the conceptual framework.

This article focused on the in-service teachers' preferences, practices, perspectives, and experiences of online PLD in an attempt to identify the elements that they consider to be effective. According to Guskey (2014), the first and second levels of PLD effectiveness occur with the participant in the PLD, i.e., the teacher. That is, the first level of effectiveness should be evaluated using the PLD participants' reactions and the second level using the PLD participants' learning. Only after these two levels of effectiveness can the PLD have effect in the classroom and on student learning. Therefore, understanding what the teachers perceive and experience as effective is critical to the overall understanding of effectiveness in online PLD. The findings from the first data collection phase (i.e., the systematic

literature review) were used as the basis from which the online survey was designed to explore the in-service teachers' preferences, practices, perceptions, and experiences of online PLD. In this article, the scarcity of literature on effective online PLD was reiterated, which continued to support the foundation of this doctoral research. However, it was noted that a heuristic framework had been proposed (Quinn et al., 2019), but it was based on the theory and policy documents rather than the perceptions and experiences of teachers. The article presented below in Section 3.3 identified that there is a disconnect between the elements of effective in-person PLD and those identified by in-service teachers for online PLD. Therefore, the importance of further understanding what constitutes effective online PLD is reinforced by the teachers' voices represented here.

3.3 Publication 2

Effective online professional learning and development: Teacher perceptions, practices, preferences, and experiences

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Abstract

Effective professional learning and development (PLD) is important in supporting teachers to continue to grow professionally. The elements of effective in-person PLD have been identified, but those for online remain elusive. This paper presents in-service teacher perspectives of effective online PLD through reporting on an online survey of their preferences, practices, and perceptions. Five elements of effective online PLD were identified: flexibility, human connection, content, savings, and technology. These elements are contextualised within teachers' perceptions and experiences, which allows a deeper understanding of effective online PLD. These findings support the future development of a framework for effective online PLD for teachers.

Highlights

- Teachers' preferences, practices, perceptions, and experiences of online PLD are presented from an online survey.
- Teachers participate in online PLD but are simultaneously wary of it.
- Teachers identified the advantages of online PLD as flexibility, content, and savings.
- Teachers identified disadvantages of lack of human connection, flexibility, poor content, technology issues, and completion.
- Teachers identified the effective elements of online PLD as flexibility, human connection, content, savings, and technology

Introduction

It is well known that in-service teachers are required to continually improve their practice through ongoing professional learning and development (PLD) throughout their careers and that this teacher PLD can support teachers' job satisfaction and self-efficacy (OECD, 2019a; Sandholtz & Ringstaff, 2020). PLD can also support the ever-changing, increasingly complex work of the teacher (Oddone et al., 2019; OECD, 2019a), which has been amplified through the abrupt shift in teaching practice due to the COVID-19 global pandemic and the rush to innovative teaching approaches including online, distance, radio, and television learning (Schleicher, 2020; United Nations, 2020). In many countries, continuing PLD is a requirement to maintain teacher registration (Mayer, 2014; OECD, 2019a), and this further signifies its importance to the profession. Substantial time and resources are invested in teacher PLD, but these may be misdirected if the teachers do not or are unable to use what they have learned through the activities (Desimone, 2009; Morris, 2019; Oddone et al., 2019; Sandholtz & Ringstaff, 2020). Thus, ensuring that PLD is effective is important in supporting teachers in their professional growth. However, determining this effectiveness is complex. As Guskey (2014) first identified, when evaluating in-service teacher PLD for effectiveness, there are five levels at which it can be determined, and each level builds on the prior level. The first two levels of evaluation occur with the participant, i.e., teachers in this context. Therefore, evaluating and understanding how participants perceive PLD is valuable in supporting continued efforts to improve these offerings.

Traditionally, teachers have been provided with opportunities for in-person PLD through their school (Morris, 2019; Oddone et al., 2019; Sandholtz & Ringstaff, 2020). However, with the increasing use of online spaces, teachers not only have increased access to school-based PLD, but also greater access to external PLD as well as a greater ability to direct their professional growth (Oddone et al., 2019; OECD, 2019a; Prestridge, 2017). With this increased access to online PLD, it is essential to understand what teachers need from online PLD to more effectively support their continuing professional growth (Bakir et al., 2016; Oddone et al., 2019; Powell & Bodur, 2019). In the literature, the effectiveness of PLD is measured in two broad ways: change in student learning outcomes (Powell & Bodur, 2019) and in teaching practice (Oddone et al., 2019). The importance of effective PLD is recognised in the literature, but understanding what comprises effective PLD is a

recurring conversation, particularly as PLD moves from the in-person to the online context (Binmohsen & Abrahams, 2020; Boylan et al., 2018; Herrington et al., 2009; Powell & Bodur, 2019; Quinn et al., 2019). It is also important to understand how teachers conceptualise PLD in order to better situate their behaviours, preferences, and perceptions of PLD. Their understandings, perceptions, and experiences affect the effectiveness of the PLD (Guskey, 2014; Morris, 2019), and this is becoming increasingly critical as the affordances (and challenges) of online PLD include the ability for teachers to (dis)engage easily.

With the increasing availability of online PLD, which has been escalated due to the COVID-19 global pandemic (Schleicher, 2020; United Nations, 2020), it is now paramount to identify the elements that make online PLD effective in supporting teacher learning and transference to the classroom. Given this context and the current gap in the empirical literature identified below, this paper reports on the components of effective online PLD from the teachers' perspectives. Here, in-service teachers are surveyed about their preferences, practices, perceptions, and experiences of online PLD, and what they believe makes online PLD effective. The teachers' contexts within which these elements are being identified are also investigated in order to more fully understand and situate the findings. The research question that shaped this study was "What are in-service teachers' (a) understandings of, (b) behaviours concerning, and (c) perceptions and experiences of effective online PLD?"

Due to the nature of this study, PLD is understood broadly to encompass experiences that are concerned with transformative outcomes (Prestridge, 2017), and it includes the activities, processes, and outcomes of engaging further with professional knowledge, skills, and abilities (Morris, 2019). In the context of this survey, the participants' perceptions and experiences of PLD were influenced by their contexts and understandings of PLD. Therefore, as part of the survey, the participants were asked to define online professional development based on their perceptions, and this understanding is made explicit in the findings.

Evaluating effective PLD: What the literature says

From the early 1980s, when governments began to recognise the importance of teacher PLD, the increasing focus on the professionalisation of teaching has included a focus on formal PLD (Mayer, 2014; Sandholtz & Ringstaff, 2020). Over the past two decades, there have been consistent research efforts focused on

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evaluating PLD and determining what makes it effective (Darling-Hammond et al., 2017; DeMonte, 2013; Garet et al., 2001; Guskey, 2000; Guskey & Yoon, 2009; Quinn et al., 2019). Guskey (2000) proposed a framework for evaluating PLD that acknowledged that PLD is a complex process, not an event, and that there are different levels at which the PLD needs to be evaluated. Since publication, Guskey's (2000) PLD evaluation framework has been widely accepted, and it is used consistently to evaluate the effectiveness and impact of PLD offerings (Ahadi et al., 2021; Binmohsen & Abrahams, 2020; Mayer & Lloyd, 2011; Morris, 2019; Quinn et al., 2019; Yoon et al., 2007).

Guskey's (2000, 2014) PLD evaluation framework identifies five critical levels of evaluation used to determine the effectiveness of PLD. Each of these levels builds on the preceding level, which means that if an evaluation is poor at one level, it is unlikely to have effectiveness at the following levels. The five levels are hierarchical in nature and begin with a simple evaluation moving through to more complex evaluations. The levels are (1) participants' reactions, (2) participants' learning, (3) organisational support and change, (4) participants' use of new knowledge and skills, and (5) student learning outcomes. These five levels show the complex connection between a teacher undertaking PLD and how that has the potential to influence student learning outcomes. While it is complex, it is because these levels can be identified that PLD can be evaluated for effectiveness, and its impact can be understood at multiple levels.

Through evaluating PLD at these five levels, the impact of the PLD can be traced through from the PLD event to change in student learning outcomes (Guskey, 2000; Herrington et al., 2009; Morris, 2019; Yoon et al., 2007). Success at each level implies the success of the PLD itself, and lack of success at a level can support the identification of areas for improvement in the PLD offering (Guskey, 2000, 2014). For example, if the participants enjoyed the PLD but did not acquire the intended knowledge and skills, it is unlikely that there will be an impact in the classroom or on the students. This indicates that the PLD offering needs improvement in the PLD content, format, and organisation. Likewise, if the evaluation does not indicate success at transference to the classroom level, then this can be further investigated to identify how the previous levels may be improved to better support transference.

Following on from the seminal PLD evaluation framework proposed by Guskey (2000), Garet et al. (2001) reported on what teachers perceived to be

effective in their PLD. This research investigated the first level of Guskey's framework, and it began a research push into determining what constitutes effective PLD from the teacher's perspective (Binmohsen & Abrahams, 2020; Powell & Bodur, 2019; Prestridge, 2017; Sandholtz & Ringstaff, 2020). Guskey (2003) furthered this discussion by identifying that there was no consensus on what constitutes effective PLD. He also identified that the understanding of effectiveness was inconsistent in the literature at that point. In addition to this lack of clarity around what effectiveness entails, there have been consistent claims of a lack of rigour in evaluating the PLD reported in the literature (Guskey & Yoon, 2009; Morris, 2019; Oddone et al., 2019; Yoon et al., 2007). From this, several studies have focused on determining what effectiveness means when evaluating PLD and what constitutes effective PLD for in-service teachers. More recently, Darling-Hammond et al. (2017), DeMonte (2013), Desimone (2009), and Yoon et al. (2007) have researched what constitutes effective teacher PLD through systematic literature reviews and document analyses, which have included government policies and reports, through which a general consensus has been reached. Table presents these four influential studies and their identified elements of effective PLD. While the studies have discussed different elements of effective PLD, five elements have been identified consistently across these and are widely accepted (Binmohsen & Abrahams, 2020; Boylan et al., 2018; Quinn et al., 2019): active learning, coherence, collaboration, content-focused, and sustained duration.

Table 1. Elements of effective PLD identified in the literature.

Effective element	Darling-Hammond et al. (2017)	DeMonte (2013)	Desimone (2009)	Yoon et al. (2007)
Active learning	Incorporates active learning		Active learning	Active learning
Coherence			Coherence	Coherence
Collaboration	Supports collaboration	Collaboration	Collective participation	Collective participation
Content-focused	Is content focused		Content focus	Content knowledge
Sustained duration	Is of sustained duration	Sustained and regular activities	Duration	Sufficient duration

Other identified elements		
Uses models of effective practice	Use technology wisely	Reform rather than traditional process
Provides coaching and expert support	Coaching	
Offers feedback and reflection	Job embedded	

While the literature has consistently referred to these elements as essential for effective PLD, the focus has remained on in-person PLD. However, with the advances in technologies and online learning, PLD has also moved online, and the importance of investigating the features of effective online PLD has been acknowledged (Mayer & Lloyd, 2011; Powell & Bodur, 2019; Quinn et al., 2019). Considering that there are significant differences between in-person and online PLD (Bakir et al., 2016; Hull & Saxon, 2009; Oddone et al., 2019; Powell & Bodur, 2019; Quinn et al., 2019; Schleicher, 2020), the research has begun to investigate what constitutes effective online PLD to ensure that PLD delivered through online platforms is designed for effectiveness and can allow teachers to benefit further from this format.

The rise of online PLD is a relatively recent phenomenon, and thus the available literature remains limited. However, Quinn et al. (2019) recently provided a review of theoretical and policy perspectives on effective online PLD through summarising and consolidating the literature and extrapolating it to the online context. In their review, they also proposed a heuristic framework to plan and evaluate online PLD, but this has not yet been validated. Quinn et al. (2019) defined online PLD as that "delivered using web-based technologies and learning approaches" (p. 406) and which includes synchronous and asynchronous activities, job-embedded content, and potentially provides opportunities for more inclusive participation. In their research, Quinn et al. (2019) applied the PLD planning and evaluation frameworks presented by Desimone (2009) and Guskey (2014) to the online PLD context. In addition to the elements of effective in-person PLD identified above, through key literature and policy documents, Quinn et al. (2019) identified additional elements for effective online PLD as the online environment, learning

objects and tools, facilitation, and participant choice. They emphasised that effective online PLD must be aware of and utilise the challenges and affordances in the online space, as well as the importance of building both group cohesion and individual online presence. While features of effective online PLD delivery are presented in Quinn et al. (2019), they are not explicitly defined and remain somewhat open to interpretation. Furthermore, they are based on theory and policy documents rather than implemented and experienced PLD. Therefore, to complement their work, the teacher perspective of what is effective when they are participating in online PLD should be investigated.

Other studies have focused on specific instances of online PLD and its effectiveness, but these lack coherence in the development of the online PLD and appear to not focus on the established elements of effective in-person PLD. For example, Herrington et al. (2009) investigated the transference of knowledge and strategies gained from an online PLD course to the teachers' classrooms. While this is one method of evaluating effectiveness, the evaluation focused on self-reported transference and not specifically on the elements that made the online PLD effective and transferable. In another study, Hull and Saxon (2009) developed an asynchronous online PLD based on a social constructivism learning design with a strong emphasis on the communication and facilitation undertaken by the instructor. They found that the instructor's facilitation and communication were critical in supporting the participants to engage effectively and transfer knowledge and practice to their classroom contexts. More recently, Powell and Bodur (2019) reported on teacher perceptions of an online PLD experience through which they identified six design and implementation features that support effectiveness (relevancy, authenticity, usefulness, interaction and collaboration, reflection, context). However, this study was limited by its design (utilising only online videos with three reflective questions) and its size (six participants), and therefore it is not generalisable. Even though there is research being undertaken in effective online PLD, a clear understanding of what constitutes effectiveness in this environment remained elusive.

Given this context and the increasing availability of online PLD, one place to start with understanding what makes online PLD effective is to start with the teachers' reactions to online PLD through investigating their perceptions, practices, and preferences. Because Guskey's PLD evaluation framework has been used across

various contexts to evaluate both in-person and online PLD (Binmohsen & Abrahams, 2020; Mayer & Lloyd, 2011; Morris, 2019; Quinn et al., 2019), it can be used as a basis for determining what constitutes effective online PLD. Therefore, teachers' responses and reactions to online PLD are explored in this study in order to determine what constitutes effective online PLD at the first level of Guskey's PLD evaluation framework. If teachers find online PLD ineffective, there may only be limited transference to their classroom teaching, and thus limited impact on student learning outcomes. Furthermore, because PLD is a process, not an event, the perceptions and experiences of teachers become pivotal in the effectiveness of PLD (Guskey, 2000). That is, they provide the foundation for evaluating the effectiveness of online PLD.

Materials and methods

This study used a mixed methods approach to data collection in the online survey. Quantitative methods were used to identify the participants' online behaviours, preferences, and perceptions, while qualitative methods were used to garner deeper insights into the in-service teachers' perceptions and experiences of effective online PLD.

Participants

The participants – in-service teachers – voluntarily responded to an online survey after indicating their consent. Participants (n=29) were predominantly female (90%, n=26), with 58% (n=17) being 40-55 years old and 27% (n=8) being 24-39 years old. The participants had an average of 13 years of teaching experience (SD = 8.96) with a range from graduate teachers through to teachers with 35 years of experience. The participants taught in a variety of contexts with the majority (76%, n=22) teaching in post-formal education contexts (e.g., college, university), and approximately half (48%, n=14) teaching in formal education contexts (e.g., primary school, middle school, high school); some (38%, n=11) taught across multiple contexts (e.g., high school and post-formal education). Although the participants taught in different contexts, their access to online PLD remained similar and was not specifically dictated by their educational setting. Therefore, their responses can be used to support the understanding of effective online PLD for in-service teachers in a variety of contexts. All participants were either currently teaching or had taught within the past two years. Participants were recruited online through informal teacher professional networks. The sampling strategy combined convenience sampling with

problem sampling (Bhattacherjee, 2012; Layder, 2014): those who participated were active in the social media sites, met the criteria of having current or recent teaching experience, and had an interest in the research focus. The survey was open for four weeks during February 2020, which was immediately prior to the COVID-19 global pandemic impacting learning, teaching, and PLD practices. There were 29 complete responses at the end of this period.

Data collection

The survey was designed to explore in-service teachers' perceptions, preferences, and experiences of online PLD. There were up to 20 questions in the survey, depending on the responses and the resultant branching. The total survey time was approximately 20 minutes, again depending on the responses and depth of written content in the open-ended questions. The questions were a combination of multiple choice, rating, and open-ended questions, and those discussed in this paper are presented in Appendix A. The survey questions were developed based on a comprehensive literature review of effective online PLD and the broad constructs of behavioural intention (influenced by attitude) and actual usage from the technology acceptance model (Fathema et al., 2015). The questions were piloted with a group of educators who did not participate in the main study in order to ensure readability, coherence, access, and accessibility of the online survey.

After receiving university human ethics approval, the survey was deployed through a secure online survey tool. The participants were able to respond at a time and location of their choice. The online delivery of the survey enabled in-service teachers from various locations to respond and participate in the data collection. It also enabled the survey to reach a broader potential audience across several professional learning networks that connect in-service teachers. The flexibility of online surveys also allows for branching and customisation of the questions, which provides greater personalisation and contextualisation for participants (Evans & Mathur, 2018). The participants were notified of the opportunity to participate through social media channels that connected with the target participant group, e.g., teachers, lecturers. The survey was conducted during February 2020 prior to the COVID-19 global pandemic.

Data analysis

The data were analysed using a combination of sentiment, descriptive, and reflexive thematic analyses. In order to provide a context in which to discuss their

perceptions and experiences of online PLD, participants were asked to respond to an open-ended question asking them about what came to mind when they heard the term 'online professional development'. The responses were analysed using a combination of reflexive thematic analysis (Braun & Clarke, 2006) and sentiment analysis (Yadollahi et al., 2017) to provide a contextual understanding of how the participants perceived and experienced online PLD. Some responses included emotions and feelings, which were themed into sentiments toward online PLD. Therefore, sentiment analysis was used to further interpret these responses through manually analysing them by looking at their sentence structure, adjectives, adverbs, and keywords to determine the positivity, neutrality, or negativity of the opinion expressed in the response (Yadollahi et al., 2017). The neutral statements were further analysed to determine if they tended towards positive or negative, or whether they were balanced and neutral. The sentiment analysis comprised a small part of the analysis reported here.

Descriptive analyses (Bhattacherjee, 2012) were employed to interpret the findings from the Likert scale response statements. The ratings and their percentages were used to draw conclusions about the participants' perceptions and experiences of online PLD and the associated trends within this data. These findings provide insight into the practices, preferences, and perceptions of online PLD for in-service teachers.

Reflexive thematic analysis (Braun & Clarke, 2006; Braun et al., 2019; Clarke & Braun, 2018) was used to interpret and theme the responses to the open-ended questions that investigated the participants' perceptions of the advantages, disadvantages, and effective elements of online PLD. These themes were derived through identifying the central organising concept that allowed the essence of the responses to be captured while acknowledging the inherent complexity of the themes (Braun et al., 2019), and subsequently developed as an output of the analytic process using the six-phase process articulated by Braun et al. (2019). The responses were manually coded and thematically analysed to identify the output themes in the responses and draw conclusions.

Results: How do in-service teachers experience and perceive online PLD?

Overall, the survey results provided insights into the research question of "What are in-service teachers' (a) understandings of, (b) behaviours concerning, and (c) perceptions and experiences of effective online PLD?" through exploring their related attitudes, behaviours, and beliefs. Of the 29 survey participants, 27 had

previously participated in online PLD. These participants were asked to reflect on their experiences and beliefs in their responses. The two participants who had not participated in online PLD were asked equivalent questions to determine their perceptions and beliefs about online PLD. The responses of these two groups were very similar: those who did not have prior experience undertaking PLD online were not more likely to have a neutral perception of or disagree on the perceived benefit of undertaking online PLD, as has been reported elsewhere in the literature (Holmes et al., 2011; Powell & Bodur, 2019). Due to the consistency and similarity between the two participant groups, the responses are reported and discussed together.

What does online PLD mean to in-service teachers?

Before responding to questions around their perceptions, practices, and preferences, participants were asked to describe what they thought about when they heard the term 'online professional development'. More than half of the participants (55%, n=16) responded with types of online PLD, e.g., webinars, online courses, videos, and asynchronous communication. Flexibility was also clearly identified a characteristic of online PLD: 28% (n=8) responded with 'flexibility' or elements thereof (e.g., own pace, own time) in the open-ended question. Eleven participants (38%) also provided sentiments around online PLD, with 45% (n=5) of these responses being positive, 27% (n=3) being neutral but tending towards positive (e.g., "Great but I don't have the time" (Participant 11)), and 27% (n=3) being negative. These sentiments were analysed by looking at their sentence structure, adjectives, adverbs, and keywords to determine the positivity, neutrality, or negativity of the opinion expressed in the response.

The survey results discussed here are presented in two groups. The first group includes the Likert rating scale responses to statements investigating participants' online behaviours, preferences, and perceptions of using online PLD resources and opportunities. The second group of responses are those that were open-ended questions: these focused on the perceived advantages, disadvantages, and effective elements of online PLD.

Understanding in-service teachers' online PLD behaviours, preferences, and perceptions

In this part of the survey, participants were asked to rate statements indicating their level of agreement on a scale of 1 (strongly disagree) to 5 (strongly agree). Five

statements focused on participant behaviours and four statements related to participants' preferences and perceptions. These results are discussed below.

Online PLD behaviours

These statements were designed to understand the participants' general behaviours around online PLD opportunities and to provide a context in which their behaviours may influence their perceptions and preferences for online PLD. Figure shows that four out of five of participants (80%, n=23) have positive behaviours with online PLD resources and opportunities.
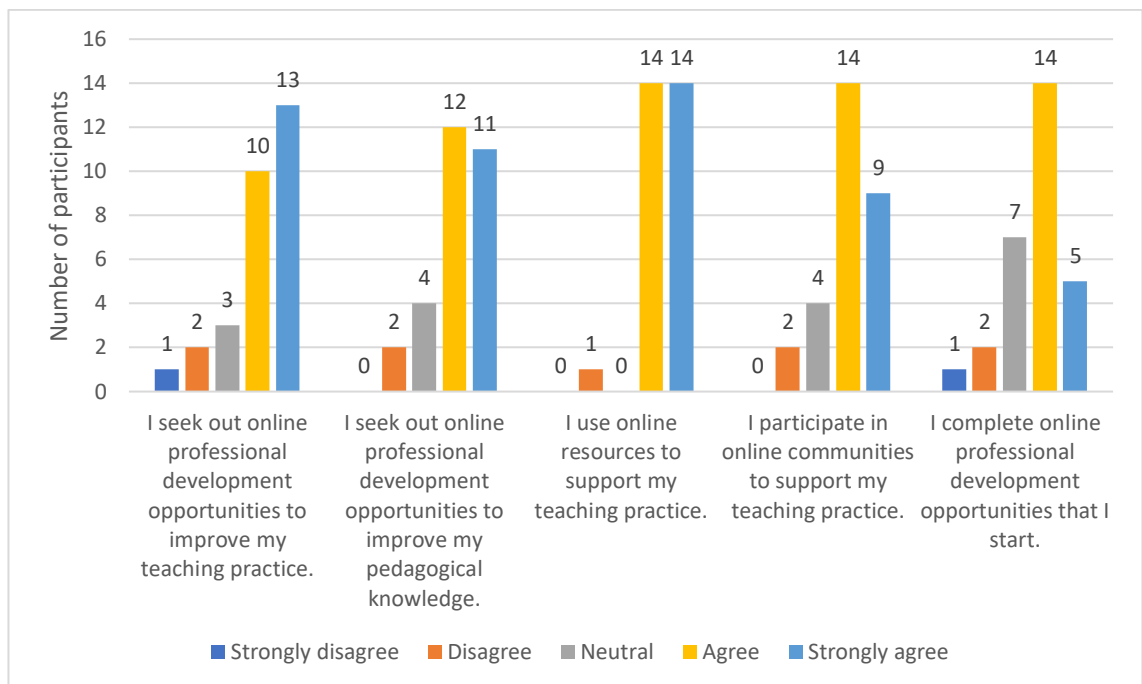
Figure 1. Behaviours relating to online PLD resources and opportunities.

As seen in Figure 1, the results show that most participants seek to improve their teaching practice (79%, n=23) and pedagogical knowledge (79%, n=23) through online PLD opportunities. They also use online resources to support their teaching (97%, n=28). Participants indicated that they participate in online communities that support their teaching practice, with 79% (n=25) of participants agreeing, 14% (n=4) being neutral about their participation in online communities, and 7% (n=2) indicating that they did not participate in these communities. Interestingly, the participants indicated that they generally complete online PLD that they start: 66% (n=19) complete the online PLD that they start, 24% (n=7) indicated that they might only sometimes complete, and 10% (n=3) indicated that they do not complete these online PLD opportunities.

Online PLD preferences and perceptions

These statements enabled deeper contextualisation for the following open-ended questions in the survey, which are discussed in the following section. As seen in Figure 2, three of the four statements had generally positive responses, while the second statement about preferring to undertake PLD online had a more neutral response, as discussed below. Figure graphs the responses to these statements.
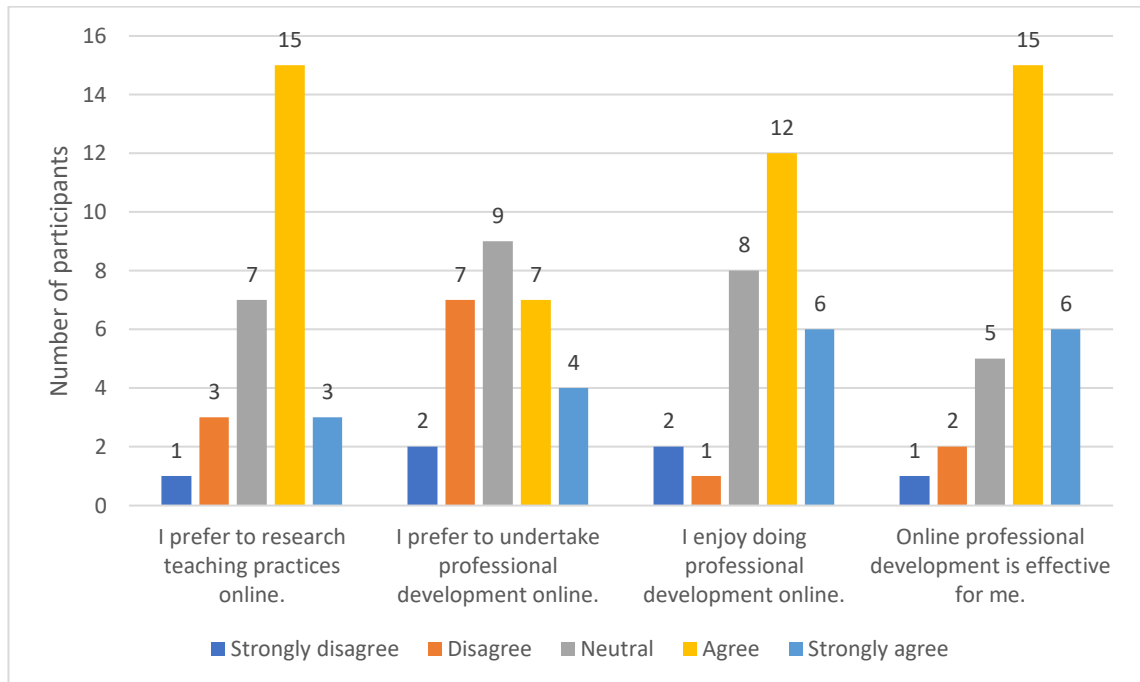
Figure 2. Preferences and perceptions of online PLD.

Most participants indicated that they prefer to research teaching practices online (62%, n=18), with 24% (n=7) indicating no preference and 14% (n=4) indicating that they do not prefer to do this online. While the participants' behaviours (see Figure) indicated that they actively sought and used online PLD opportunities, they were only slightly more positive about undertaking PLD online with 38% (n=11) preferring to undertake PLD online, 31% (n=9) not having a preference, and 31% (n=9) preferring not to undertake PLD online. This result contrasts with the participants indicating that they enjoyed (62%, n=18) or neither enjoyed nor disliked (28%, n=8) undertaking PLD online. To explore this further, the participants were asked to identify whether online PLD is effective for them. Most participants (72%, n=21) agreed or strongly agreed that online PLD was effective, with some (17%,

n=5) neither agreeing nor disagreeing that it was effective, and few (10%, n=3) indicating that it was not effective.

Understanding in-service teachers' perceptions of the advantages, disadvantages, and effective elements of online PLD

Three open-ended questions were asked after the rating statements, and these questions were designed to further explore the participants' perceptions of online PLD in terms of advantages, disadvantages, and elements of effectiveness. The responses to these questions were analysed using reflexive thematic analysis to distil the key themes that arose. Table presents an overview of the distilled themes, which are presented in detail with further analysis of the questions and responses below. As seen in the table, some themes were found across multiple areas of perceptions, and this highlights the inherent complexity of these themes and the subsequent complexity in determining what constitutes effectiveness in online PLD.

Table 2. Themes emerging about the perceived advantages, disadvantages, and effective elements of online PLD. See Appendix B for details of the theme induction and synthesis.

Advantages	Disadvantages	Effective elements
Flexibility (83%, n=26)	Human connection (69%, n=20)	Flexibility (52%, n=15)
Content (31%, n=9)	Flexibility (38%, n=11)	Human connection (24%, n=7)
Savings (24%, n=7)	Content (14%, n=4)	Content (21%, n=6)
	Technology (14%, n=4)	Savings (14%, n=4)
	Completion (14%, n=4)	Technology (3%, n=1)

Perceived advantages of online PLD

In the survey, participants were asked to describe their perceived advantages of undertaking online PLD. The responses were thematically analysed into three broad themes of flexibility, content, and savings, which provides insight into the teachers' perspectives that can be used to support effective online PLD. While the participants identified different aspects within these three themes, it was clear that these were considered the key advantages of undertaking online PLD. Within these three themes, flexibility was the most common with most participants (84%, n=24) referring to aspects of flexibility such as being able to undertake the PLD in their own time, at their own pace, and in a location that suited them, while having the flexibility to choose which PLD they participated in based on their needs or interests. The theme of content was the next most commonly identified advantage (31%, n=9)

and the responses fell into two categories: increased access to PLD and increased access to resources. When describing how increased access was an advantage of online PLD, participants commented on being able to participate in PLDs that they would not have otherwise had access to due to the travel required, time zones, or cost. They also discussed the variety of PLDs available online and that they could access interstate and international PLD opportunities more easily. In relation to increased access to resources, participants indicated that an important advantage of online PLD was that it often included asynchronous access to supporting information, connection to professional networks, and gaining access to the most current knowledge and high-quality resources. The third theme of savings was considered an advantage by 24% (n=7) of participants. This theme arose when participants identified that online PLDs saved them time, money, and travel associated costs. Overall, these advantages of online PLD were weighted towards the typical affordances of technologies and asynchronous communications.

Perceived disadvantages of online PLD

Participants were also asked to share their perceptions of the disadvantages of online PLD. Five overarching themes were identified in the responses: lack of human connection, timing, technical issues, content-related factors, and completion. The most identified disadvantage was that online PLD had less (or no) human connection. Sixty-nine percent of participants (n=20) felt not engaged, disconnected, and isolated while experiencing a lack of community, interaction, teacher presence, and networking. It is noteworthy that the two participants who had not experienced online PLD only identified potential disadvantages within the human connection theme. The next most common disadvantage was regarding flexibility. Thirty-eight percent of participants (n=11) identified that flexibility was a problem because they had "competing attention demands" (Participant 1) and experienced a lack of timely feedback and responses, as well as a lack of flexibility in timing (e.g. requirements for synchronous activities). Some identified that the online PLD became "extra work" (Participant 20) done in their own time. The three remaining themes were identified as equally disadvantageous with 14% (n=4) of respondents identifying these. The technological issues were related to technical requirements to engage with the online PLD content (e.g. learning management system, webinar tools), general technology issues, internet connection, and feeling too similar to social media rather than learning. Content-related factors included disadvantages such as poor-quality

resources, lack of guidance (which also relates to human connection), unnatural discussions, and "more complex concepts [being] more difficult to grasp online" (Participant 20). Like many online learning opportunities, it was also identified that PLD completion was affected by being online and easily forgotten because it was not an in-person, synchronous opportunity. Overall, the identified disadvantages of online PLD were typically focused on the human element in the PLD process, but also reflected that sometimes an advantage could also be a disadvantage, as seen with the themes of flexibility and timing.

Perceived effective elements of online PLD

Participants were asked what made online PLD effective for them within their contexts. This open-ended question garnered responses in five themes: flexibility, human connection, content, savings, and technology. Flexibility was the most frequently identified factor for effectiveness: 52% of participants (n=15) identified flexibility in timing, pace, and choice of content as being necessary for effective online PLD. The next theme was human connection with 24% of participants (n=7) identifying this as being important: the comments indicated that the connection and communication with peers and facilitators are essential for effective online PLD. The theme of content included the content being new, useful, relevant, current, and authentic; this was considered necessary for effective online PLD by 21% of participants (n=6). Savings in time, cost, and travel were also identified by 14% of participants (n=4) as being a factor in effective online PLD. Aspects of technology were identified by 3% of participants (n=1) as making online PLD effective for them, including the use of a suitable technological platform for delivering the online PLD and setting clear "rules of engagement" (Participant 16) within this space. Overall, these five themes align with those identified in the advantages and disadvantages, but to varying degrees.

Discussion: What makes it come together for effective online PLD?

Through understanding the complex context within which in-service teachers are experiencing and participating in online PLD, as well as their perceptions of the associated advantages, disadvantages, and effective elements, an evidence-based approach to designing effective online PLD can be developed. In-service teachers are already undertaking PLD online through accessing resources and opportunities that further develop their professional knowledge and skills. However, their inconsistency in completing and reluctance to prefer online PLD indicates that these

offerings need to be improved and demonstrably more effective. Teachers can afford to be highly selective and more autonomous in their online PLD undertakings and choose to opt-out when the PLD does not meet their expectations. Considering that the first level of Guskey's PLD evaluation framework (2000) evaluates teacher reactions, the criticality of developing online PLD that is effective through deeper understanding of teachers' perceptions and experiences cannot be overstated. Through combining teachers' perceptions of the advantages, disadvantages, and effective elements of online PLD, a deeper and more nuanced understanding of what supports effective online PLD can be developed.

The survey results identified five themes that affect in-service teachers' perceptions and experiences of online PLD. These themes were presented in Table in order of identification frequency. In all three survey questions, the themes of flexibility and content were identified, but to varying degrees with varying emphasis on the features within each theme. Interestingly, the themes of savings, human connection, and technology also appeared as elements of effectiveness and either a potential advantage or disadvantage, which indicates their importance when developing effective online PLD for in-service teachers. These five themes are discussed below as elements that support effective online PLD in order to understand how they come together for participants to create positive reactions, which support the first level of PLD evaluation according to Guskey (2000).

Flexibility. As is widely recognised (Binmohsen & Abrahams, 2020; Fathema et al., 2015; Koehler et al., 2013; Quinn et al., 2019), a key affordance of technology is its flexibility and adaptability. In the survey responses, the participants defined flexibility as being able to undertake online PLD in their own time and at their own pace, with the content being what they are interested in and with options for asynchronous and synchronous participation in learning activities. They also described flexibility as including the level of participation in the online PLD: those who wanted to engage more were able to, and those who wanted to engage less and simply access the resources could do so. This flexibility is a particular advantage of online PLD, but it also brought about disadvantages when it lacked sufficient structure and relied on the participants to fully determine their learning journey. Participants also identified that flexibility was important for effectiveness, although the degree of flexibility to achieve effectiveness is changeable depending on the content, context, and purpose of the online PLD. Through this understanding of

flexibility, it is clear that this element is complex and must be considered carefully when designing online PLD as it can bring about advantages and disadvantages. In some cases, too much flexibility may be a disadvantage because more structure would be beneficial; in other cases, too little flexibility will hinder participation and completion of the online PLD. In the literature, flexibility is considered a strength of online learning (Fathema et al., 2015; Herrington et al., 2009), and thus it could also be transferable to online PLD. Furthermore, as Quinn et al. (2019) discussed in their article, participant choice, which is part of flexibility, is a critical feature of effective online PLD.

Content. The literature has identified the content focus as being an element of effective PLD (Darling-Hammond et al., 2017; DeMonte, 2013; OECD, 2019a; Yoon et al., 2007), and this element has been reinforced as a significant factor according to the survey participants in relation to the advantages, disadvantages, and effectiveness of online PLD. While the literature confines the understanding of a content focus to subject/discipline knowledge, the participants' responses have enhanced and elaborated this element. There are advantages of online PLD in terms of participants having greater access to resources and different content to tailor their professional growth. Teachers can participate in PLD opportunities that are not local to them, and there is greater opportunity for them to participate in a wider variety of PLD opportunities. This diversity in content areas and access to more PLD can allow teachers to participate in online PLD offered by leading practitioners in the field and to engage with likeminded participants, as well as allowing teachers to personalise their PLD to suit their desired professional pathway. However, the flipside of this element is that not all content is created equal: some content is high quality, and other content is not. Compensating for this, though, is the ability for teachers to quickly opt-out of a PLD opportunity when they have made a judgement that it does not have the quality that they are seeking. While there is a plethora of online PLD available, the quality may be hit-and-miss, so the flexibility that online PLD affords allows teachers to stop participating in the online PLD or not complete it.

Human connection. This element was identified as both a perceived disadvantage and perceived effective element in the survey. As a disadvantage, the participants noted that the lack of human connection and interaction distanced them from the PLD content and resulted in fewer professional connections with their peers. Some participants felt that the lack of human connection was disengaging and

reduced their tendency to complete the online PLD. It follows on that human connection was identified as a critical element in effective online PLD when there was direct, active engagement with peers and facilitators. This element of human connection aligns with the teaching and social presence elements from the community of inquiry framework developed by Garrison et al. (2010). These two community of inquiry framework elements have become a key element in online learning, particularly in online PLD (Holmes et al., 2011). Interestingly, the responses in the survey conflated social presence and teaching presence into one notion of human connection where both connection with the facilitator and peers were seen as important. That is, lack of this connection is considered a disadvantage, while the human connection is also considered to be a part of effective online PLD. Therefore, clear consideration of the balance of human connection, including both facilitator-participant connection and participant-peer connection, is important in ensuring effective online PLD.

Savings. This was identified as both an advantage of online PLD and an element of effective online PLD. As an advantage, the time and cost savings that online PLD presented to participants was conducive to positive experiences; however, as an element of effectiveness in online PLD, the savings should allow participants to maximise their time and costs in undertaking the online PLD. The element of savings can be associated with that of flexibility, in that the flexible nature of online PLD can afford different savings in time and cost, while enabling participants to undertake the online PLD outside of traditional working hours. Through these savings, as identified in the survey data, it can also be possible to undertake more online PLD opportunities than would be possible when doing them in a traditional in-person environment. Moreover, the savings that participants may accrue should be made explicit and visible in order to leverage this as an element of effectiveness rather than an implicit assumption of undertaking PLD online.

Technology. Technology has been identified in the literature as being an element of effective online PLD, with DeMonte (2013) concerned with using technology wisely and Quinn et al. (2019) focusing on different aspects of the technology. The responses garnered here in the theme of technology advance the understandings of what this element comprises. This theme was identified as both a disadvantage and an element of effectiveness. The technology theme encompasses the software and tools, and the way that facilitators use these to support the PLD.

Having a balanced approach to technology and using technology to support the PLD learning with technology-knowledgeable and technology-capable facilitators can provide an environment in which effective PLD can be undertaken. As proposed by Koehler et al. (2013), technology knowledge is an important part of teaching using the digital technologies that are instrumental in providing PLD in the online environment. In the case of online PLD, understanding the constantly evolving digital space and its associated technology knowledge is particularly important in delivering effective online PLD as this is how teachers experience the online PLD and their reactions to it inform the first levels of Guskey's PLD evaluation framework (2000, 2014) and Kirkpatrick's evaluation model (2006).

These five elements of effectiveness demonstrate that there is no simple answer to what makes an online PLD opportunity effective, but rather it is a balancing act of the right combination of flexibility, content, human connection, savings, and technology that will make it effective. As discussed above, some elements can be both an advantage and a disadvantage, while also being crucial in the effectiveness of an online PLD opportunity. Therefore, there is no simple panacea for developing and delivering effective online PLD, but it can be designed and supported to be as effective as possible and must be further iterated based on participant feedback in order to ensure that it is meeting the needs of the teachers.

Implications and conclusion

To date, the literature has clearly identified the effective element of in-person PLD, but there is a gap in understanding what makes online PLD effective. By garnering in-service teachers' perspectives of online PLD through investigating their practices, preferences, and perceptions, five elements of effective online PLD were identified. These elements – flexibility, content, human connection, savings, and technology – can be used to inform online PLD development, and they illustrate the inherent complexity of developing online PLD that may be considered effective by in-service teachers. The teachers who responded to this survey are already engaging with online PLD opportunities, so increasing the effectiveness of online PLD has the potential to increase the impact on student learning. Therefore, a deeper understanding of what teachers perceive to be the elements that make online PLD effective is beneficial when providing online PLD that is more likely to be completed and have a positive influence on the subsequent levels in Guskey's (2000, 2014) PLD evaluation framework.

The perceptions and experiences of in-service teachers presented here provide a foundation for further exploring what constitutes effective online PLD as experienced by the teachers themselves. Aligned with Guskey's PLD evaluation framework (2000, 2014), the Kirkpatrick evaluation model (Kirkpatrick & Kirkpatrick, 2006), and Ahadi et al.'s (2021) evaluation model, effectiveness must be found in the teacher's responses and reactions before the effectiveness can travel through to the next levels and eventually impact on student learning outcomes. This study has two key limitations. The first is that the survey participants were only gathered from a limited number of online teacher professional networks. The second limitation was that the survey was conducted immediately before the COVID-19 pandemic, during which there has been an exponential increase in online PLD being offered and undertaken, which would provide teachers with more experiences to draw on and to evaluate the effectiveness of online PLD. It will be important to conduct this survey again for two reasons: to increase the potential participants through wider dissemination among more teacher professional networks and to garner post-COVID responses to what is effective for in-service teachers in online PLD.

This study demonstrates that in-service teachers are engaging with online PLD but are not yet finding it effective. They have provided their perceptions and experiences so that online PLD can be improved and become more effective. In the current context of COVID-19 where most PLD is offered online and traditional in-person PLD is limited, the importance of determining the effective elements of online PLD cannot be overstated. Furthermore, COVID-19 has highlighted the importance of effective online PLD and how online PLD has the opportunity to become a significant and enduring pathway for teachers to participate in the PLD opportunities that they want to through the flexibility and convenience that it affords.

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Appendix A: Online survey questions

The following questions are drawn from the section of the online survey discussed in this paper. The questions provide the wording for the participants who had participated in online PLD as well as the equivalent wording for those who had not participated in online PLD in square brackets.

- When you hear "online professional development", what comes to mind?
- How strongly do you agree or disagree with the following statements? (Likert scale from 1 (strongly disagree) to 5 (strongly agree))
    - I seek out online professional development opportunities to improve my teaching practice.
    - I seek out online professional development opportunities to improve my pedagogical knowledge.
    - I use online resources to support my teaching practice.
    - I prefer to research teaching practices online.
    - I participate in online communities to support my teaching practice.
    - I enjoy doing [would like to undertake] professional development online.
    - I [would] complete online professional development opportunities that I start.
    - I [would] prefer to undertake professional development online.
    - Online professional development is [would be] effective for me.
- What are [do you perceive to be] the advantages of undertaking online professional development?
- What are [do you perceive to be] the disadvantages of undertaking online professional development?
- What makes [would make] online professional development effective for you?

Appendix B: Reflexive thematic coding

The following table provides excerpts from the data that informed the identification of themes through induction and synthesis.

Advantages	Disadvantages	Effective elements
Flexibility (83%, n=26) • "flexibility" • "fitting in with my time schedule" • "self-paced" • "fits around my life"	Human connection (69%, n=20) • "lack of teacher presence" • "fewer personal interactions" • "unnatural discussion" • "lack of connection with others" • "little sense of community"	Flexibility (52%, n=15) • "choose what I want" • "own pace" • "flexibility to fit into busy life" • "available 24/7" • "maximise time" • "individual needs met"
Content (31%, n=9) • "access to more high quality resources" • "updated knowledge" • "access overseas PD" • "resources available afterwards" • "more opportunities for PD"	Flexibility (38%, n=11) • "competing attention demands" • "lack of flexibility" • "distractions" • "lack of timely communications" • "not enough flexibility in synchronous mandatory tasks"	Human connection (24%, n=7) • "teacher presence" • "having face time with others" • "opportunities to connect with others" • "sense of community"
Savings (24%, n=7) • "saves travel and cost" • "saves time" • "cheap"	Content (14%, n=4) • "poor quality" • "quickly forgotten" • "lack of guidance to what is worthwhile" • "more complex concepts difficult to grasp"	Content (21%, n=6) • "usefulness of content" • "relevancy" • "up-to-date content" • "learn something new" • "meaningful and relevant" • "videos of real classrooms"

Technology (14%, n=4)	Savings (14%, n=4)
• "technical issues" • "internet connection" • "dislike social media and OPD can feel like that"	• "save time" • "save energy" • "maximise my time" • "can do more of these (time and travel savings)" • "save cost"
Completion (14%, n=4)	Technology (3%, n=1)
• "challenging to complete tasks" • "easy to skip" • "rarely finish"	• "suitable platform" • "clear rules for engagement"

3.4 Additional findings from the online survey

As indicated in the paper presented in Section 3.3, there were additional questions in the online survey that were not reported in the paper. These were deemed not appropriate for inclusion in the paper, but there was an interesting finding from one question prompts when considered in conjunction with the findings presented in the paper. The question was an open-ended question that asked participants, "When you hear "online professional development", what comes to mind?"

Through synthesizing the responses to this question together with the responses analysed in the paper, it was discovered that while most survey participants used online resources in their teaching and engaged with online support related to their teaching, they were not eager to undertake PLD online. This could result from a negative perception of online PLD, which was highlighted in some responses (e.g., "I don't have the time" (P11), "often it is a cheap way of getting an obligation out of the way" (P22), "my own time being taken up" (P23)). This discrepancy in the practices of using online resources and support, and the perception that online PLD is not as beneficial as in-person PLD indicate that there may need to be a shift in participant perceptions to support more effective online PLD. That is, a misalignment exists between the practices and actions of some survey participants and their perceptions of online PLD. Therefore, developing a framework that understands this through incorporating participant perspectives as informing factors is important. Another important part of recognising and understanding this discrepancy can be beneficial when promoting an online PLD opportunity during which some of these negative perceptions could be addressed.

3.5 Summary

While the second publication uses theory and the SLR findings to support the development of the online survey, it is the teachers' practices, preferences, perceptions, and experiences that drive the research and analysis. This brings the teachers' lived experiences and real-world perspectives to the overall research, which complements the theoretical perspective presented in the first publication. The process of writing the journal article with its embedded critical analysis and synthesis reinforced the importance of listening to in-services teachers and hearing their perceptions and experiences of online PLD. It confirmed that when identifying what

is effective in online PLD, it is important to understand the PLD participants'
experiences so that online PLD can be designed to be effective for them. In this way,
it reaffirms the PLD evaluation framework presented by Guskey (2014), which
positions the PLD participants' reactions and learning as foundational to the
effectiveness of the PLD, which subsequently impacts the potential for change in
teaching practice and student learning. The findings from the second data collection
phase were used to inform the indicative questions in the semi-structured online
focus groups, which were conducted after the online survey. The next chapter
continues the research narrative by presenting the response to the third research
question, which is embedded within the third publication.

Chapter 4: What should be considered when designing effective online professional learning and development for in-service teachers?

4.1 Introduction

This chapter responds to the third research question of "What should be considered when designing effective online professional learning and development for in-service teachers?" It provides an overview of the third publication followed by the publication presented as the submitted journal article. Then, details from the online focus group (i.e., the third data collection phase) that could not be included in the journal article due to word limits, are presented to provide further detail of the methods and analysis. Additional findings from the online focus groups are also presented in order to further contextualise the research. Finally, a brief summary of how the response to this question is situated within the overall research.

4.2 Publication overview

The following table provides an at-a-glance summary of the publication information. In this, it presents an overview of the publication details, including the research question, title, submitted journal and its statistics, publication status, data sets used, methodology, findings, and authorship.

Table 4.1. Publication 3 overview.

Research question	What should be considered when designing effective online professional learning and development for in-service teachers?
Title	A conceptual framework for effective online professional learning and development informed by in-service teachers and theory
Journal	Journal of Education for Teaching Ranking: Q1 2018 Impact factor: 1.373 Double blind peer review
Status	Under review (CJET-2020-0677)
Data set	All data collection phases: systematic literature review, online survey, online focus groups
Methodology	Reflexive thematic analysis
Findings	A conceptual framework for effective online PLD comprising four informing factors and seven design considerations (2 of which are constant and 5 of which are variable).
Authorship	Trisha Poole (80%) Angela Fitzgerald (10%) Chris Dann (10%)

The third publication in this doctoral thesis presents the conceptual framework of design considerations for effective online PLD that was developed through this research. The article presented an overview of the three data collection phases, including the systematic literature review, online survey, and online focus groups. The data was analysed using reflexive thematic analysis (Braun & Clarke, 2006; Braun et al., 2019; Clarke & Braun, 2018) and subsequently synthesised to identify the key elements of effective online PLD, their constituting components, and their relationships. The conceptual framework of design considerations for effective online PLD illustrates the relationships and connections between the key concepts and components. In the conceptual framework, there are four informing factors that influence the seven design considerations. The informing factors of content, context, purpose, and participant provide the environment in which the online PLD is being undertaken, and these inform the importance levels and development of the design considerations and their constituting components. In the seven design considerations, two are constant (savings and technology) and five are variable according to the

informing factors (flexibility, communication, content, human connection, and community). This conceptual framework responds directly to the third research question through its identification of the design considerations that should be considered when designing and developing online PLD to be effective for in-service teachers.

This article provides a succinct overview of the complex data collection phases and findings that underpin this doctoral research. It brings together the analyses and findings in the form of a conceptual framework that can be used to support the design and development of effective online PLD. The article reiterates that effective online PLD differs from in-person PLD, although there are some similarities in some design considerations. The conceptual framework presented in this article is supported by both the theory identified in phase one of data collection and the in-service teachers' perspectives and experiences identified through phases two and three of the data collection. Using these two foundations of theory and teachers' preferences and experiences, the conceptual framework is positioned as a responsive framework that considers the needs of teachers, and thus it incorporates the understandings of Guskey's evaluation framework for effective PLD (Guskey, 2014). This conceptual framework is specifically developed for online PLD, and it presents a new way to understand effective online PLD. Furthermore, it provides a way forward for designing and developing effective online PLD for in-service teachers.

4.3 Publication 3

A conceptual framework for effective online professional learning and development informed by in-service teachers and theory

Abstract

The importance of providing effective online professional learning and development (PLD) for in-service teachers has never been more prominent than during the COVID-19 pandemic. The significant shift from in-person to online PLD as the norm, combined with the rapidly increasing availability of online PLD, has highlighted the importance of having a framework that supports the design of effective online PLD. While the components of effective in-person PLD are well established, those for online remain elusive. This paper presents a conceptual framework for effective online PLD developed based on empirical literature and teacher experiences and preferences. It was developed through three phases of data collection, and it consists of four informing factors and seven design considerations. This conceptual framework provides a foundation for designing effective online PLD, which has become critical in the face of the increased availability of online PLD.

Introduction

Professional learning and development (PLD) is a significant part of professional growth for in-service teachers, with it often forming part of teacher accreditation and registration requirements (AITSL & Learning Forward, 2014; Darling-Hammond et al., 2017; Desimone & Garet, 2015). Constant investigation into teacher PLD and its effectiveness have resulted in much research being undertaken to determine what makes PLD effective. This research began more than two decades ago with the focus on in-person PLD, and the elements of effective in-person PLD are now well established. However, with the advances in technology and the rise of online learning environments, together with increasing teacher demands for more flexible PLD options, online PLD has become an essential pathway for undertaking PLD. This demand has led to the rapidly increasing availability of online PLD, which has only intensified during the COVID-19 pandemic as in-person PLD has often not been an option, but PLD requirements have remained constant or have

increased. It is now even more critical that online PLD is examined for its effectiveness. Therefore, this paper presents a conceptual framework for effective online PLD which has been developed from a more extensive study. The conceptual framework presents the design considerations and their relationships that should be considered when designing effective online PLD. This conceptual framework responds to the question of what should be considered when designing effective online PLD, and it uses in-service teachers' preferences and experiences, together with the empirical literature, as its foundation.

Effective PLD for in-service teachers

The elements of effective PLD have been well established in the literature for in-person PLD (AITSL & Learning Forward, 2014; Cirkony et al., 2021; Darling-Hammond et al., 2017; Desimone & Garet, 2015; Guskey, 2014), but they remain an emerging field for online PLD (Qian et al., 2018; Quinn et al., 2019; vanOostveen et al., 2019). For in-person PLD, the five minimum components that should be considered are active learning, coherence, collaboration, content-focused, and sustained duration (Darling-Hammond et al., 2017; DeMonte, 2013; Desimone & Garet, 2015; Yoon et al., 2007). These five minimum components are generally accepted as being important, but some researchers have identified additional components that require consideration for effective in-person PLD. Yoon et al. (2007) identified that PLD should focus on reform rather than traditional processes, whereas DeMonte (2013) recognised that using technology wisely, coaching, and being job-embedded were important elements of effective in-person PLD. Furthermore, Darling-Hammond et al. (2017) established that using models of effective practice, providing coaching and expert support, and offering feedback and reflection are important. Most recently, Cirkony et al. (2021) conducted a rapid review and identified eight elements of effective PLD, while highlighting three additional contextual considerations of workplace conditions, PLD providers, and online and blended approaches. These elements of effective in-person PLD are important, but they cannot simply be transferred to the online PLD context due to the inherent differences between online and in-person PLD. For example, a fundamental difference is that online PLD can be a more independent, asynchronous process than in-person PLD where all participants are in the same place at the same time. Therefore, due to the distinct differences between in-person and online PLD

environments, a more nuanced understanding of effective online PLD and its key design considerations is required.

　　While the differences between in-person PLD and online PLD, and the affordances that online can provide, have been identified and discussed in the literature (Cirkony et al., 2021; Qian et al., 2018; Quinn et al., 2019; vanOostveen et al., 2019), a consistent perspective on what constitutes effective online PLD remains elusive. Quinn et al. (2019) presented a heuristic framework for online PLD that was based on theory and policy content, while evaluating the frameworks presented by Desimone (2009) and Guskey (2014) for use in an online PLD context. While these frameworks provide valuable insights and some support for designing effective online PLD, they cannot be used without further consideration regarding the affordances of online environments and the changing expectations of teachers when participating in online PLD (Schleicher, 2020). The heuristic framework presented by Quinn et al. (2019) provides a starting point for understanding effective online PLD, but it does not consider the empirical research and teacher's perspectives and experiences of the online PLD, which is paramount to effectiveness (Guskey, 2014; Quinn et al., 2019). In their research, Qian et al. (2018) designed and implemented an online PLD program for computer science teachers, and they made three recommendations for designing effective online PLD for a specific content focus. More recently, vanOostveen et al. (2019) identified that effective online PLD is inherently more complex and therefore online PLD must go beyond platform constraints to embed four key online learning attributes of "being community-centred, knowledge-centred, learner-centred, and assessment-centred" (p. 1879). These studies establish that understanding what constitutes effective online PLD remains a work in progress with both researchers and practitioners engaged in determining a consistent foundation for effective online PLD.

　　Currently, there are mixed approaches to designing online PLD for effectiveness, and these are typically based on either effective in-person PLD (e.g. Boloudakis et al., 2018; Holmes et al., 2011) or effective online learning (e.g. Hull & Saxon, 2009). Some use effective online learning approaches as a foundation, but online PLD differs to this because it focuses on participants who are already in their profession, not learning to become a professional. While the effective online learning literature can support the understanding of effective online PLD, because online PLD

is about extending a professional position, the fundamental purpose, and hence motivation, for undertaking online PLD differs.

The importance of understanding what should be considered when designing for effectiveness is becoming vital with the rapidly increasing availability of online PLD. This has been emphasised further with the COVID-19 pandemic forcing more teachers to undertake their PLD online. Therefore, this study focuses on identifying what should be considered when designing effective online PLD with the view to developing a conceptual framework that is informed by both empirical literature reporting on and in-service teacher perspectives and experiences of effective online PLD.

Methods

The conceptual framework presented here was developed using a social constructivist approach, which posits that meaning is socially constructed through interactions with others to create shared experiences, understandings, and meanings (Creswell & Creswell, 2018). Rather than starting with a theory, this social constructivist approach was grounded in combined iterative inductive and deductive processes for gathering, analysing, and interpreting the data, which were then thematically analysed to develop the findings (Creswell & Creswell, 2018). The combined approach to the data collection and thematic analysis enabled effective online PLD to be investigated from both theoretical and practical perspectives in order to develop a conceptual framework that is informed by both theory and in-service teachers. The inductive process allowed the initial elements of effective online PLD to be identified from the empirical literature, and these were then used as the foundational theory to be explored in the deductive processes involving in-service teachers. This combined approach to the study enabled the intersection of theory and practice to be investigated in order to develop a holistic understanding of what should be considered when designing effective online PLD for in-service teachers.

A strength of using a combined inductive and deductive approach to the thematic analysis was that both the existing empirical research and in-service teachers were given a voice in the process of developing the conceptual framework. The combined approach also allowed the researcher to begin without preconceived notions of what should be considered when designing for effectiveness in online PLD. Using an inductive approach, a theory of design considerations for effective

online PLD was developed from the empirical literature (Phase 1). This theory was then used as the foundation for the deductive approach used in the online survey (Phase 2) and online focus groups (Phase 3). Methods and data triangulation were used to connect the three data sets and their resultant themes (Flick, 2018; Renz et al., 2018). The method triangulation involved using mixed methods (i.e., systematic literature review, online survey, and online focus group) to collect the initial data. These data sets were then triangulated by analysing them for similarities and discrepancies to determine the consistent themes. Furthermore, using the social constructivist approach whereby knowledge is socially situated and developed through a series of interactions (Creswell & Creswell, 2018; Creswell & Poth, 2018), the combined approach ensured that the three interrelated phases of the study were connected and developed, and they iteratively and recursively informed the analyses. The three data collection and analysis phases are presented in Figure in sequential order with the data source, focus, and analysis targets indicated next to each phase.
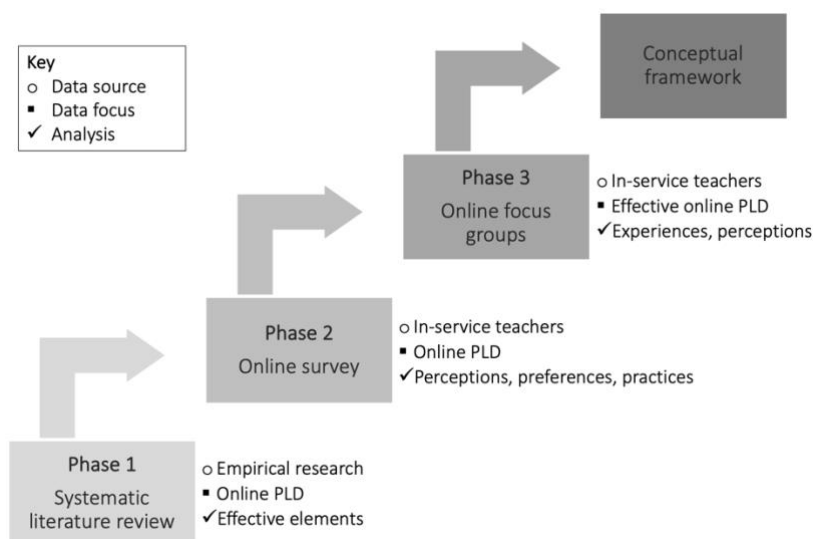
Figure 1. Iterative data collection and analysis phases used to develop the conceptual framework.

In the three study phases, reflective thematic analysis (RTA) was used to iteratively identify the themes and subthemes from the data. This approach supported rich analysis of the findings to tell the story and emphasise the importance of what should be considered when designing effective online PLD (Braun et al., 2019; Clarke & Braun, 2018). For each set of findings from each phase, there were six steps in the thematic analysis (Braun & Clarke, 2006; Braun et al., 2019; Maguire & Delahunt, 2017): familiarisation with the data, coding, generating the initial themes, reviewing the themes, defining the themes, and writing the themes up for use in the

subsequent phase. Through using consistent steps in the thematic analysis, the resulting themes were able to be clearly identified and articulated. Familiarisation with the data through reading and re-reading allowed full immersion in the data with contextual understanding to then generate labels (coding) that could support a response to the research question. Once the labels were generated, they were reviewed and grouped into broad patterns that could become the initial themes. Once the initial themes were identified, they were reviewed and their associated subthemes (constituting labels) were reviewed for consistency and coherence within the theme. Next, the themes were defined, and descriptions were written to ensure that the subthemes aligned with the main themes. Finally, all themes and subthemes were reviewed to ensure that they were aligned and held internal consistency. The final themes and subthemes were then presented to peers for feedback. These themes were then used in the subsequent data collection phase. In the development of the conceptual framework, all themes and subthemes were reviewed and reconsidered to reflect the findings as a coherent whole.

Results

The results are presented separately for each data collection phase as the subsequent phases cumulatively built on the findings from the previous phases. In the SLR findings, depicted in Figure 2, four elements of effective online PLD for in-service teachers were identified from the empirical literature. These elements, in order of prevalence in the literature, were connection, communication, community, and flexibility. Connection refers to three subthemes of explicit or direct connection: between people (facilitators and participants), content, and context. Communication signifies the visibility and depth of communication among participants and facilitators; it is based on interactions and interactivity, and includes communication and interaction between participants, facilitators, and learning activities. Community encompasses the relationships and connections that can be created in online environments to support interactions among participants and facilitators, development of professional networks within and outside the PLD opportunity, and professional learning communities. Flexibility refers to the ability for participants to engage with the content that is of interest to them at a time and place that suits them.
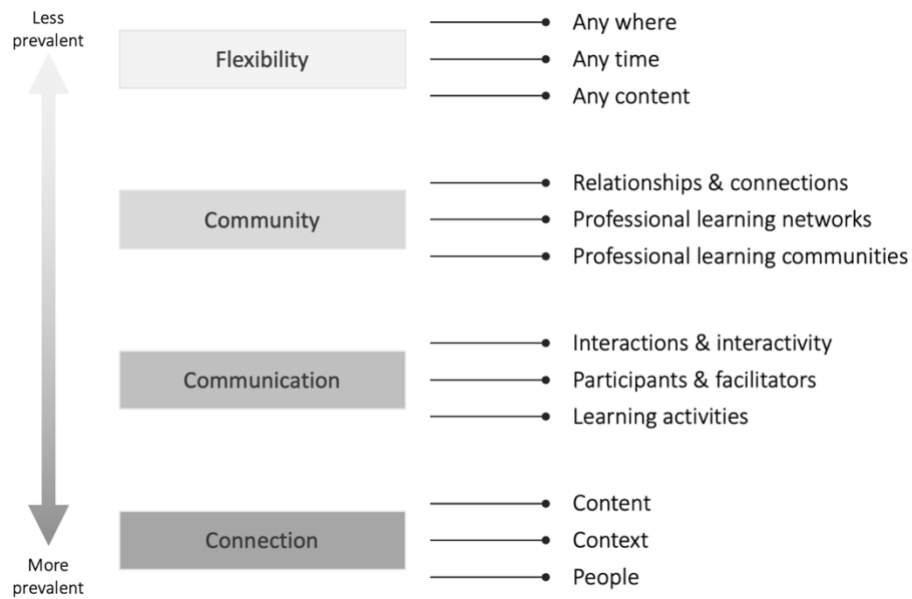
Figure 2. Elements and features of effective online PLD derived from the SLR.

These findings from the empirical literature provided a foundation, together with the technology acceptance model (Fathema et al., 2015), from which the online survey on effective online PLD for in-service teachers was designed. This survey garnered in-service teachers' perceptions, practices, and preferences around online PLD, as well as investigating these as features of effective online PLD. From the responses, it was identified that there are five themes that support effective online PLD, and these have a clear hierarchy from most to least important: flexibility, content, human connection, savings, and technology. The in-service teachers identified that flexibility was a critical aspect of effective online PLD because they could complete it in their own time at their own pace, while making choices around the content in which they wanted to invest their time. They also indicated that their level of participation, including asynchronous and synchronous participation, should be flexible to gain maximum effect. In relation to content, it was identified that greater access to resource and content was a key to effective online PLD, as were the ability to personalise their learning and to access higher quality online PLD. Human connection was identified as important to effectiveness because the connections between participants, facilitators, and content were important for effective engagement with the PLD, which resulted in effective PLD according to the in-service teachers. This theme also included aspects of teaching and social presence, as identified in the 'community of inquiry model' (Garrison et al., 2010) for online

learning. The theme of savings featured in the responses as well, and it referred to savings in time and cost when compared with attending an in-person PLD. However, the survey participants noted that it is important to have these savings visible and clearly articulated before beginning the online PLD. The fifth theme of technology included the use, stability, and suitability of the tools and software that were used to present the online PLD, as well as the technology-knowledgeable and technology-capability of the facilitators. Figure 3 presents these findings with notations of the constituting subthemes that were identified through the survey and the subsequent reflexive thematic analysis and synthesis.
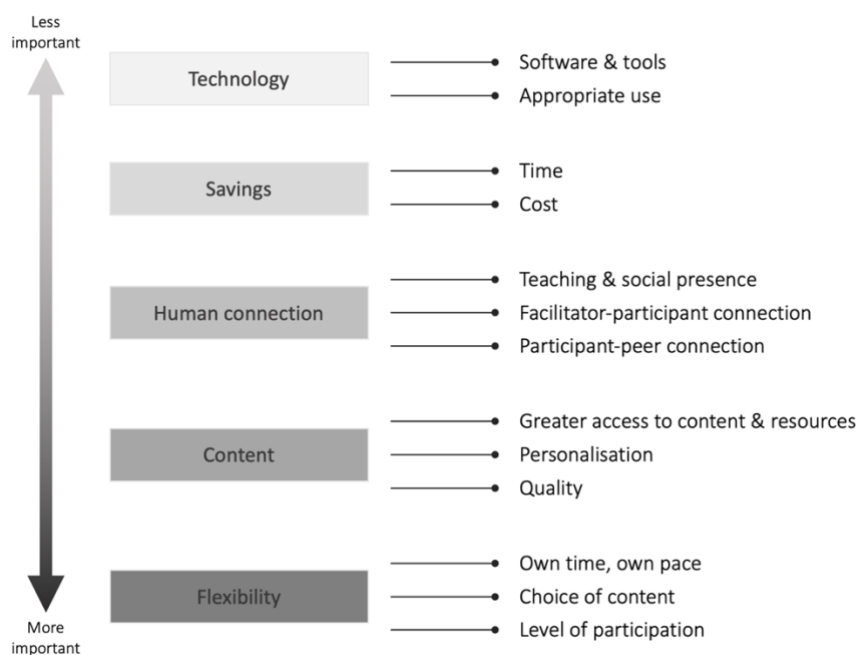
Figure 3. Themes and subthemes derived from the online survey on effective online PLD for in-service teachers.

The findings from both the SLR and the online survey informed the semi-structured online focus groups, which resulted in a deeper understanding of what makes online PLD effective for in-service teachers. The participants in the semi-structured online focus groups were garnered from those who participated in the preceding online survey, which included an option to nominate via a linked survey to participate in the online focus groups. As seen in Figure 4, the findings from the online focus groups resulted in a more complex and nuanced understanding of what should be considered when designing online PLD to be effective for in-service teachers.
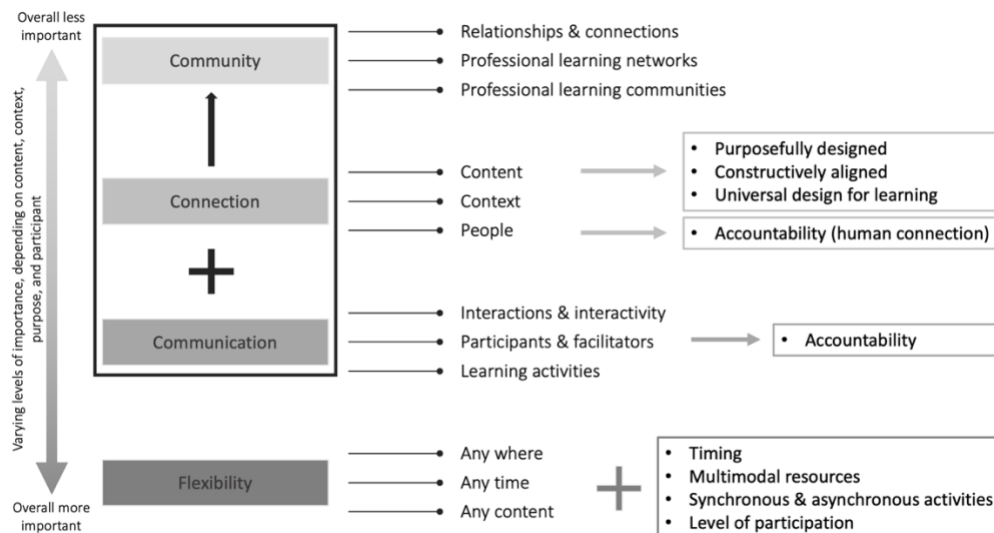
Figure 4. Themes and subthemes resulting from the online focus groups of in-service teachers.

While the four themes identified in the SLR remain key components of effectiveness, a clear hierarchy was identified through synthesis and evaluation of the online surveys and focus groups, with an explicit ranking task provided to the online focus group: without flexibility, online PLD is not effective, and flexibility is more nuanced than simply anywhere and anytime, because it also includes flexibility in content, the synchronicity of activities, resource modality, levels of participation, and timing. Next, communication was identified as critical to effectiveness, and together with connection, this can create a community, which was placed as least important of the four themes. In the communication theme, the focus groups identified that accountability was important, and that this accountability could come in many forms, but perhaps the most effective way was from others within the online PLD. The theme of connection was discussed with three subthemes: content, context, and people. The aspects of content and people were further elaborated, with a strong focus on the content being 'purposefully designed, constructively aligned' (Gallagher, 2017), and including 'universal design for learning' (Rogers-Shaw et al., 2018). The people subtheme was further nuanced through the discussion around accountability and how connection with people inside and outside of the PLD can support the human connection and accountability to complete the PLD.

The four themes of effectiveness that were identified in the SLR and confirmed through the online survey and online focus groups were also recognised as having varying degrees of importance depending on the content, context, purpose,

and participant. For example, if the online PLD is a type of knowledge refresh, then the flexibility is critical, but communication, connection, and community are less critical for effectiveness. The online focus group participants discussed that they were less inclined to engage with others in these types of PLD and more likely to do it in their own time at their own pace. However, if the online PLD was to deepen knowledge or gain new knowledge, then these four themes have a greater impact on its effectiveness. That is, flexibility with its nuanced components is critical, as are communication and connection with their deepened comprising components. Community also becomes important, but it still has the lowest importance of these four themes.

Discussion: A conceptual framework for effective online PLD for in-service teachers

Using the empirical literature as a foundation for exploring in-service teachers' perceptions, practices, preferences, and experiences of online PLD provided a rich and nuanced understanding of what makes online PLD effective. Through synthesizing and triangulating the data collected in the three study phases, a more complex understanding of effective online PLD and its design considerations were used to develop a conceptual framework that encompasses both theoretical and practical aspects. The conceptual framework for effective online PLD depicts these design consideration constructs and their relationships, as presented in Figure . At a foundational level, this conceptual framework consists of seven design considerations: five of which are variable and two of which are constant. These seven design considerations are influenced by the informing factors of content, context, purpose, and participant. The conceptual framework components are discussed below.
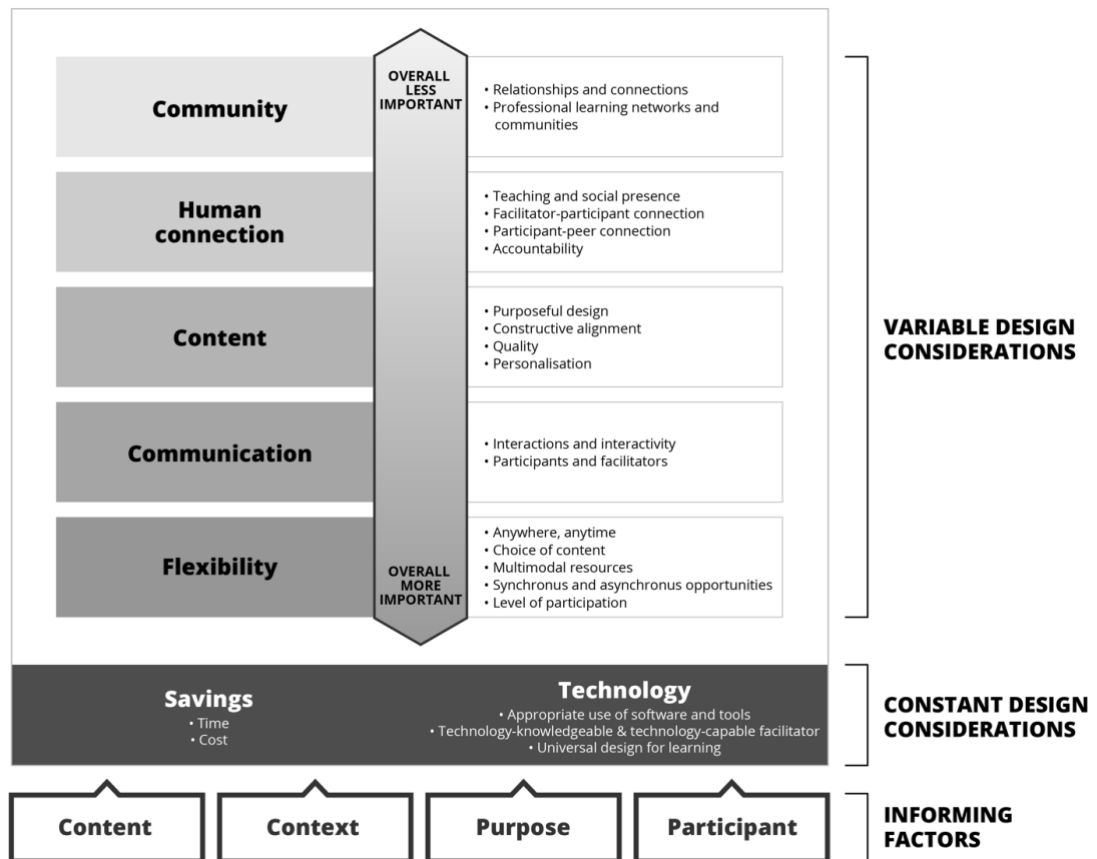
Figure 5. Conceptual framework of design considerations for effective online PLD.

Informing factors

The informing factors are content, context, purpose, and participant, and these influence the participants' perceptions of the online PLD, its importance, and its perceived effectiveness. These informing factors encompass a range of attributes and provide insight into participant perceptions, experiences, and expectations.

- *Content* refers to the topic and the depth of the topic presented in the online PLD. It is closely connected to purpose.
- *Context* is the participant's environment in which they are undertaking the online PLD, and it includes attributes such as their employment situation, geographic location, time of day for participation and engagement, and device used to engage with the online PLD, among others.
- *Purpose* is why the teacher is participating in the online PLD, and this can be for a variety of reasons ranging from personal interest to being required to do so for registration requirements.

- *Participant* refers to the individual differences among participants in relation to engagement preferences, technology capabilities, perceptions of the online PLD, and so on. These vary widely within and across online PLD cohorts, and understanding the general attributes of the participant cohort will support more effective online PLD design.

The informing factors provide broader considerations when designing for effective online PLD. While they are generally not controllable by the online PLD designers and facilitators, they can be factored into the design to increase effectiveness and design online PLD that meets the needs of the participants while engaging them effectively to achieve their goals. These four informing factors influence both constant and variable design considerations.

Constant design considerations

As identified through the SLR, online survey, and focus groups, the constant design considerations consistently have high importance and a minimum standard below which the online PLD is considered less effective overall. The two constant design considerations are savings and technology. While these two constant design considerations are subjective to the online PLD participant's experiences and preferences, the minimum acceptable level remains consistent, and they provide a foundation from which to understand and view the variable design considerations.

Savings. This constant design consideration centres on the visibility of savings in time and cost, when compared with in-person PLD. These are essential for perceived effectiveness when potential participants are contemplating undertaking online PLD. That is, if the participants cannot clearly identify how the online PLD could save them time and money, then the perceived effectiveness of participating online versus in-person is reduced.

Technology. In the same way, the technology design consideration has a baseline level that is required for the online PLD to be perceived as effective. The components of the technology design consideration include appropriate use of technology (tools, software), as well as technology-knowledgeable and technology-capable facilitators. The appropriate use of technology indicates that each tool or software that is used has a clear purpose and functionality in the overall online PLD, i.e., that its use clearly supports the learning outcomes. The component of technology-knowledgeable and technology-capable facilitators refers to the technical ability and comfort of the facilitators: are they confident in using the tools that the

online PLD uses? Are they capable of troubleshooting these tools? Through the focus groups, it was clear that when facilitators are not technology-knowledgeable or technology-capable, the perceived quality and effectiveness of the online PLD is reduced. It was also identified that universal design for learning (UDL) should be inherent in the technology and design choices because it enables multiple means of representation, action, expression, and engagement (Rogers-Shaw et al., 2018). UDL also enhances the accessibility and flexibility of the online PLD to cater to different participant needs and preferences.

The technology design consideration has been identified previously as a part of effective online PLD (AITSL & Learning Forward, 2014; Quinn et al., 2019) and online learning (Miller et al., 2020) at the basic level of ensuring the technology use is appropriate and mindful of the affordances and challenges that are found in online environments. However, the nuanced description of technology as a constant design consideration with its comprising components enhances the previous understandings because it is based on in-service teachers' experiences of online PLD. It also provides a more complex understanding of how the facilitators' technology use, competence, and confidence impact the perceived overall effectiveness of online PLD.

Variable design considerations

Using the two constant design considerations as the foundation, the variable design considerations are developed and varied according to the informing factors. In order of importance, which emerged from the SLR and online surveys, and was subsequently validated in the focus groups, the five variable design considerations are flexibility, communication, content, human connection, and community.

Flexibility. This design consideration is more than simply anywhere, anytime access to online PLD, as it includes flexibility in the way participants engage with the online PLD. This more nuanced definition of flexibility includes a choice of content and PLD opportunities. Flexibility should also be designed into the resources by providing multimodal resources that cater for different preferences in engaging with content, including having multiple means of access, e.g., having written content in a format that can be read aloud for participants who may engage with it during their daily commute. Multimodal resources also connect with the UDL component identified in the technology design consideration, which illustrates that while these design considerations are presented separately, they are innately connected and

embedded within each other. Furthermore, flexibility in offering synchronous and asynchronous opportunities to engage with the online PLD, including peers and facilitators, and the required level of participation in these opportunities forms part of the nuanced understanding of flexibility. The level of participation component applies to all aspects of the online PLD: from participation in learning activities to assessment items and group activities. It is also connected with the synchronous and asynchronous opportunities and participation in these. Overall, the flexibility design consideration has five components that are interconnected yet distinct in their perspective of flexibility.

This deeper and more nuanced understanding of flexibility is important when designing online PLD for effectiveness from in-service teachers' perspectives. Through connecting with the teachers' needs for flexibility, online PLD has a greater opportunity to be deemed effective by them, which is the first level of Guskey's PLD evaluation framework (Guskey, 2014). Further understanding how the components of flexibility can be varied to adapt to the informing factors and subsequently influence effectiveness can support the transfer of the PLD content knowledge to the classroom to have an impact on students (Guskey, 2014; Herrington et al., 2009).

Communication. In any PLD, communication is important. However, it becomes critical in online PLD because it is the primary interaction method between participants, content, and facilitators. There are two components in the communication design consideration: interaction and interactivity, and participants and facilitators. These components indicate the importance of the different types of communication that can occur in an online PLD. Interaction and interactivity refer to the designed-in opportunities for participants to interact meaningfully with the content and learning activities, as well as their peers and facilitators. This indicates that active learning and opportunities for engagement should be a key part of online PLD as it allows the participants to actively participate in the learning process rather than passively receive knowledge. The participants and facilitators component is partially included in interaction and interactivity, but it also refers more specifically to the types, clarity, quality, and frequency of these interactions and communications. To be effective, the right balance of communication should be determined based on the informing factors and with the nuanced understanding of flexibility in communication.

Appropriate and regular communication is well established as a foundational part of online learning (Miller et al., 2020; Redmond et al., 2018) and online PLD (Quinn et al., 2019). While the online environment has many communication affordances, effective communication is related to the timely and appropriate communication strategies that facilitators employ in the design and implementation of online PLD. With the current state of online learning environments, online PLD typically lacks the capability of conveying non-verbal communication cues except through explicitly designed learning activities and communication opportunities (Miller et al., 2020; Quinn et al., 2019).

Content. The content design consideration encompasses four components: purposeful design, constructive alignment, quality, and personalisation. When designing online PLD, each part of the PLD must have a clear purpose and connection to the overall content and learning outcomes: from images to content order, from learning activities to assessment opportunities. This relates to constructive alignment wherein the content, learning activities, and assessment opportunities should clearly align to achieve the stated learning outcomes. Without purposeful design and constructive alignment, participants are likely to question the quality of the online PLD and their participation in it. Thus, the quality component refers to the perceived level of excellence designed into the online PLD and experienced by the participants. Added to this, the ability to personalise the content to an individual participant's contexts and preferences is an important component of the content design consideration. While this may appear similar to the choice of content component in the flexibility design consideration, personalisation is more refined because it occurs within an online PLD. In personalisation, the participant chooses which content to engage with from the overall PLD content, whereas choice of content refers more broadly to choosing from a range of available online PLD opportunities.

It is well established that content is critical in effective PLD (AITSL & Learning Forward, 2014; Darling-Hammond et al., 2017; Desimone & Garet, 2015; Guskey, 2014), and it is unsurprising that it is the same for online PLD. However, the understanding of what makes content an important design consideration for online PLD is expanded here to include greater clarity in the content design and alignment, as well as quality and personalisation, all within an online environment.

Therefore, the content design consideration discussed here provides a more nuanced and complex understanding of how content is critical in effective online PLD.

Human connection. The fourth variable design consideration is something that may be taken for granted in in-person PLD: human connection. However, when taking PLD online, the human connection must be proactively considered as it is not inherent within the online context. That is, the four components of human connection – teaching and social presence, facilitator-participant connection, participant-peer connection, and accountability – must be actively designed into online PLD. Teaching and social presence refer to the visibility and engagement of facilitators and participants in the learning process. Originating in Garrison et al.'s community of inquiry model (2010) for collaborative learning, teaching presence focuses on the design, facilitation, and direction of the cognitive and social processes within an online PLD to achieve meaningful and educationally worthwhile outcomes. Social presence refers to peer engagement as part of the learning journey towards achieving the learning outcomes. This component connects with and impacts the next two components: facilitator-participant connection and participant-peer connection. These connections illustrate the interdependent nature of the components within this design consideration because teaching and social presence also incorporate these connections. While these components may be encapsulated within the one concept, they should be considered separately due to the informing factors that will influence the importance of each individual component. The fourth component of accountability refers to feelings of responsibility in the online PLD for both participants and facilitators. This component could be encompassed within the communication design consideration as accountability requires a form of communication, but it is situated within human connection because it is through the human connection that it can be supported and increased.

Online environments are often criticised for their lack of human connection (Miller et al., 2020; Quinn et al., 2019), and the online focus groups identified it as a reason why some in-service teachers are reluctant to undertake PLD online. The apparent impersonal nature of the online environment can be countered through the purposeful design of human connection opportunities where participants can connect with each other and the facilitators. As noted by Quinn et al. (2019), the online environment limits the ability for participants and facilitators to interact physically

with each other, so the inclusion of opportunities to build individual online presence and group cohesion is important for effective online PLD.

Community. The variable design consideration of community refers to the professional relationships, connections, networks, and communities that can be created through PLD. Developing these professional connections and relationships may occur organically during in-person PLD, but they must be designed into online PLD. First, relationships and connections include the internal online PLD interactions between participants, peers, and facilitators that support the development of an online PLD community among professionals, and then the potential for these to move outside of the online PLD environment. Second, the professional networks and communities are typically external to the online PLD, but they can be easily connected within it using the affordances of the online environment. The connection with these external professional learning networks and communities may extend beyond the time and scope of the online PLD. Developing a community within online PLD may evolve into supportive professional connections outside of it and become profession-long connections. Some participants may engage more than others in these community development activities, and this connects with flexibility in the level of participation. While the relative importance of community in the overall online PLD experience is low, it remains an essential part, particularly when the online PLD focuses on extending and deepening knowledge.

It has been well established that creating a community of learners can increase online engagement and effectiveness (AITSL & Learning Forward, 2014; Darling-Hammond et al., 2017; Miller et al., 2020; Redmond et al., 2018), and this can be applied to online PLD considering the number of similarities between online learning and online PLD. Here, the clarification of how community can support effective online PLD provides a deeper understanding of its importance and how it impacts effectiveness.

Implications

With the exponential growth in the availability of online PLD for in-service teachers resulting from the COVID-19 pandemic, it has become vital that these online PLD opportunities are designed for effectiveness. While models of effective PLD exist, they have been developed for in-person PLD, not online PLD. Although some aspects of these models can be effective in online PLD contexts, there are significant differences that require a more nuanced understanding of the design

considerations for developing effective online PLD. The conceptual framework presented here establishes a foundation for designing effectiveness into online PLD for in-service teachers.

At a fundamental level, the conceptual framework for effective online PLD provides a clear path for designing online PLD. However, there is more work to be undertaken to verify the framework. At the foremost, the framework has not yet been applied to real-world online PLD, so it should be used to design online PLD that would subsequently be implemented and evaluated to determine its effectiveness. In this way, feedback from the online PLD designers, facilitators, and participants could be used to improve and add rigour to the conceptual framework. In concert with this, an evaluation approach should be designed so that it can be applied consistently across different online PLD implementations. Further work can also be undertaken to determine how this conceptual framework may apply to in-person PLD delivery.

There are two additional limitations in this study that provide a way forward for further exploring the conceptual framework as a tool to support the design of effective online PLD. First, the data collected from in-service teachers was collected online, and this may unintentionally exclude those who do not engage with online activities and social media. To gather the perceptions, preferences, practices, and experiences of those teachers, the survey and focus groups could be conducted using paper-based or in-person formats. Second, the survey should be conducted again to gather broader perceptions and capture the changes in perceptions that have resulted from increased exposure to online PLD since the advent of COVID-19.

Conclusion

The COVID-19 pandemic has highlighted the importance of teaching and being adaptable to different teaching contexts. The instances of and opportunities for online teaching and learning have significantly increased during this period, as have those for online PLD. The importance of providing effective online PLD has never been more evident than now. The identified lack of knowledge around effective online PLD and the design considerations specific to online PLD have been brought into the spotlight through the research as presented in this article. The conceptual framework proposed here responds directly to the question of what should be considered when designing effective online PLD, and it uses in-service teachers' preferences and experiences, together with the empirical literature, as its foundation. Moving forward, online PLD can be designed with greater confidence that it will be

effective in achieving its goals, which is becoming increasingly critical as learning and teaching environments evolve rapidly and in-service teachers need more support through online PLD to continue to evolve their own practice.

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4.4 Online focus groups

4.4.1 Overview

This section overviews the third data collection phase, i.e., the online focus groups. It provides the context for this data collection phase, including the rationale behind its importance. It briefly presents the methodology and findings, together with their analysis. This section provides greater detail of the data collection and depth of analysis, which could not be included in the third publication due to word limit requirements. This data set was used together with the other two data sets in the development of the third publication, which was presented in Section 4.3.

4.4.2 Context

The third phase of data collection was linked to the online survey in the second phase, and it focused on listening to teachers' voices and probing their perceptions and experiences of online PLD. At the end of the online survey, participants were asked if they would like to join an online focus group to discuss their experiences and perceptions of effective online PLD in further depth. In total, there were eight participants over three online focus groups. All participants were in-service teachers working in a variety of contexts, including primary schools, high schools, tertiary education institutes, and private education institutes. Some participants had experience across multiple educational contexts, e.g., teaching at high school and university. The participants were female, represented a number of different cultural and linguistic backgrounds, and were geographically located across two countries (Australia and the United Kingdom). All focus group participants had previously participated in online PLD, and they were encouraged to share their experiences with the group.

4.4.3 Method

Online focus groups are used in qualitative research to provide opportunities for groups of participants to talk at length and in detail about the given topic (Lobe, 2017; O.Nyumba et al., 2018; Stewart & Shamdasani, 2017). In this research, they were used to provide a semi-structured, open-ended space for participants to offer their insights and experiences of online PLD, as well as to deepen the conversation through discussion with peers about their perceptions and experiences. The group dynamics enabled differences and similarities to be identified quickly, and these

were probed more carefully by both the group facilitator and other focus group participants.

The participants in the online focus groups were sourced from the online survey. At the end of the online survey, participants were asked if they would like to join an online focus group to further discuss effective online PLD. This convenience sampling ensured that the online focus group participants had an overview of the topic of interest, which allowed for a reduced orientation period during the online focus group session. Of the 29 survey respondents, eight participated in the online focus groups, which was 27% of the potential pool of participants. The online focus groups were held synchronously via Zoom, and participants were given a choice of three focus group times to allow for different work schedules and time zones. Two groups were held after work hours at night, and one group was held during a lunch hour. The focus groups ran for approximately one hour each, depending on the conversation and discussion. In each focus group, participants were advised before starting and again at the end of their ability to withdraw from the research at any point prior to publication. The focus groups began with an icebreaker activity to support the development of group cohesion (Stewart & Shamdasani, 2017). The facilitator used a semi-structured interview approach whereby they had a list of indicative questions (see Box 4.1 below) to guide the discussion, but they were responsive to the participants' discussion points and drew on those to further deepen the discussion. The online focus groups were recorded and transcribed by the researcher, with participants given the opportunity to amend their contributions before the transcripts were anonymised and finalised. These finalised transcripts were used as the data for analysis.

Box 4.1. Indicative questions used to guide the semi-structured focus groups.

Focus group indicative questions

The following questions were the indicative questions used in the online focus groups, in no specific order. These questions were used to prompt discussion, but the discussion was responsive to the participants' contributions during the online focus groups.

- What is important to you in online professional learning and development?

- Through a systematic literature review, we identified four elements of effective online teacher professional learning and development – connection, communication, community, and flexibility. Through the survey, we found that there was general support for these elements with some being discussed more than others. Firstly, what do you think about these elements overall?

- In the survey, the responses indicated that "flexibility" was a "given". That is, it wasn't discussed much, it was just identified as very important and also expected. Can we talk more about flexibility? What does it mean to you?

- In the survey, a respondent mentioned that connection and communication could come under the umbrella of community. What are your thoughts on this idea?

- In the survey, some respondents indicated that connection, communication, and community were variable elements. That is, that they were dependent on other contextual factors such as experience, PLD topic, and personal preferences. Depending on these factors, these elements were more important or less important. What do you think about this? When would they be more/less important?

- What is missing from these elements?

- What else do you want to tell me about online teacher professional learning and development?

As part of the post-online focus group follow up, the participants were invited to complete a short online survey to summarise their reported perceptions and experiences. This survey was based on the reflexive thematic analysis of the transcripts, and the responses were used to triangulate the data collected until this point in order to increase the validity of the analysis. The participants were asked to agree or disagree on the importance of the elements of effective online PLD being responsive, to confirm the more nuanced understanding of flexibility, and to rank the importance of the additional four elements that support effective online PLD. They were also given another opportunity to provide further feedback and thoughts on effective online PLD.

4.4.4 Analysis

Reflexive thematic analysis (Braun & Clarke, 2006; Braun et al., 2019; Clarke & Braun, 2018) was used to identify the key themes that arose from the discussions, and these themes were then considered in conjunction with the previous data collection and analysis activities. Four components were added to the understanding of effective online PLD. These components were accountability, constructive alignment, purposeful design, and universal design for learning. The element of flexibility was further nuanced to incorporate synchronous and asynchronous activities, multimodal resources, level of participation, and timing. In addition, the discussions in the online focus groups had a strong emphasis on effective online PLD being responsive to the content, context, and purpose of the online PLD, as well as the participant's needs. These findings were confirmed through the short online survey and were then used to further develop the conceptual framework presented in the third publication.

4.4.5 Additional findings from the online focus groups

During the online focus groups, the participants consistently came back to the point that each element of effective online PLD was variable and depended on the context and purpose of the online PLD. For example, if the online PLD's primary purpose was compliance related, then the level of flexibility was critical, and all other elements were significantly less important (but retained some importance when considering effectiveness). While this variability has been embedded within the conceptual framework, the explicit examples of how this variability may function in a real online PLD opportunity remain as work yet to be undertaken. The key finding of this is the increased importance of this variability to the teachers: the conceptual framework is not a static framework that can be implemented through a series of steps, but rather must reflect the informing factors and the overall projected perceptions by the participants.

4.4.6 Summarizing the online focus groups

The online focus groups were used to further explore in-service teachers' perceptions and experiences of online PLD. The analysis supported a more nuanced and more in-depth understanding of what should be considered when designing online PLD for effectiveness. These findings, together with those from the first and second phases of data collection, were triangulated by comparing and contrasting the

key words and themes that arose. These were then used to develop the conceptual framework of design considerations for effective online PLD, which is the heart of this research.

4.5 Summary

In this chapter, the third publication was presented together with further detail for the online focus group data collection phase. The third publication uses theory and the findings from the three data collection phases to underpin the development of the conceptual framework of design considerations for effective online PLD for in-service teachers, which is the heart of this research. Furthermore, combining the responses from the first two research questions, together with the data from the online focus groups, enabled a holistic approach to developing the conceptual framework. The process of developing the conceptual framework and writing the journal article provided opportunities to reflect on the data in more depth and add greater rigor to the analysis, synthesis, and resultant conceptual framework. The iteration and reiteration that occurred during the development of the conceptual framework also further solidified the importance of understanding, acknowledging, and incorporating the teachers' perceptions and experiences of online PLD within the conceptual framework. When examining the developed conceptual framework in connection with the established literature on effective PLD, it further emphasised that there is a significant difference between in-person PLD and online PLD. It also reiterated the lack of literature in the field of online PLD that can support the development of effective online PLD.

This third publication completes the doctoral research cycle and presents new knowledge in the form of a conceptual framework of design considerations for effective online PLD. While work remains to be undertaken to validate and add rigor to the conceptual framework, the framework responds to the overall research question of what should be considered when designing online PLD for effectiveness. The next chapter presents a discussion of the doctoral research as a whole through identifying and examining three assertions that were uncovered when the findings from the data collection phases and responses to the research questions were synthesised and considered in unison.

<center>**Chapter 5: Discussion**</center>

5.1   Introduction

This chapter presents a cohesive discussion that integrates the findings of the research as presented across the three publications in Chapters 2, 3, and 4. It begins with identifying the three assertions that have been distilled from the analysis and synthesis of the findings, and these are discussed in connection with the research questions. Through these assertions, the findings are reiterated, critically analysed, and implications are provided.

5.2   Three assertions about online PLD and designing for effectiveness

During the process of analysing and synthesising the data from the three data collection phases, together with developing the three publications, three central assertions about online PLD were uncovered. These assertions resulted from more deeply engaging with the responses to the research questions, and then synthesizing these responses in a way that enabled further depth of understanding of the importance and significance for designing and developing effective online PLD for in-service teachers.

The three assertions that are introduced and explored in this discussion are as follows.

1. Online PLD is different.
2. Online PLD is complex.
3. Online PLD supports teacher agency.

These three assertions have evolved from the responses to the research questions, as articulated in the discussion below, and are encapsulated within the conceptual framework developed through the research. Therefore, through these three assertions, the importance and significance of the conceptual framework developed through this research, with its informing factors and design considerations, is highlighted. While there has been a gradual increase in availability of online PLD over the past decade, the COVID-19 global pandemic has resulted in a rush to move the majority of teacher PLD online (Schleicher, 2020; United Nations, 2020). This further highlights the need for a clearer and stronger understanding of

what is effective in online PLD, as well as understanding how online PLD supports teacher agency and professional growth.

Thus, in order to contextualise the discussion around these three assertions, the conceptual framework developed through this research is represented in Figure 5.1. This framework presents an understanding of the design considerations that are important when developing online PLD for effectiveness. The conceptual framework consists of three central parts: informing factors, constant design considerations, and variable design considerations. These areas are divided into further factors and considerations that support a nuanced and complex understanding of what should be considered when designing online PLD for effectiveness. It should be noted that while the figure is static due to the restrictions of print-based media, in practice it is dynamic because the information garnered through the informing factors influences the acceptable levels of the constant design variables and the changing levels of importance in the variable design considerations. This dynamic responsiveness to the informing factors, and thus the contextualised understanding of the participants and their purpose, is critical in designing and developing effective online PLD.
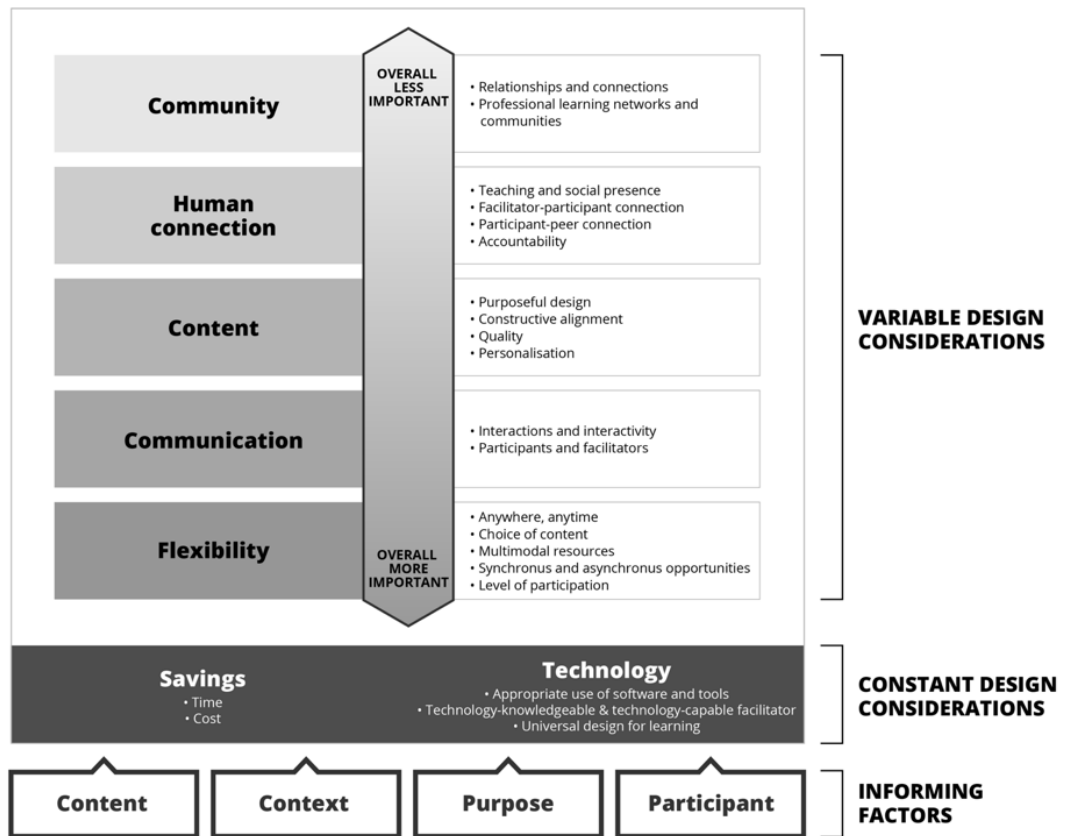
Figure 5.1. Conceptual framework of design considerations for effective online PLD. (Reproduced from Publication 3 for consistency and clarity.)

5.3 Assertion 1: Online PLD is different

5.3.1   Contextualisation

Kathy's story*

Being a teacher educator, I've seen firsthand how in-service teachers struggle with the apparent lack of connection to the professional learning and development activities that they are required to undertake in order to meet their registration requirements. In Australia, many schools support their teachers to maintain registration through providing mandatory PLD days at the beginning of each term. While this appears to be supportive of teachers, it is often perceived as a "tick-and-flick" exercise, with some school leaders going so far as to give a presentation that provides the answers to the required PLD knowledge reviews. Teachers have discussed this with me, and they see the PLD process as superficial. One teacher went on further to clarify her experiences with this collegial approach to PLD and her experience of an online PLD that she was required to complete because she could not attend the whole-school, in-person PLD day. She completed this PLD online on her own and found that she gained more from the online experience where she could take time to go deeper into the content being presented. Being older and somewhat tech-hesitant, Kathy was pleasantly surprised how much she enjoyed undertaking the PLD online and now seeks further opportunities to do so. However, she is often frustrated by the variability in the online PLD offerings and finds some opportunities more effective than others. In particular, she enjoys the flexibility that online PLD provides, as well as the opportunities to connect with likeminded colleagues in other contexts. From my perspective, if we can support in-service teachers to have consistently positive experiences with online PLD, then these could be more effective in supporting them to continue to evolve as teachers.

* Pseudonym used to retain anonymity.

This teacher story came to light through the focus groups, and it highlights that online PLD is different to in-person PLD. It further reinforces the findings from the SLR and the online survey. Although Kathy was initially hesitant to undertake PLD online, she needed to do it this way in this instance. Through this required

engagement with online PLD, Kathy has found that it can be an effective way of engaging with PLD opportunities. She also finds certain characteristics of online PLD to be more important than when undertaking PLD in-person, e.g., flexibility, quality, professional communities, and professional networks. Through this teacher story, it can be identified that online PLD is different to in-person PLD, and it requires different considerations when designing for effectiveness.

5.3.2   Supporting findings

Overall, the findings that support this assertion are found in the analyses of all data collection phases and in the responses to all research questions. Specifically, the findings from the SLR discussed in Chapter 2 and Publication 1 identify two critical aspects of the theory and practice around online PLD. First, there is little reported theory on what constitutes effectiveness in online PLD. Second, there is a lack of consistency in the design and development of online PLD, particularly with using an underpinning framework or theory to support the design decisions when such guidelines exist for in-person PLD. These two inherently interrelated aspects indicate a lack of knowledge and consensus about how to design online PLD for effectiveness. While some literature reports the use of the elements of effective in-person PLD as their design foundation (Dede et al., 2009; Prestridge, 2017), others do not and use online learning frameworks (e.g., Holmes et al., 2011), and yet other reported online PLD does not clearly identify their design foundations (e.g., Boloudakis et al., 2018; Wambugu, 2018).

In concert with this, the findings from the online survey (Chapter 3 and Publication 2) and the online focus groups (Chapter 4), which respond to research questions two and three (discussed in Chapters 3 and 4), further support this notion that online PLD is different. The teachers who discussed their experiences and perceptions of online PLD in this research identified that their needs were different in the online context and that elements such as flexibility, choice, and purpose were critical to the effectiveness of the online PLD. Through identifying and articulating these needs, the teachers have determined that the online environment is different to the in-person environment, and what is effective for in-person does not indicate that it is effective online.

Combining the findings from the theory discussed in Chapter 2 and the lived experiences of in-service teachers discussed in Chapters 3 and 4, it becomes clear

that online PLD is fundamentally different in its conceptualisation and experience. Through this clear identification that online PLD is different to in-person PLD, it is natural that the elements that comprise effectiveness for online PLD are also different.

5.3.3 Affordances and challenges of online PLD

The literature has reported researchers' attempts to transfer the concepts of in-person PLD to online PLD (Dede et al., 2009; Herrington et al., 2009; Prestridge, 2017), yet it cannot be a simple transfer or translation because the environment differs in fundamental ways through its inherent affordances and challenges (Bakir et al., 2016; Boloudakis et al., 2018; Bragg et al., 2021; Ní Shé et al., 2019; Oddone et al., 2019; Qian et al., 2018). This difference results in subsequent differences in the informing factors and design considerations for online PLD, and it widens the gap between what is suitable for in-person PLD and for online PLD. While there are numerous differences, and listing them is out-of-scope for this discussion, it is important to understand that the foundational environment and delivery is different. For example, when presenting in-person PLD, the facilitators are performing and presenting content in the moment with immediate responses (Kennedy, 2016). These instantaneous and synchronous responses to the different participants and discussions that are occurring in real time require responsivity in the facilitators' skills and knowledge, despite the levels of preparation and experience of the PLD facilitators. Together with this, the participants are often required to engage in real time with expectations placed on this engagement. In this way, in-person PLD is much like a performance on a stage where timely and appropriate responses from both facilitators and participants are critical. However, due to its more asynchronous nature, online PLD provides space and multiple opportunities to prepare, write and rewrite, record and rerecord, define and redefine (Oddone et al., 2019). It also allows participants to slow down or speed up the delivery of the content according to their needs. While online PLD allows space for both facilitators and participants to formulate responses and engagement strategies, in-person PLD cannot allow this due to the constraints of it being synchronous and in real time.

Online PLD also offers affordances and challenges that are closely related to technology: an affordance is that participants can be directed to external content and resources, and its mirroring challenge could be bringing the participants back to the

PLD space. Another affordance could be allowing participants extended time to engage with the content, resources, and learning activities, but its mirroring challenge is determining the participants' engagement in these. When facilitating in-person PLD, gauging the reactions of the participants and determining whether they are engaging with the PLD can be achieved using non-verbal cues in real time, and the PLD facilitators can proactively respond to increase engagement. However, this responsiveness to participant engagement and reactions is difficult in the online environment when the participants are often engaging asynchronously and when the non-verbal cues of the participants are less visible. Furthermore, an additional challenge of the asynchronous delivery is a reduced awareness of participant reactions, and thus it requires increased facilitator visibility and opportunities for human connection and communication.

The findings from the online survey and online focus groups also identified that this aspect of human connection is an important characteristic that exists when undertaking in-person PLD but is often lacking in online PLD, e.g., "Fewer personal interactions" (P4), "lack of help from a tutor" (P22). Conversely, as reported by in-service teachers through the online survey and focus groups, when participants can choose their time to engage with the online PLD, it is more likely that they will choose a time when they can engage productively, e.g., "fitting in with my schedule" (P1), "You can fit it in whenever" (P20). PLD participants and facilitators are also able to use more time to consider the content being presented and formulate responses to or queries about the PLD, e.g., "You can often pace them" (P2). These representative differences between in-person and online PLD provide the broader context within which the conceptual framework of design considerations can be understood as being imperative to the development of effective online PLD. Furthermore, a heightened awareness of the differences inherent within each online PLD through identifying and considering the informing factors is critical in the development of effective online PLD.

5.3.4 Implications

With these significant differences between in-person and online PLD, it follows that the elements of effective PLD differ between them as well. The literature has attempted to address this through recognising technology as an important element of online PLD (see, for example, Bragg et al., 2021; DeMonte,

2013; Quinn et al., 2019; Starr & Kurz, 2020). However, this focus on technology has centred on its appropriate use rather than understanding how the online environment changes the foundations of effective PLD. The conceptual framework developed through this research and founded on the responses to all research questions presents a new way to understand what should be considered when designing online PLD for effectiveness. The four informing factors and seven design considerations provide a more nuanced conceptualisation of the complex nature of designing online PLD for effectiveness. However, they do not disregard the established elements of effective in-person PLD, which are active learning, coherence, collaboration, content focus, and sustained duration. Excluding the duration element due to its complexity in the online environment, these elements for effective in-person PLD are deeply embedded within the conceptual framework, as discussed below in Section 5.4.

5.3.5   Summing up Assertion 1

Online PLD should focus on design considerations that are specific to the online environment when being developed for effectiveness. Using the informing factors to provide the environmental considerations, the design considerations need to be understood at their varying levels of importance aligned with the different purposes of the online PLD. This variability in the design considerations results in there being no 'one-size-fits-all' approach to effective online PLD design and development (Kennedy, 2016; Mayer & Lloyd, 2011; Morris, 2019; Oddone et al., 2019; Overstreet, 2017; Qian et al., 2018), and the impact of the informing factors is critical. This shows that online PLD is different to in-person PLD and should therefore be designed differently from the foundations of the informing factors through to the design considerations.

5.4 Assertion 2: Effective online PLD is complex

5.4.1 Contextualisation

> *Jamie's story**
>
> *Jamie's professional growth as a teacher has taken many turns, and she understands that her professional needs have changed as she has moved through her career from a graduate teacher to an experienced teacher. As a graduate teacher, Jamie relied on her school to help direct her professional growth as a teacher because she wanted guidance on how to continue her learning and find her path as a teacher. However, as she grew into her teacher-self more, she began to find that her PLD needs were becoming more complex as her teaching priorities changed. When Jamie was undertaking the mandatory PLD activities to maintain her registration, all she wanted was to "get it done" and "tick the box". So, she wanted maximum flexibility with minimal interaction and communication, where possible. In contrast, when she was learning about a new classroom management technique, Jamie wanted a degree of flexibility, but it was more important to have conversations with her colleagues to delve deeper into the new techniques. In this way, Jamie's needs changed when undertaking different types of PLD for different purposes: she found that different aspects of PLD had different levels of importance and there was no clear "one size fits all" when undertaking new or complex PLD. This was particularly reflected when Jamie sought out online PLD opportunities that would support her evolving PLD needs. Added to this, when Jamie realised that she had less influence over in-person PLD, she began to actively seek out online PLD due to its flexibility in content, timing, and participation as well as other benefits such as savings and ability to connect with other like-minded teachers.*
>
> ** Pseudonym used to retain anonymity.*

Jamie's story is an amalgamation of the lived experiences that the in-service teachers shared and discussed during their online focus groups. One teacher would share one part of their PLD story, and the other teachers would agree with and expand on it. There were points of difference in the shared stories, but the overall impressions retained consistent quality, content, and meaning. These stories continued as a way of examining their online PLD perceptions and experiences in

more depth during the online focus groups. Being a representation of the teachers' lived experiences of both online and in-person PLD, it clearly showcases the complexity of online PLD and how the content, context, and purpose change what teachers need in online PLD to make it effective for them. This adds further nuance and complexity to the understandings of effective online PLD.

5.4.2 Supporting findings

In line with the notion that online PLD is different to in-person PLD discussed above in Section 5.3, it follows that what constitutes effectiveness also differs. The findings from the SLR discussed and analysed in Chapter 2, the online survey presented in Chapter 3, and the online focus groups presented in Chapter 4, together with the holistic responses to the three research questions contained within Chapters 2, 3, and 4, reinforce this difference through the identification of a vastly different set of seven design considerations when designing for effective online PLD. These design considerations, together with their constituting components and the informing factors, create a more complex understanding of how to design online PLD for effectiveness. However, these informing factors and design considerations do not ignore the elements of effective in-person PLD; rather, they have deeply embedded these elements within the conceptual framework.

It has been well established that in-person PLD requires consideration of five elements for effectiveness: active learning, coherence, collaboration, content focus, and sustained duration (Cirkony et al., 2021; Morris, 2019; Oddone et al., 2019; Quinn et al., 2019; Sandholtz & Ringstaff, 2020; Starr & Kurz, 2020). Of these five elements, four are deeply embedded within the informing factors and design considerations for effective online PLD as components rather than distinct elements. The following presents a discussion of the connections and disconnections between the elements for effective in-person and online PLD, which leads to the more nuanced presentation of the complexity of designing online PLD for effectiveness considering three different types of online PLD.

5.4.3 Connecting the elements of effective in-person PLD and online PLD

Active learning is defined as the active engagement of participants in a PLD opportunity as opposed to passively receiving information, for example, rather than only reading content, participants would be asked to use the content as part of a learning activity (Cirkony et al., 2021; Desimone, 2009). This is considered to be

central to learning and developing new skills, particularly from a social constructivist perspective, and it is reflected in three of the design considerations presented in the conceptual framework. Therefore, rather than being a single effective element in itself for online PLD, it is further nuanced for the online environment to have impact within the design considerations of communication, content, and human connection. That is, within the communication design consideration, the first component refers to the interaction and interactivity of the online PLD opportunity, and this component includes the notion that communication is an active process that should be designed into the opportunity. Next, the content design consideration implies active learning through the purposeful design, constructive alignment, and personalisation components. Finally, the human connection design consideration has active learning embedded within the presence, connections, and accountability components. Therefore, while active learning is not explicit in the design considerations, it is embedded within the model as a foundational part of the design.

The element of content focus for effective in-person PLD refers to the PLD focusing on subject matter content and specific methods to teach this content (Darling-Hammond et al., 2017; DeMonte, 2013; Desimone, 2009; Guskey, 2014; Quinn et al., 2019). While this is not explicitly reflected within the design considerations in the conceptual framework, it can be inferred within the flexibility design consideration as the choice of content component indicates that teachers will pick and choose what they want to focus on in their online PLD. An important part of the flexibility design consideration is that participants have choice and agency in their PLD: they can choose to engage with specific content areas. Furthermore, within the content design consideration, the ability to personalise the content to focus on their specific needs can be perceived as containing part of the understanding that the in-person PLD component of content focus holds. However, this is a very fluid understanding of how the content focus from effective in-person PLD is represented within the conceptual framework. It should be noted that the content design consideration refers to more than the discipline knowledge and pedagogy.

For effective in-person PLD, coherence is important. Coherence refers to the extent to which there is alignment between the teachers' learning and the teachers' existing knowledge and beliefs (Darling-Hammond et al., 2017; DeMonte, 2013; Desimone & Garet, 2015). However, its importance for effective online PLD is

heightened due to the ease of disengaging in the online environment when it lacks coherence. Due to this, the element is not specifically included within the conceptual framework because it is embedded deeply within the notions of designing online PLD with the informing factors. The informing factors provide environmental information, which includes understanding the participant factors such as prior knowledge, assumptions, and beliefs, as well as the context within which the PLD is being offered. Using the informing factors to support the design consideration decisions, such as selecting content that might extend teacher learning or challenge teacher beliefs, the notion of coherence is embedded within the conceptual framework.

Collaboration is the element of effecting in-person PLD that refers to teachers working together to learn more about the content being presented. It is also referred to as collective participation, but this is where teacher groups (e.g., from the same school, grade, or department) undertake the same PLD opportunity and work together to complete it (Darling-Hammond et al., 2017; Desimone, 2009; Yoon et al., 2007). In the conceptual framework of design considerations for effective online PLD, the collaboration element is not included specifically but can be designed in when considering the informing factors of context and purpose, as well as within the design considerations of human connection and community. This deeper embedding of the notion of collaboration allows greater flexibility to design and develop online PLD opportunities to best serve the informing factors with explicitly requiring elements that may not be suitable for all PLD opportunities.

The fifth element of effective in-person PLD refers to the duration of the PLD opportunity. It has been suggested that 14 hours is the minimum amount of time for effective in-person PLD (Cirkony et al., 2021; DeMonte, 2013; Desimone & Garet, 2015; Quinn et al., 2019; Yoon et al., 2007), but this is not reflected in the conceptual framework for effective online PLD. When delivering PLD in an online environment, it can be difficult to determine the duration of the opportunity as the time and pace are often flexible, which is part of the flexible design consideration of effective online PLD. When delivering in-person PLD, the duration can be easily determined by the amount of time that is spent in the in-person environment. However, in the online environment, PLD participants can spend more time on content and activities where they want, or they can spend less time and move through

content and activities faster than the PLD designers could predict. Therefore, the duration element becomes more complex in the online PLD environment, and it is more important to design PLD for effectiveness based on the informing factors and design considerations than to focus on a specific amount of time.

In general, the elements of in-person PLD that have been consistently identified in the literature as effective (i.e., active learning, coherence, collaboration, content-focused, and sustained duration) are deeply embedded within the conceptual framework developed through this research. The embedding of these elements within the informing factors and design considerations indicates their foundational importance, but also that online PLD requires a different focus that is more aligned with the online environment and its affordances and challenges. This reflects the key differences between the in-person and online environments through the more nuanced understanding of what should be considered when designing and developing online PLD for effectiveness.

5.4.4 Changing levels of importance in the variable design considerations

Using this more nuanced understanding of the design considerations, a further level of complexity for designing online PLD is the changing level of importance in the variable design considerations. The five variable design considerations of flexibility, communication, content, human connection, and community vary in their level of importance in relation to the informing factors, with a particular emphasis on the purpose of the online PLD. PLD typically falls on a continuum from performative to developmental PLD, with varying degrees along this continuum (Kennedy, 2015; Qian et al., 2018; Quinn et al., 2019). During the online focus groups, the in-service teachers identified three broad types of PLD in which they engage: knowledge refresh, knowledge development, and knowledge extension.

In a knowledge refresh online PLD, the content is typically already known, but the participant is required to complete a refresher to maintain currency or update to recent changes. The context and purpose of this could be the mandatory yearly content refresher PLD that is offered by administrative bodies to ensure compliance with registration, accreditation, or government bodies. The participants themselves might see this type of PLD as a requirement that they need to complete to 'tick a box'. In this case, the design considerations of flexibility and content are critical,

while there is comparatively little emphasis on communication and human connection, and a very low importance for community. Overall, this type of online PLD may be compliance-oriented and not acquiring new skills or new knowledge: it simply refreshes existing knowledge and may update it slightly. Given this content, context, and purpose, participants in this type of online PLD are likely to want to complete it with maximum flexibility and minimal interaction with others.

The knowledge development type of online PLD indicates an online PLD that is designed to provide foundational knowledge and develop knowledge from a basic understanding. Therefore, the content is critical, with flexibility, human connection, and communication also being very important. The design variable of community has a lower importance than the other four design considerations, but it is still high because this type of online PLD may be an entry point to a professional community and may support the induction of new professionals into the profession. An example of this type of online PLD is when a teacher is training to be specialist, e.g., a primary teacher specialising in English as a Second Language. With this content, context, and purpose, participants are likely to highly value interactions and communication with others along with flexibility and content.

In a knowledge extension online PLD, the participants typically possess a solid foundation of knowledge about the content presented and this PLD will extend that knowledge. The context and purpose can be that the teacher is continuing a specialisation in order to become more knowledgeable and senior in their context. In this type of online PLD, content is critical, as is flexibility. Communication and human connection are also important as these teachers may have more nuanced understandings and complex interactions. Community is more important than in the other types of online PLD, but its importance remains below that of the other variable design considerations. Considering this content, context, and purpose, the participants in these types of online PLDs are likely to be seeking deeper discussion and explore the content in more complex ways.

5.4.5 Implications

These example types of online PLD and their varying levels of importance in the variable design considerations, together with the more nuanced understanding of these considerations, demonstrates the inherent complexity of designing online PLD for effectiveness. This complexity results in the need for PLD developers to carefully

consider the informing factors in order to appropriately determine the level of importance of each variable design consideration, which then informs the overall online PLD design. Therefore, the implications of online PLD being complex include that it requires a clear framework of design considerations and that these need to be understood and explored in context. It also reiterates that existing PLD design frameworks cannot be simply transferred or translated to the online context, because online PLD is different to and more complex than in-person PLD. Therefore, given this context and understanding that online PLD is complex, the conceptual framework developed through this research is of critical importance for effective online PLD.

5.4.6 Summing up Assertion 2

Through this assertion, it is clearly visible that designing and developing online PLD is not a simple process, but rather it requires careful consideration of the informing factors which subsequently impact the design considerations. The depth of nuance in the design considerations enables online PLD designers and developers to create online PLD with effectiveness at the forefront of all considerations. The deep embedding of the five elements of effective in-person PLD also demonstrates that these elements are fundamental to the deep understanding of effective online PLD. Using the three different types of online PLD as examples of how the levels of importance may change according to the context further illustrates the inherent complexity of online PLD.

5.5 Assertion 3: Online PLD supports teacher agency

5.5.1   Contextualisation

> ### *Mike's story**
>
> *Teachers are the recipients of many good intentions with PLD, but rarely are they consulted and feel heard before the PLD opportunity to find out what they really want to know or would like support with in their teaching. In conversation with a mid-career teacher, he shared one of his stories about being frustrated with the PLD days planned for the beginning of each term. In his school, he is the English as a Second Language (ESL) teacher and works across multiple classrooms and student groups. His role is a specialist role, and many of the mainstream teachers do not fully understand it. This is amplified when he attends the whole-school PLD days at the beginning of each term. These PLD days are typically designed with the mainstream teachers in mind, and he often finds the topics presented to be irrelevant to his teaching context within the school. Furthermore, when he is collaborating with other teachers during the PLD activities, he spends much of his time explaining to others his teaching context and not on the topic at hand. He expressed a desire to be able to tailor these PLD days to his needs, or to have them be more flexible through offering them online so that he could engage with the parts that meet his needs. ESL teachers and other specialist teachers are not uncommon in Australian school settings and supporting them in their professional growth through appropriate PLD is important. Through enabling teacher agency and teacher choice, online PLD can be more effective and support teachers to direct their own professional growth.*
>
> ** Pseudonym used to retain anonymity.*

Mike's story was shared in an online focus group in which he went into detail about his frustrations around his school-based, mandatory PLD sessions. As he shared this story, the other teachers agreed on points and commiserated with his situation. This story illustrates the frustration that teachers can experience when undertaking PLD that is not aligned with their teaching focus or professional growth aspirations. It also signals the teacher's desire to take greater ownership and control over their professional growth. Fortunately, Mike has identified that online PLD

opportunities are more flexible and allow him greater choice and agency in his professional growth.

5.5.2 Supporting findings

The findings from the online survey presented in Chapter 3, and reiterated through the online focus groups discussed in Chapter 4, revealed that teachers regularly use online resources and opportunities for their self-directed PLD and to support their work. They use these online resources and opportunities because they are able to select the content and activities that they want to engage with and that are relevant to their needs. In this way, the teachers have agency in their PLD journeys and are better able to direct their professional growth to align with their professional needs. However, as uncovered in the additional findings in Section 3.4, while these teachers undertake various PLD activities online, they are yet to perceive the structured online PLD opportunities as effective when compared with in-person PLD. This results from the teachers' perceptions that online PLD often lacks the teachers' desired levels of human connection and flexibility. Teachers also identified the current difficulty in selecting appropriate online PLD due to the varying levels of quality and the difficulty in determining which ones would be worthwhile investing their time in. However, they remain eager to engage with online PLD as a way to support their professional growth and to allow them greater agency in their own professional learning journeys. These findings are all connected with teacher agency, which is also embedded in the responses to the second and third research questions.

5.5.3 Teacher agency increases effectiveness

It is well known that teacher PLD has come under significant criticism for failing to deliver improvements in teaching practice and student learning outcomes (Bragg et al., 2021; Calvert, 2016; Desimone & Garet, 2015; Oddone et al., 2019; Wild et al., 2018). From an administrative perspective, the funding spent on teacher PLD has not seen significant improvements in student learning outcomes (Calvert, 2016; Sandholtz & Ringstaff, 2020). From the teachers' perspective, PLD is often criticised for being compliance-focused rather than true learning that can lead to professional development (Kennedy, 2016; Morris, 2019; Oddone et al., 2019; Sandholtz & Ringstaff, 2020; Wild et al., 2018). The methods of delivering PLD have also been often criticised for being touted as one-shot panaceas for any issue encountered in schools (Desimone & Garet, 2015; Morris, 2019; Oddone et al., 2019;

OECD, 2019a). The literature has long argued that teacher PLD needs to be effective so that schools and schooling can be improved (Guskey, 2002; OECD, 2019c; Starr & Kurz, 2020; Zhang et al., 2019). Much research has been undertaken to identify how to make PLD effective, and while the elements of effectiveness have been identified for in-person PLD (see, for example, Cirkony et al., 2021; Darling-Hammond et al., 2017; Quinn et al., 2019), the teachers' agency in their PLD journeys has emerged (Calvert, 2016) as an influential element in the overall effectiveness of PLD that should be investigated further.

Teacher agency, defined as "the capacity of teachers to act purposefully and constructively to direct their professional growth and contribute to the growth of their colleagues" (Calvert, 2016, p. 4), has had a resurgence in relation to PLD (Calvert, 2016; Oddone et al., 2019; Wild et al., 2018). Calvert (2016) identified that agency is important in supporting teachers in their professional learning and growth, and that it could be the missing component that could create positive associations with the PLD activities that teachers undertake. There is increasing recognition that teacher agency is one of the influencing factors that supports the effectiveness of PLD opportunities (Lopes & Cunha, 2017; Oddone et al., 2019; Prestridge, 2017; Wild et al., 2018), and it sits on the foundation that, when combined with collaboration and active learning, it can create enduring changes in teaching practice (Desimone & Garet, 2015). Therefore, the findings that teachers desire choice in their PLD and actively seek online PLD resources and opportunities indicates that they are purposefully directing their professional growth and self-advocating for their needs in the online environment.

The online environment provides many affordances and opportunities for teachers to self-direct their professional growth and PLD journeys. Of particular note, online PLD has one key affordance that in-person PLD lacks: flexibility in its fully nuanced understanding. This nuanced understanding of flexibility in online PLD includes the timing and pace, the choice of content, the multimodality of resources, the opportunities for synchronous and asynchronous participation, and the level of participation. The online environment enables this flexibility which supports teacher agency through allowing teachers to make choices about their professional growth. These choices enable teachers to have greater agency over their professional learning and their subsequent professional development. When the element of

flexibility is combined with the notions of collaboration and active learning, online PLD has the ability to provide opportunities for teachers with agency to self-advocate and to opt-in and opt-out of PLD that aligns with their needs and interests. However, the findings indicate that although online PLD enables greater self-advocacy and agency, teachers remain reluctant to fully engage in online PLD because they experience varying levels of quality and perceived effectiveness in these opportunities. Therefore, understanding how to design online PLD for effectiveness through understanding teacher perceptions, practices, and preferences underpins the ability for online PLD to support teacher agency.

To this end, the identified design considerations of flexibility, communication, human connection, and content provide online PLD designers and developers with the ability to embed teacher agency within the PLD activities and opportunities. Flexibility, as discussed above, allows for teachers to guide their professional growth journeys in a proactive and supportive way in order to meet their professional wants and needs. The design considerations of communication and human connection enable the collaborative participation of teachers in their PLD through actively engaging with the content, learning activities, and their peers. Furthermore, the content design consideration takes into account the purposeful design and active engagement of teachers within the PLD. In concert with these design considerations are the changing levels of importance discussed in Section 5.4 as part of the complexity of effective online PLD. Incorporating these changing levels of importance into online PLD design further supports teacher agency through improved understanding of teacher needs and purposes in undertaking the PLD, which can result in greater effectiveness. Using these nuanced understandings of the design considerations together with their changing levels according to the purpose, online PLD can support teacher agency when effectiveness is at the forefront of the design.

5.5.4 Implications

The ability for online PLD to support teacher agency is significant in two key ways: (1) it enables teachers to become more proactive and to self-advocate for their professional growth, and (2) it provides avenues for PLD developers to design-in more opportunities for agency in order to achieve greater effectiveness in online PLD. As Calvert (2016) notes, the notion of teacher advocacy lies on an engagement

continuum with traditional PLD at one end representing little opportunity for agency and the emerging PLD environments at the other end positioning teachers as active, constructive participants in their professional growth. The online environment sits in the emerging PLD environments end of the continuum because it supports both teacher self-advocacy and teacher agency, while providing PLD developers with more affordances to enable this agency through the design considerations. In this way, using the conceptual framework for effective online PLD that has been developed through this research, with particular emphasis on the flexibility, communication, human connection, and content design considerations, online PLD can be designed to support teacher agency and increase the effectiveness of PLD.

5.5.5 Summing up Assertion 3

Teacher agency has emerged as a part of effective in-person PLD, and online PLD offers teachers great agency due to its inherent nature that includes flexibility, choice, and variety. This is reflected in the nuanced design considerations of flexibility, communication, human connection, and content, which inherently contain teacher agency affordances. Through these design considerations and recognising how they support teacher agency, the conceptual framework developed through this research further supports effective online PLD and teachers' professional growth.

5.6 Significance of the three assertions

The significance of these three assertions is held in two key areas: in theory and in practice. First, these three assertions advance the understandings of effective online PLD through identifying that it is different and more complex than in-person PLD, and that it can support teacher agency. This expands the knowledge around effective online PLD (Bragg et al., 2021; Powell & Bodur, 2019; Quinn et al., 2019) and advances the conversation in the literature (Bragg et al., 2021; Cirkony et al., 2021; Dede et al., 2009). Furthermore, the perceptions and experiences of teachers that have been embedded within these assertions also increases the visibility of teachers and adds greater nuance to what constitutes effectiveness from their perceptions and experiences. Through incorporating the teacher voice, these assertions embed themselves within the PLD literature where the PLD is being done 'with' the teachers: the online PLD opportunities are being designed with the teacher voice (Calvert, 2016; Overstreet, 2017).

Second, the significance of these three assertions for practice relate to the use of the conceptual framework, particularly by online PLD designers and developers. Through understanding that online PLD is different, more complex, and can support teacher agency, online PLD designers and developers can create online PLD opportunities that are more effective for the teacher participants (Bragg et al., 2021; Powell & Bodur, 2019). Furthermore, with the embedded teacher voice, the online PLD can be designed in a way that mirrors PLD being undertaken with the teachers, not imposed on the teachers.

5.7 Summary

The three assertions stated here have been extrapolated and synthesised from both the data collection findings and the responses to the research questions. Each assertion is a reiteration of why it is important to advance the understanding and research into what constitutes effective online PLD. From a foundational level, in order to more fully understand why this is important is understanding that online PLD is different to in-person PLD. Without this foundational understanding, then the significance of this research may be underestimated. The second assertion that online PLD is complex furthers the first through expanding the conceptualisations of online PLD and what constitutes effectiveness in this environment. It provides greater depth and nuance to the discussion and reiterates that online PLD differs to in-person PLD. The third assertion of online PLD supporting teacher agency is directly connected to the emerging element of teacher agency in effective in-person PLD. As teacher agency is embedded within the affordances of the online environment, online PLD supports it when designed accordingly using the conceptual framework of design considerations developed through this research. Through engaging with these three assertions and understanding how they support the underpinning notions of effective online PLD, the potential of online PLD can be further realised and the significance of this change can be embedded.

In this chapter, a discussion of three assertions that arose when the research question responses were synthesised and considered in unison has been presented. The elements of effective in-person PLD are well established, but those for online PLD have been elusive until now. Understanding that the online PLD environment is different and requires different design considerations than an in-person environment is the first step towards recognising the inherent complexity of online PLD. Through

these two assertions, online PLD can be understood as different and complex, which is important in determining what should be considered in order to develop it with effectiveness at the forefront of the design. In conjunction with these two assertions, the ability for online PLD to provide greater teacher agency further supports the effectiveness of online PLD. Therefore, the conceptual framework of design considerations for effective online PLD developed through this research using both theory and teacher practice provides a stronger foundation for better understanding what comprises effectiveness in online PLD and how it can be designed to further support teacher agency. The next and final chapter concludes this narrative by presenting a summary of the key findings in relation to the research questions, the contributions to the field of PLD, the research limitations, recommendations, and a concluding statement.

Chapter 6: Conclusion

6.1 Introduction

This chapter concludes the narrative presenting this research. It highlights the key findings and contributions to the PLD field. It also provides insights into the limitations of the research, further research opportunities, and recommendations emerging from the research. In presenting this conclusion, this chapter provides a cohesive summary of the research project and subsequent findings.

6.2 Research overview

This research investigated what constitutes effective online PLD in an effort to identify the design considerations that support online PLD to be considered effective for in-service teachers. The following three research questions were established to achieve this goal.

RQ1.   What constitutes effective online professional learning and development for in-service teachers in the empirical literature?

RQ2.   What are in-service teachers' (a) understandings of, (b) behaviours concerning, and (c) perceptions and experiences of effective online PLD?

RQ3.   What should be considered when designing effective online professional learning and development for in-service teachers?

In seeking to answer these three research questions, the research progressed with three phases of data collection and three resultant publications. Each publication addressed one research question. The first research question was investigated through a systematic literature review (SLR) using the Prisma workflow (Moher et al 2009). The SLR focused on determining what had been identified in the empirical literature as effective online PLD. The findings were reported in the first publication submitted as a journal article and were applied in the development of the online survey, which was used to explore the second research question. The online survey asked in-service teachers to respond to a range of Likert-scale and open-ended questions to determine their perceptions of, practices around, and preferences in online PLD. This brought the teacher experience into the data collection. Based on the findings of the online survey, the second publication was developed to respond to the second research question. The findings from the online survey were also used to guide the question prompts in the semi-structured online focus groups, which were

the third phase of data collection. The findings from these online focus groups, together with those from the systematic literature review and online survey, were triangulated and synthesised to respond to the third research question. This culminated in the development of the conceptual framework of design considerations for effective online PLD, which was presented in the third publication. In this way, the research questions were investigated as independent yet connected questions with the iterative development of a more holistic and nuanced understanding of what comprises effective online PLD for in-service teachers.

6.3 Key achievement and findings of the research

The key achievement of this research is the identification and clarification of the design considerations for effective online PLD and their relationships as discussed in Section 6.3.3 and depicted in the conceptual framework in Figure 6.3. The key findings from each research question were synthesized to develop this conceptual framework of design considerations, and thus it encapsulates the findings from all data collection phases and research questions. The findings from each research question are presented explicitly below.

6.3.1   Research question 1

The first research question posed was "What constitutes effective online professional learning and development for in-service teachers as identified in the empirical literature?" The SLR was used as the data collection tool to respond to this question. Through this data collection and the subsequent analysis, it was found that there are four key elements that are important to the effectiveness of online PLD, which directly responds to the research question posed. These four elements in order of prevalence in the empirical literature are connection, communication, community, and flexibility. These four elements differ to those identified as effective for in-person PLD, which indicates that online PLD is different (Assertion 1) and requires a different understanding of what constitutes effectiveness. These four elements were detailed in the first publication, which was presented in Chapter 2, and are described briefly here.

- *Connection*: This refers to two types of explicit or direct connection: between people (participants and facilitators) and between the PLD content and the participants' context.

- *Communication*: This refers to the visibility and depth of communication among participants and facilitators. It is based on interactions and interactivity. It includes communication and interaction between participants, facilitators, and learning activities.

- *Community*: This refers to the relationships and connections that can be created in online environments to support interactions among participants and facilitators, development of professional networks within and outside the online PLD opportunity, and professional learning communities.

- *Flexibility*: This refers to the ability for participants to engage and interact with the PLD content and activities that they choose to at a time and place that suits them.

Figure 6.1 depicts these four elements with their constituting parts. Note that the less prevalent element is at the top and the most prevalent is at the bottom. This ordering was chosen to indicate that the more prevalent elements appear to be more foundational in supporting the effectiveness of the online PLD.

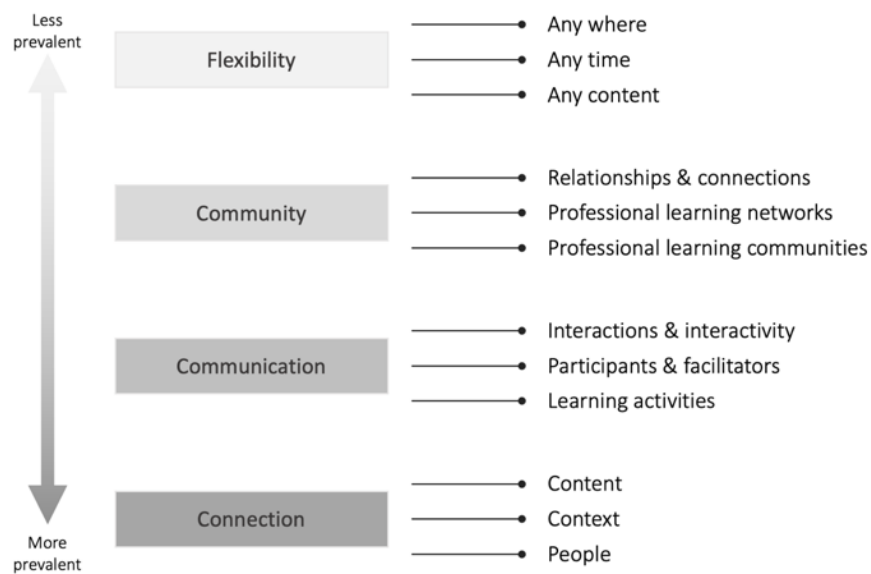

Figure 6.1. Key findings in response to the first research question. (Reproduced from Publication 3 for consistency and clarity.)

6.3.2   Research question 2

The second research question was "What are in-service teachers' (a) understandings of, (b) behaviours concerning, and (c) perceptions and experiences of effective online PLD?" This research question focused on the teacher voice and

attempted to distil what matters to teachers when they are undertaking PLD online and is presented in detail in Chapter 3 together with its accompanying publication. An online survey was used to garner in-service teachers' responses to questions to discover how they understand, perceive, and experience online PLD. Their behaviours around online PLD were used to inform and provide context for these findings as the in-service teachers' practices can provide insights that may be otherwise hidden. These findings made explicit that effective online PLD is different (Assertion 1) and more complex (Assertion 2) than in-person PLD. It also articulated that in-service teachers consider online PLD as a way to gain greater agency in their professional growth (Assertion 3).

6.3.2.1 In-service teachers' understandings of online PLD

The online survey began with an open-ended question to garner in-service teachers' understandings of online PLD, which formed a lens through which to interpret the remainder of the survey responses. To start with, the in-service teachers' understandings of effective online PLD were somewhat limited to their experiences, and many simply responded with types of online PLD, e.g., webinars, online courses, online videos. Some responses indicated characteristics that they thought were indicative of what online PLD should offer, e.g., own time, own pace, flexibility. Overall, the in-service teachers' understandings of online PLD were informed by their experiences and tended towards identifying types and characteristics of online PLD.

6.3.2.2 In-service teachers' behaviours concerning online PLD

The next part of the survey asked teachers about their behaviours related to online PLD and it was affirmed that many undertake self-directed online PLD with different purposes, e.g., to better understand a concept, to learn a new teaching skill. It was found that teachers generally utilise online PLD for developing their teaching practice and pedagogical knowledge, while also broadening their professional networks through participating in online communities focused on teaching. This was complemented by most indicating that they complete the online PLD that they start and that they use online resources to support their teaching. These findings provide a foundation from which to understand how teachers behave in relation to and engage with online PLD resources and opportunities.

Together, the teachers' understandings of and their behaviours concerning online PLD were used to support the reflexive thematic analysis and subsequent synthesis of the data collected in the second part of the online survey.

6.3.2.3 In-service teachers' perceptions and experiences of effective online PLD

The second part of the survey responded to the perceptions and experiences of effective online PLD in the research question. The teachers reported on the advantages and disadvantages of online PLD, and then their perceptions around what makes online PLD effective for them. The teachers identified three advantages of online PLD as being flexibility, content choices, and savings in time and cost. They identified the disadvantages as being the lack of human connection, having too much or not enough flexibility, content-related factors, technical challenges, and lack of completion. The responses to the survey question on the elements that make online PLD effective reiterated some of the advantages and disadvantages. The identified elements were flexibility, human connection, content, savings, and technology, which are presented below in Figure 6.2 with their constituting components.

Overall, the response to the second research question was informed by the teachers' perceptions and experiences, and it resulted in the elements of effective online PLD being identified as depicted in the figure below. Note that the less important element is at the top and the most important is at the bottom. This ordering was chosen to indicate that the more important elements, as identified by the teachers, appear as foundational in supporting the effectiveness of the online PLD.
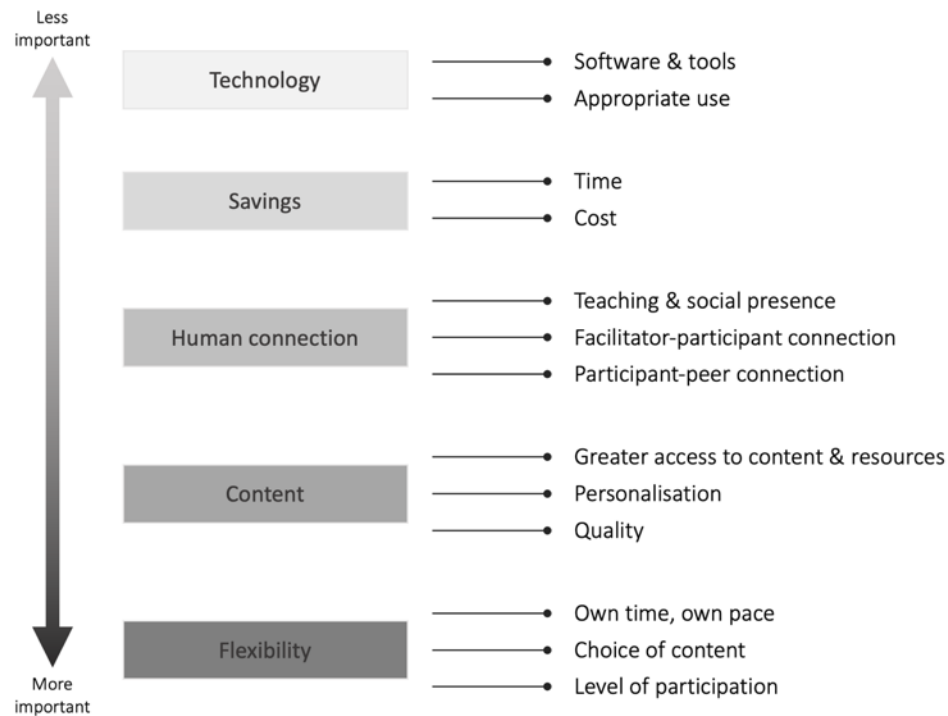
Figure 6.2. Key findings in relation to the effective elements of online PLD distilled from the online survey in partial response to the second research question. (Reproduced from Publication 3 for consistency and clarity.)

6.3.3 Research question 3

The third research question focused on determining what is important when designing online PLD for effectiveness: *What should be considered when designing effective online professional learning and development for in-service teachers?* The response to this research question was drawn from the three data collection phases in which elements that support effective online PLD were identified, analysed, and synthesised. The third publication included as Chapter 4 presents a more complete response to this research question. Through triangulating and synthesizing the identified elements of effective online PLD, a conceptual framework of design considerations was developed, as depicted in Figure 6.3 below.

This conceptual framework provides a concrete response to what should be considered when designing effective online PLD for in-service teachers. It also illustrates that online PLD is different to in-person PLD (Assertion 1) and that it is more complex (Assertion 2). The conceptual framework consists of four informing factors, two constant design considerations, and five variable design considerations. These have been defined and discussed in the third publication and are briefly

summarised here. Through these informing factors and design considerations, the conceptual framework supports greater teacher agency through embedding choice and flexibility into online PLD in ways that support teachers' professional growth (Assertion 3).

6.3.3.1 Informing factors

The informing factors provide contextual and environment information to support the design choices made in terms of the constant and variable design considerations. These informing factors also provide detail that can be used to change the level of importance of the variable design considerations.

- *Content*: This refers to the general content focus of the online PLD and the potential expectations of the participants in relation to this content. It does not include the elements of content that are discussed in the variable design consideration.

- *Context*: This considers the situation within which the online PLD is being undertaken and the potential environmental factors that will influence the participants' perceptions of the online PLD.

- *Purpose*: This is the reason for the participants to participate, for providing the online PLD, and for the intended learning outcomes.

- *Participant*: These are the factors that are related to the participants, e.g., their work context, their motivations for participation, their competing priorities, their general attitudes towards the online PLD.

6.3.3.2 Constant design considerations

The constant design considerations are the foundational considerations that all online PLD opportunities should consider. These are constant because they do not move or change significantly according to the informing factors, but the informing factors provide information regarding the minimum level that may be acceptable within the online PLD opportunity.

- *Savings*: This refers to the potential savings in time and cost that the participant might experience. These should be visible to the participant prior to engaging in the online PLD, but they can become more explicit through participation as well.

- *Technology*: This comprises three key aspects of appropriate use of software and tools, technology-knowledgeable and technology-capable facilitators, and universal design for learning. There is a baseline for these three aspects of technology below which the online PLD opportunity is more likely to be perceived as less effective.

6.3.3.3 Variable design considerations

The variable design considerations are those that have varying levels of importance in the online PLD opportunity depending on the informing factors. That is, while they maintain an overall hierarchy of importance from most important to least important as listed below, the degree to which they are important within that level varies in accordance with the type of online PLD being designed, as discussed in Section 5.4.4.

- *Flexibility*: This is critical in all online PLD opportunities, and it refers to more than flexibility in the anytime, anywhere delivery of the online PLD. It also includes flexibility in the choice of content, the resources through provision of multimodal resources, the opportunities to engage in synchronous and asynchronous activities, and the level of overall participation. Flexibility also enables teacher agency within the online PLD opportunity. This more nuanced understanding of what comprises flexibility is important to comprehend this design consideration more fully.

- *Communication*: This design consideration is twofold: it refers to the interactions and interactivity designed into the online PLD opportunity and the communication between the participants and facilitators. Due to the inherent nature of online PLD, communication needs to be specifically designed into the online PLD opportunity in order to support effectiveness from the participants' perspectives. This communication can occur through the learning activities and designed-in interactions, as well as between the participants and facilitators.

- *Content*: This variable design consideration refers to the purposeful design of the opportunity with clear constructive alignment. These two components support the perceptions of quality in the online PLD opportunity. The final component of content is the ability for a participant to personalise the content

to suit their context and purpose for participating in the online PLD opportunity. This personalisation component also supports teacher agency through allowing teachers to self-direct their professional growth within the bounds of the online PLD opportunity.

- *Human connection*: This refers to the participants feeling like they are not simply a number in a computer, but that they are a human and that there are humans facilitating the online PLD opportunity. This variable design consideration has four components including teaching and social presence, facilitator-participant connection, participant-peer connection, and accountability. Together, these components build the human connection that online PLD is often criticised for lacking.

- *Community*: While this variable design consideration is considered the least important for effective online PLD, it remains important because the overall context of the online PLD is connected with professional growth and developing professional connections, networks, and communities. It consists of two components that are interconnected but should be considered and designed specifically based on the informing factors. The first component is the relationships and connections that can be developed when professionals come together to learn. The second component is the professional communities and networks that can be formed through participation in an online PLD opportunity. These communities and networks can be internal or external to the online PLD opportunity, depending on the informing factors.
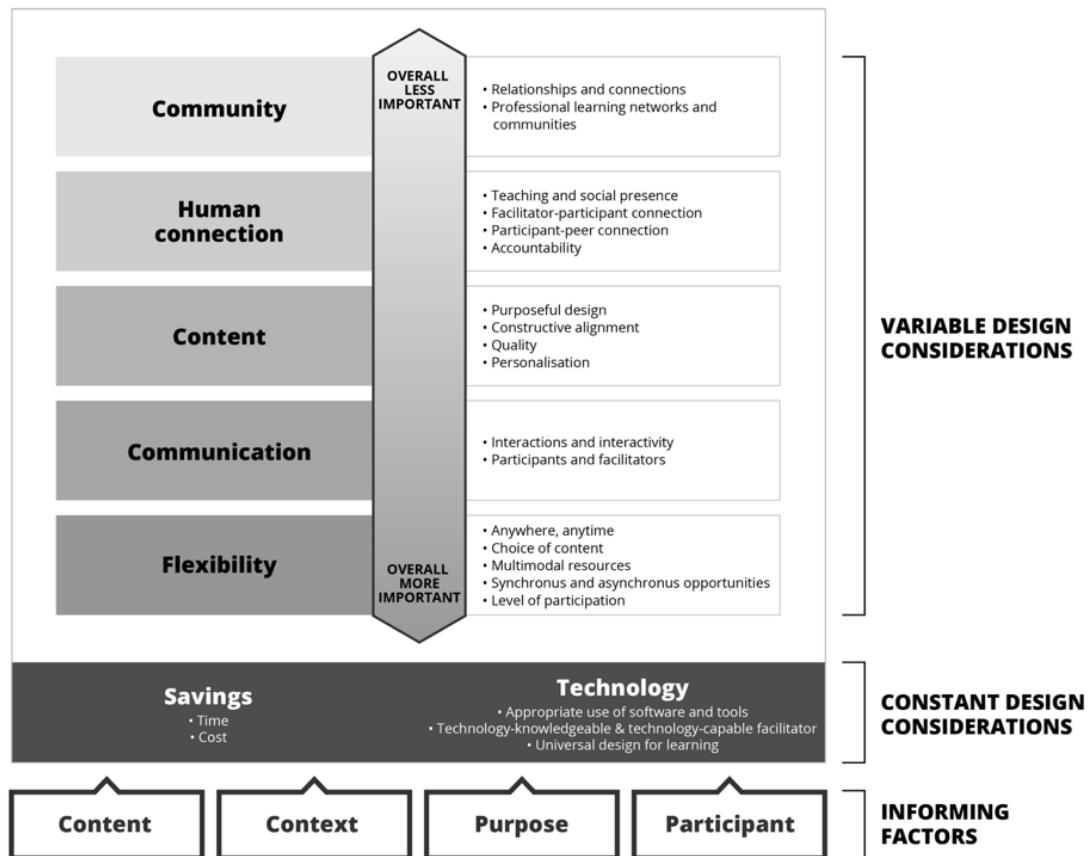
Figure 6.3. Conceptual framework of design considerations for effective online PLD. (Reproduced from Publication 3 for consistency and clarity.)

6.4 Contributions to the PLD field

This section presents the contributions that this research makes to the existing knowledge in the PLD field and to the practice of designing and developing online PLD for in-service teachers. Through these contributions to knowledge and practice, the importance of this research is highlighted further.

6.4.1 Knowledge contributions

This research contributes to the knowledge around effective online PLD in three significant ways. The first is that it provides further discussion on what constitutes effective online PLD for in-service teachers. To date, the research has focused primarily on effective in-person PLD, with little focus on the online environment (Quinn et al., 2019). The theory that does focus on effective online PLD tends to present either instances of online PLD or discuss it with only reference to the technical aspects of online PLD (Oddone et al., 2019; Powell & Bodur, 2019). However, there is a significant difference in the learning environments of in-person

PLD and online PLD. Therefore, simply discussing the technical aspects of effective online PLD remains insufficient. This research provides a deeper investigation of what constitutes effective online PLD and enhances the discussion around these elements.

The second contribution to knowledge is the conceptual framework of design considerations that can be used to design effective online PLD. This conceptual framework expands the understandings of what is effective in online PLD through deliberate consideration of the non-technical aspects of delivering PLD in an online environment. It further builds on the understandings of effective online PLD because it provides a more nuanced understanding of the design considerations, what they entail, and the responsiveness required in the variable design considerations to better design effective online PLD. This more detailed and nuanced understanding of the design considerations that should be considered for effective online PLD are based in both empirical literature and teacher voice; they also advance the discussion around what is important in designing effective online PLD.

The third contribution is the inclusion of the teachers' perceptions and experiences in the development of the conceptual framework (Oddone et al., 2019; Powell & Bodur, 2019). The explicit inclusion of teacher perspectives highlights the collaborative nature and social constructivist approach to the development of the conceptual framework. Utilising the teachers' perspectives allows greater input and influence from those who may benefit from the use of this conceptual framework. In this research, considering the teachers and what they find effective in online PLD is an important part of being able to design a conceptual framework that supports effectiveness from both the theoretical and practical perspectives. In this way, this conceptual framework has a distinctive approach to its development, yet it is grounded in the empirical literature and supported by teacher perspectives.

6.4.2 Practice contributions

In practice, online PLD is typically designed using either the elements of effective in-person PLD or general learning theories as the foundation for design decisions. However, the online environment differs significantly to the in-person environment, so these considerations are important but not critical. It is critical the affordances and challenges of the online environment are considered when designing online PLD for effectiveness. While models of online learning could support the

design of online PLD, the overall purpose of these online learning models differs to that for online PLD. With this difference in purpose, it is not sufficient to simply transfer online learning models to online PLD design. Therefore, the significant contribution to practice that this research makes is the presentation of a conceptual framework of design considerations for effective online PLD.

This conceptual framework contributes to practice by providing clear support for the design and development of effective online PLD. It is the first conceptual framework that can be applied in practice to support the development of effective online PLD through considering both the teacher perspective and the existing empirical literature. Through using these two sources of data as the foundation, it places the participant as the key to determining the effectiveness of the online PLD. This aligns with the growing recognition that the teachers' experiences and perceptions of PLD have impact on the realised effectiveness of the PLD. Therefore, using the teacher perspective as a foundational element in the development of the conceptual framework, it is envisioned that this framework will enable positive engagement with online PLD. The conceptual framework also provides practical design considerations that allow online PLD designers and developers to create these opportunities with effectiveness at the forefront of the design.

6.5 Limitations of the research

There are three key limitations of this research, which are identified and described here. Identifying these limitations and potential methods to overcome them provide insight into the prospective future direction of this research.

The first limitation is that the SLR restricted its interpretation of PLD to focus on programs and PLD opportunities with clear structures and learning progressions. Therefore, some specific types of online PLD were not considered, e.g., self-directed PLD, online coaching and mentoring. While the rationale for limiting the understanding of online PLD programs was to clearly identify components of purposefully designed online PLD, many teachers undertake self-directed PLD and join less structured online PLD opportunities. Therefore, undertaking a broader systematic literature review may support the identification of more elements that are effective in online PLD.

The second limitation is that the online survey and focus groups were conducted prior to the COVID-19 pandemic. This is a limitation because the pandemic has resulted in exponential growth in the availability of online PLD for teachers. With the restrictions on in-person PLD attendance, much has been taken online and more teachers will have experienced online PLD. This increased exposure to and experience of online PLD would provide teachers with greater clarity in what constitutes effective online PLD in their context. Therefore, learning from these experiences is vital in further refinement of the conceptual framework of design considerations.

The third limitation centres on the types and number of participants in the online survey and online focus groups. As noted previously, the data collection techniques used in phases two and three were online techniques. This potentially excluded participants who do not engage online or who do not frequent online spaces. While this research focuses on online PLD, it is important to garner perspectives from those who do not use online spaces as often as they may provide different understandings of what would make online PLD effective for them and what may encourage them to look to online PLD as a potentially effective way to engage with PLD opportunities. Furthermore, the number of online survey participants was relatively small considering the overall population of teachers that engage online. Because the online focus group participants were drawn from the online survey participants, this number was also relatively small in relation to the overall population, but it was representative of the survey participants. Therefore, two key characteristics are recognised: generalisation of these findings may not be appropriate, and it would be beneficial to conduct the online focus groups again in order to scale up the findings.

These identified limitations provide avenues for understanding the inherent limits of the findings presented here and directions for future potential research. The key future research opportunities are discussed in the following section.

6.6 Future research

The future of PLD for in-service teachers is online. Therefore, it needs to be effective, and this research provides a solid foundation from which to begin designing online PLD for effectiveness. This research could continue in various ways, and two key areas for future research are identified here.

First, to further support the foundations of the conceptual framework, more data should be collected from in-service teachers about their perceptions and experiences of online PLD, as this may have changed or been enhanced through increased exposure to online PLD as a result of the COVID-19 pandemic. To support this, the online survey could be administered again endeavouring to capture a broader potential audience through wider promotion in social media. Furthermore, another systematic literature review could also be undertaken with a specific focus on non-program based online PLD in order to capture the elements that have been reported as effective in those types of online PLD. These additional data collections could be used to further support the development and evolvement of the conceptual framework of design considerations for effective online PLD.

Second, the research focused on a framework that supports the online PLD of in-service teachers who are typically in formal education settings, e.g., in primary school and high school contexts. These teachers are experts in teaching who teach disciplinary knowledge to students. However, there is a large group of teachers who exist in a different context, i.e., that of post-formal education in the tertiary sector. These teachers are academics and trainers who are discipline experts who teach, rather than being teaching experts. Therefore, it is expected that they will have different perspectives on what constitutes effective online PLD for them. For example, they may prefer to focus on teaching techniques rather than discipline content areas, and they prefer more practical strategies and activities embedded within the content. In this way, this group of teachers has different requirements that may be captured in the informing factors, but the variable design considerations may change to reflect the approach to teaching that comes with being a content expert rather than a teaching expert.

Through these two future research pathways, the conceptual framework of design considerations can be further refined and validated as a solid foundation for the design of effective online PLD for teachers, academics, and trainers.

6.7 Recommendations from the research

To truly harness the value of the conceptual framework of design considerations developed through this research, it needs to be put into practice and evaluated. However, in order for it to be implemented broadly, five recommendations should be considered to support its successful implementation.

These recommendations should be considered by online PLD designers and developers and those who support these roles, as well as those who are organising these activities.

6.7.1 Recommendation 1: Increase understanding that online PLD is different to in-person PLD

Because it is an emerging field, it is not yet well recognised that online PLD differs to in-person PLD. Online PLD has significant differences to in-person PLD, as discussed in Section 5.3 (Assertion 1), and these need to be understood by PLD developers in order to harness the potential affordances and meet the challenges that the online PLD environment allows. Building this understanding of the differences means that PLD developers will be better equipped to develop online PLD that will be effective for the participants. In order to build awareness and increase understanding of these differences, PLD – both online and in-person – can be developed that provides further information and practical strategies for supporting PLD developers to broaden their knowledge, skills, and abilities related to online PLD. Further awareness can be built through conducting more research and deepening the discussion in the literature about these differences. These differences between online and in-person PLD are important, particularly when designing PLD for effectiveness from both the participants' and facilitators' perspectives.

6.7.2 Recommendation 2: Develop guidelines for using the conceptual framework

The conceptual framework developed through this research clearly specifies the informing factors and design considerations that must be considered when developing online PLD for effectiveness. While the conceptual framework has been designed to be used immediately, it would benefit from having a set of guidelines around its use for PLD developers due the complexity of online PLD, as discussed in Section 5.4 (Assertion 2). These guidelines would support PLD developers to enact it with due consideration for all aspects of the conceptual framework. The guidelines would have multiple formats, and the conceptual framework would be used to develop the guidelines themselves, thus being an authentic representation of the enacted framework. That is, the guidelines would use the informing factors to understand the purpose of the guidelines and the participants (i.e., those who will use them, e.g., online PLD designers and developers). Then, the design considerations to

present the guidelines would be more informed and effective, e.g., using multimedia to present content, applying principles of UDL as a foundation, interactive learning activities to reinforce the informing factors.

After the initial guideline development and use, there should be further refinements that would allow for advances in understanding of the conceptual framework as applied in practice. Through engaging with the online PLD designers and developers around their use of the guidelines, a deeper understanding of the practical aspects of the conceptual framework and its implementation could be garnered. With the PLD developers' experience using the conceptual framework, their insights into the guidelines would be valuable in creating a more accessible and useful framework with supporting guidelines. This could in turn support a more in-depth iteration of the framework that provides greater clarity, coherence, and practicality within the framework.

6.7.3 Recommendation 3: Develop an evaluation process for the conceptual framework

The conceptual framework developed through this research can be applied broadly across various teacher PLD contexts with different purposes, processes, and end products. The different implementations would allow for a variety of contexts and situations worldwide. In order to assure consistency in evaluating the conceptual framework in terms of its appropriateness, ease of use, and resultant effectiveness in PLD, it is crucial to develop a consistent evaluation process that can be used across these contexts. This was recommended in Publication 3 presented in Chapter 4, but it is expanded further here due to the inherent complexity of online PLD, as discussed in Section 5.4 (Assertion 2).

The evaluation should occur at two levels: (1) evaluation by the PLD developers and their ability to implement the conceptual framework and (2) evaluation by the PLD participants and their perceived effectiveness of the online PLD. Using these two levels of evaluation, the conceptual framework can be evaluated for its effectiveness from the perspectives of those who use it and those who undertake the PLD designed from it, which are equally important when evaluating the conceptual framework as a whole. The purpose of the conceptual framework is to support effectiveness from these two perspectives, so it is important to evaluate it from the PLD developers' perspective of being effective in achieving

the intended learning outcomes and from the participants' perspective of being effective in refreshing, developing, or extending their knowledge, skills, and abilities. In this way, the effectiveness of the conceptual framework can be understood, and it can be further refined if areas of improvement are identified. Developing a consistent approach to this evaluation is critical in understanding how the conceptual framework supports effective online PLD, areas for improvement, and how it is being implemented in different contexts.

6.7.4 Recommendation 4: Implement the conceptual framework

The conceptual framework has been developed based on both teachers' perspectives and empirical literature, as well as deeply embedding the current understandings of effective in-person PLD. It provides a clear process for decision-making using the informing factors to shape the design considerations for effective online PLD. With this solid foundation, the next step is implementing the conceptual framework in the development of online PLD, which follows the recommendations from Publication 3 in Chapter 4. Online PLD designers and developers can use the conceptual framework immediately to support the design of online PLD with the aim of developing effective online PLD. The conceptual framework implementation will provide insights into areas for improvement and further development. It can also inform the guidelines and evaluation process that are recommended above. Through the implementation and subsequent evaluation, the conceptual framework can be verified as being effective in designing online PLD that supports teachers in their professional growth.

6.7.5 Recommendation 5: Scale up implementation of the conceptual framework

The implementation of the conceptual framework should be scaled up to provide more teachers with access to effective online PLD. The increasing implementation should seek to apply the conceptual framework across different content areas, different contexts, with different participants, and for different purposes. Using the informing factors as a guide to target different implementation contexts will provide greater depth of understanding how the conceptual framework can be used and the impact that it has. Implementing the conceptual framework across these various contexts should also aim to support teachers in three levels of professional growth: refreshing, developing, and extending their knowledge, skills,

and abilities. These different contexts should also include PLD for different teacher cohorts, e.g., primary school teachers, specialist teachers, high school teachers, teachers with different levels of technical skills. Through increasing the implementation and the subsequent evaluation of the conceptual framework, it can be further refined and developed to continue to support teachers with online PLD as knowledge in the field evolves.

6.8 Summary

The future is now. Online PLD needs to be designed with effectiveness at the forefront of the design choices, and the conceptual framework developed through this research supports these design considerations. Building the conceptual framework based on teachers' perspectives and empirical literature provides a solid foundation for the identified design considerations. These design considerations and their constituting components provide clear support and direction to develop effective online PLD, as well as embedding teacher agency as a key aspect of the design.

Using the conceptual framework developed through this research will support the provision of effective online PLD and teachers in their unending quest to maintain currency and update their teaching and discipline knowledge, skills, and ability. In this way, teachers can guide our future generations and prepare them for an unknown future where the jobs and skills are yet to be defined. When our teachers are supported to achieve this important work, the future looks bright and promising.

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