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Article abstract

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Teachers as Connected Professionals: A Model to Support Professional Learning Through Personal Learning Networks

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Abstract

As education becomes increasingly complex, effective continuing professional learning is an important strategy to support teachers in schools. However, current professional development approaches may not meet contemporary teachers' needs. Seeking to enhance teachers' professional learning opportunities, this paper presents a model of learning as a connected professional. The model draws upon the findings of a qualitative case study of 13 teachers who interact with others through a personal learning network (PLN).

Theories of connectivism, networked learning, and connected learning underpin the model, which conceptualises the whole experience of learning as a connected professional. The model comprises three elements: arenas of learning, teacher as learner, and PLN. Key characteristics of the experience are practices described as linking, stretching, and amplifying. These practices recur in various ways across all three elements of the model. The model promotes professional learning that is active, interest-driven, and autonomous, meeting personal learning needs while being socially connected.

Keywords: Personal learning network, professional learning, networked learning, model, teachers

Introduction

For school teachers, the increasing complexity of professional practice calls for sophisticated, ongoing professional learning. The literature suggests teacher agency, collaboration, and active participation create enduring changes in practice (Desimone & Garet, 2015); however, traditional models of professional development are often discrete events, disconnected from practice and of limited impact (Calvert, 2016). There is continuing disparity between what is known to be effective, and what teachers experience (Edge, Reynolds, & O'Toole, 2015; Webster-Wright, 2009). In response, this paper presents an innovative model that draws upon the affordances of social technologies for professional learning through a personal learning network (PLN).

A PLN connects people and resources for informal professional learning. While there is a body of anecdotal evidence and professional literature describing the nature of PLNs (Moreillon, 2016; Nussbaum-Beach, 2013; Warlick, 2009), fewer studies have investigated teachers' interactions through PLNs (Prestridge, 2017, 2019; Trust, Krutka, & Carpenter, 2016). The latter studies recognise the shift towards self-directed and interest-based professional learning, and reveal the potential for PLNs, with their dynamic and diverse nature, to meet the needs of teachers seeking professional learning.

This paper presents a model of professional learning based on case studies of 13 teachers. First, we situate this research within current literature about teachers' professional learning needs, and PLNs. Then, we outline the theoretical framework and design of the research from which the model emanated. The main part of the paper details the nature and constituent elements of the model. The paper concludes with a discussion of the potential for the model to facilitate the transformative experience of learning as a connected professional when teachers engage with professional learning through a PLN.

Literature Review

Teachers are experiencing increasingly complex contexts, rapid change, and high demands for accountability (Huitt & Monetti, 2017; Mockler & Groundwater-Smith, 2009). They are challenged to maintain their professional learning to meet the needs of students and expectations of external stakeholders (Hargreaves, 2000; Sachs, 2011).Within this environment, creating opportunities for relevant, collaborative, and impactful professional learning remains problematic.

A growing body of research investigates how teachers learn collaboratively through professional interactions both online and offline. This includes examinations of teachers' communities of practice and professional learning communities (Cochran-Smith & Lytle, 1999; Macià & García, 2016; Stoll, Bolam, McMahon, Wallace, & Thomas, 2006; Wenger, 2010) and networked learning communities (Katz & Earl, 2010; Lee, Rahmat, Heng, Li, & Hwee, 2018; Mackey & Evans, 2011).

When investigating learning through social networks, researchers generally take one of two fundamental approaches. A whole-network approach analyses patterns of connections and interaction from a birds-eye perspective (Haythornthwaite & de Laat, 2010; Moolenaar, 2012; Smith Risser & Bottoms, 2014). The second approach examines the network from the perspective of the individual (Haythornthwaite & de Laat, 2010). This perspective is notable for its relational focus on the learning of individual teachers who have created personal networks to meet their own strategic goals. Studies taking the latter approach include those which focus on personal networks developed by teachers to support and enhance their professional learning (Baker-Doyle, 2012; Van Waes et al., 2016). One type of learning network that is directed by the individual is the personal learning network (PLN).

A PLN is a network of people, information, and resources that an individual strategically develops using social technologies to access informal learning (Couros, 2010; Nussbaum-Beach, 2013; Trust et al., 2016; Warlick, 2009). The individual nature of the PLN differentiates it from a learning community or community of practice, where participants typically work together towards shared goals (DuFour, 2004; Haythornthwaite & de Laat, 2010; Wenger, Trayner, & de Laat, 2011). The PLN allows the individual to exploit the affordances of social technologies in connecting people or information at any time or place (Carpenter & Krutka, 2015; Ranieri, Manca, & Fini, 2012; Visser, Evering, & Barrett, 2014).

Although PLNs have received attention in the professional literature (Moreillon, 2016; Nussbaum-Beach, 2013; Warlick, 2009; Way, 2012; Whitby, 2013), empirical research which explores the experience of teachers engaging through PLNs is limited. The majority of studies focused on bounded spaces, which concern either interaction within a single, specifically designed community (Cho, 2016; Hur & Brush, 2009; Tseng & Kuo, 2014), or one particular platform, such as Twitter or Facebook (Ranieri et al., 2012; Visser et al., 2014). More holistic studies of direct relevance to our research include a large survey that explored teachers' interactions through PLNs (Trust et al., 2016), and a smaller study of how expert ICT teachers perceive and enact professional learning through social technologies (Prestridge, 2019).

The original model of professional learning presented in this paper contributes to the body of research that explores how teachers engage with professional learning through their PLNs. This model innovatively integrates understandings of networked learning, connectivism, and connected learning. It informs the operationalisation of self-directed online professional learning for teachers who seek agentic social learning which is active and authentic (Couros, 2010; Couros & Hildebrandt, 2016; McLoughlin & Lee, 2010; Prestridge, 2019).

Theoretical Framework

The theoretical concepts of networked learning, connectivism, and connected learning underpin the model of learning as a connected professional. These concepts relate to learning that takes place through social, networked, and connected learning environments, mediated by social technologies. While they stand alone, they also flow into and build upon each other.

Networked learning focuses upon connections between individuals, groups, and learning resources which are mediated by technology (Jones, 2015). In particular, social technologies increase access to information and resources and enable people to work together regardless of time and space (Weeks, 2012). Networked learning also examines ties, relations, and network formations as well as their influence upon the learner and learning (Haythornthwaite & de Laat, 2010). The learner, their relations with others, and the context within which the learning takes place are all considered of value from the networked learning perspective.

Connectivism, which is closely related to networked learning, explains how learning occurs within networked digital environments (Downes, 2010; Siemens, 2005). A key principle of connectivism is that knowledge extends across multiple nodes within nebulous digital environments. Learning is the active process of creating connections between these nodes (Siemens, 2005). The learner may see patterns and create connections between nodes; therefore, the capacity to know is more important than what is already known (Siemens, 2005). Connectivism suggests that although knowledge is socially constructed, learning is driven autonomously by the individual (Tschofen & Mackness, 2012). Through

the connectivist lens, successful networks are characterised by the features of autonomy, diversity, openness, interactivity, and connectedness (Downes, 2010, 2012).

Connected learning presents a pedagogical approach to learning within networks. Gogia (2016, p. 90) suggests that connected learning and networked learning have "almost identical underlying assumptional frameworks, specifically, that learning and education should be self-determined, social, relevant, equitable and accessible." The pedagogical framework of connected learning is also informed by connectivism, encouraging learners from different contexts to make connections as they co-construct knowledge and understanding (Ito et al., 2013). These connections are motivated by shared purposes and mutual interests within a flexible, networked enterprise, emerging through participation in culture and community (Ito et al., 2013).

Research Design

The empirical model presented in this paper builds upon the findings of a qualitative collective case study. A collective case study examines individual cases, before drawing cross-case comparison, thus gaining the in-depth, contextual insights of each individual as well as a rich understanding across a spectrum of viewpoints (Simons, 2009; Thomas, 2016). This research investigated the phenomenon of teachers' experience of learning through a PLN. The lead author recruited 13 practicing teachers (9 female, 4 male), from primary and secondary schools in various international locations. Selection criteria required that participants were currently practicing teachers who engaged at least weekly with social media for the purposes of professional learning. The participants held various roles including classroom teacher, technology integrationist, teacher librarian, and primary years program co-ordinator. Their years of teaching experience ranged between 6 and 41 years. The lead author conducted semi-structured interviews lasting 45 to 60 minutes via a web conference platform.

In preparation for their interview, participants constructed a visualisation of their PLN (diagram or sketch). During the interview they explained their visualisation and discussed their experience of learning through their PLN. Participants also recounted critical incidents that had been significant or memorable for them. This involved the teachers explaining their thoughts, feelings, and actions in light of a particular event or experience (Butterfield, Borgen, Amundson, & Maglio, 2005; Hughes, 2012).

The verbatim interview transcripts underwent thematic data analysis (Braun & Clarke, 2012). The lead author coded the transcripts separately to ensure consideration of each participant as a separate case. Cross-case analysis (Simons, 2009; Thomas, 2016) then revealed broader insights into how teachers use social technologies to create timely, contextual and personalised professional learning experiences.

Case Study Findings

The case study findings suggest that professional learning through a PLN creates opportunities for teachers to enhance their pedagogical knowledge and practice, develop perceptions of themselves and others as teachers, and contribute to the wider teaching profession and beyond. In addition, the research indicates that teachers' experience of professional learning through a PLN is highly personal, with variation depending upon their individual learning purposes, characteristics as a learner, and the structure of their PLN. The study's overarching finding is that teachers' experience of professional learning through a PLN can be conceptualised as learning as a connected professional. This major finding is encapsulated in the model proposed below.

A Model for Learning as a Connected Professional

The model depicted in Figure 1 indicates that learning as a connected professional incorporates three interrelated elements: (a) the context, which comprises three arenas of learning (i.e., pedagogical, personal, and public); (b) the teacher as learner, who is characterised by various attributes; and (c) the PLN, which mediates professional learning through social technologies.
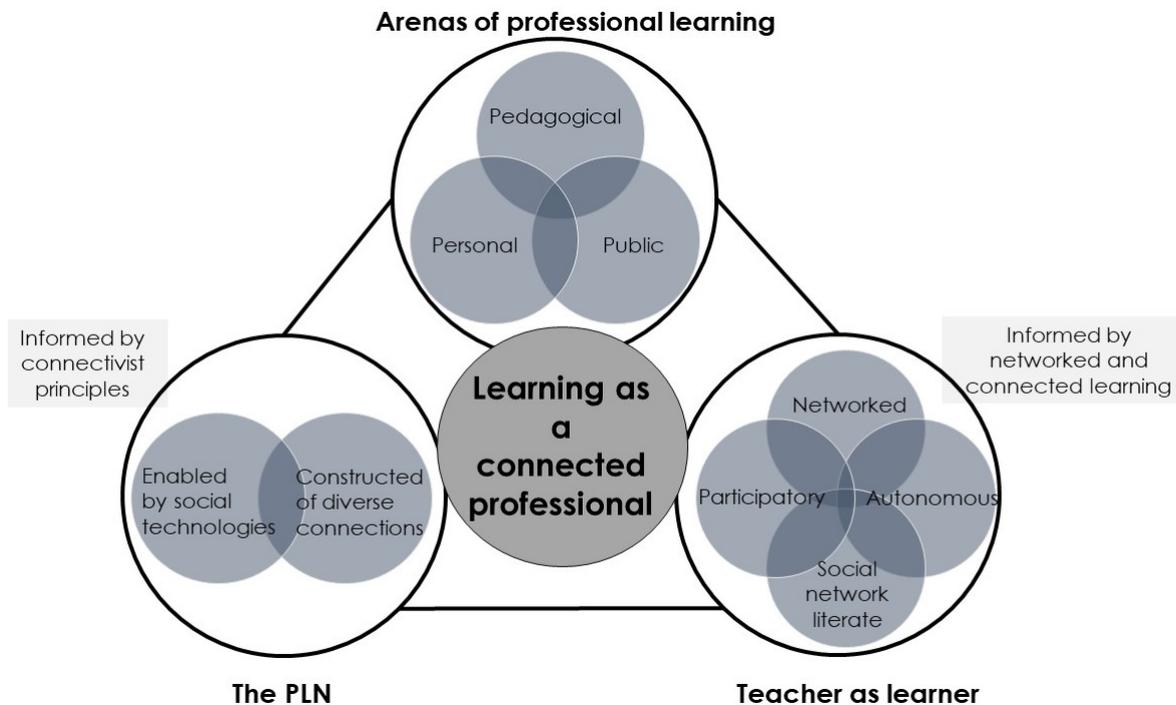

Figure 1. Learning as a connected professional.

Linking, stretching and amplifying practices recur in various ways across all three elements of the model, and represent the key characteristics of the experience of learning as a connected professional. Linking is driven by pragmatism, as the teacher connects effectively and efficiently with people or resources to meet immediate or near future professional learning needs. Stretching is associated with discovery, expansion of the network, and curiosity. Amplifying involves active contribution, creativity, and knowledge formation, as well as collaborative co-construction, and remixing or redistribution of information and resources.

We now will consider each element of the model in turn, through the lens of linking, stretching and amplifying. Brief examples from the participants' experience illustrate the authenticity of the model.

The Arenas of Professional Learning

Professional learning through a PLN creates opportunities for teachers to experience learning as a connected professional across pedagogical, personal, and public arenas. These arenas are the context in which teachers enhance their pedagogical knowledge and practice, develop perceptions of themselves and others as teachers, and contribute to the wider teaching profession and beyond. Within each of the arenas, teachers may engage in linking, stretching and amplifying practices.

The pedagogical arena. This arena is the space in which teachers extend and enhance their content knowledge and practice. Teachers relate their learning through their PLN to the work they do

within their own classrooms, or within the context of their school. The pedagogical arena assists teachers to update and refresh their knowledge, and to seek advice and further support when implementing curricular or pedagogical change. This learning is associated with the teacher's current activities, exemplified by one participant who commented that:

> On the spot I was able to feed it through . . . and my colleague would go 'that's fantastic! Let's implement that!' so rather than sitting and reading through books, it was just a quick Tweet, or an article that came across Facebook.

In the pedagogical arena, teachers link, stretch, or amplify their professional learning through a variety of practices (see Table 1). Linking occurs when teachers engage with simple question and answer interactions to resolve technical queries or identify appropriate resources. When stretching their professional learning, teachers use their PLN as a source of inspiration and innovation, updating their practice, and introducing new pedagogical approaches. When amplifying their professional learning, teachers work with their connections synchronously and asynchronously to conduct inquiry or research, and to create new knowledge in the design of curriculum or pedagogy.

Table 1

Teachers' Practices in the Pedagogical Arena

Teachers' practices	Ways in which content knowledge and practice are enhanced	Outcomes
Linking	Linking to others for everyday problem solving, asking and answering questions of a technical or practical nature.	Improved teaching skills
Stretching	Stretching network to include new connections to stay up-to-date with pedagogical and curricula changes. Designing or redesigning pedagogical approaches or curricula.	Updating or implementing new content knowledge or pedagogical skills
Amplifying	Amplifying new knowledge through collaborative inquiry and research.	Production of new knowledge

The personal arena. This arena is the context in which teachers enhance their knowledge of self as a professional through interactions mediated by their PLN. Teachers' experiences of linking, stretching, and amplifying are determined by the extent of their interaction and shared personal opinions and feelings (see Table 2). In the personal arena, learning appears more likely to occur through stretching or amplifying. Opening oneself to vulnerability, and sharing personal experiences and aspects of personality, creates the authentic connections where individuals may feel safer to take risks and invite innovation and change (Baker-Doyle, 2017). For example, one participant observed that:

it (the PLN) makes you feel not alone. And when you don't feel alone as an educator you have the confidence to try new things . . . it's affected me as an educator just giving me that feeling of not being isolated. And as a result, pushing myself.

In the personal arena, teachers who stretch their professional learning offer and receive feedback and advice about their personal experiences of teaching, which enrich and clarify how they see themselves within the teaching profession. For example, some participants said that by sharing their personal thoughts and feelings about teaching, they gained greater self-confidence, openness, and empathy toward others. When teachers amplify their professional learning, they draw on feelings of support and connectedness within their PLN to present themselves authentically, openly sharing their personal reflections and observations with confidence. These teachers demonstrate feelings of agency and capacity to contribute to their profession (Baker-Doyle, 2017).

Table 2

Teachers' Practices in the Personal Arena

Teachers' practices	Ways in which knowledge of self as professional is enhanced	Outcomes
Linking	Placing limits on personal information shared, choosing instead to seek validation through commonality of experience.	Self-confidence Openness to others
Stretching	Engaging through reciprocity, feedback, and advice, expanding sense of self as educator.	Self-confidence Empathy Openness to others Clearer sense of self
Amplifying	Presenting an authentic representation of self across all parts of the PLN. Drawing on sense of support and established relations to experiment and innovate. Openly sharing personal reflections.	Self-confidence Empathy Reflexivity Openness to others Positive sense of self

The public arena. This arena offers a learning context where teachers can contribute to the wider education profession and enhance their professional recognition. Here teachers link, stretch, and amplify by creating content and sharing thoughts and opinions that inform the learning of others within and beyond their PLN (see Table 3). The PLN allows teachers to share expertise publicly, creating the potential for others to see their interests, practice, and expertise in a way that may have not been possible previously (Lieberman & Pointer Mace, 2010).

The high levels of interactivity and contribution that characterise amplifying practices in the public arena underpin professional learning experiences which enhance professional recognition. Participants spoke about rewards which they felt were due in part to their active presence within their PLNs, and the

positive public representation this created. For example, one participant commented that she owed her PLN for enabling opportunities to speak at conferences, present overseas, and that her online profile resulted in her appointment to her current position.

Some participants engaged with linking practices in the public arena by following network stars—teachers who share high quality resources and information regularly with their connections. Participants stretched their learning in the public arena when they increased their levels of interactivity and contributions within their PLN.

Table 3

Teachers' Practices in the Public Arena

Teachers' practices	Ways in which professional recognition is enhanced	Outcomes
Linking	Recognising the professional capital of other individuals within the network. Following 'network stars' to access high quality information and resources.	Access to high quality information and learning experiences from network stars.
Stretching	Developing their reputation within the PLN through increased interactions and contributions.	An increase in the number of individuals becoming connected to them through the PLN. An increase in the influence and/or distribution of contributions made to PLN.
Amplifying	Maintaining a well-established presence within PLN and beyond, based upon an evidence base shared through the PLN. Contributing thoughts and opinions which inform the learning of others.	Greater opportunities for career development. Opportunities to share knowledge and expertise beyond PLN and to promote and advocate for contemporary education in public forums.

Teacher as Learner

The second element of the model relates to teachers as learners. It highlights that teachers who learn as connected professionals share learning attributes which influence their experience of professional learning through their PLN. As outlined below, teachers as connected professionals engage with linking, stretching and amplifying practices which characterise their varying autonomy, participation, and understandings of networked learning. Teachers who learn as connected professionals are active and self-directed, as well as literate within social networks to differing degrees. These attributes represent a networked, connectivist approach to learning, as teachers autonomously navigate their PLN, forming

connections, and making decisions about the quality of the information and resources gathered from diverse sources (Downes, 2010). Interdisciplinary learning opportunities created when teachers leverage the affordances of social technologies to connect and collaborate across geographic and temporal boundaries, create a participatory connected learning environment (Gogia, 2016; Ito et al., 2013).

The autonomous learner. As autonomous learners, teachers link, stretch, and amplify with networks "of their own accord, according to their own knowledge, values and decisions" (Downes, 2010, p. 18). Teachers can autonomously direct their PLNs; however, their learning depends upon how they exercise this autonomy—as choice and control, an expression of self, or both (Ryan & Deci, 2011; Ting, 2015). When linking, teachers can exercise autonomy through choice and control by determining when and how links are made through the PLN. When stretching, teachers use their PLN to create opportunities to express themselves as teachers and learners, as they seek learning of personal interest and direct their network towards their own, rather than their school's goals. When amplifying, teachers pursue learning horizons that are broader than immediate professional needs through their PLN. This was exemplified by some participants who stated their interaction with their PLNs was driven by a love of learning and a passion for education in general. One participant commented that her PLN was "part of who I am and what I enjoy doing."

In summary, teachers experience autonomy within the PLN as:

- choice and control (linking)

- an expression of self as teacher and learner (stretching)

- an expression of self as individual (amplifying).

They exercise their autonomy by:

- making links within the PLN at times and places that most suit the learner, to enhance practice as needed (linking).

- taking advantage of the capacity to tailor and personalise learning – stretching beyond immediate needs to explore broader professional interests (stretching).

- taking advantage of the opportunity to continually expand learning horizons, amplifying learning to meet intrinsic motivations (amplifying).

The participatory learner. Teachers demonstrate a participatory approach when they describe their professional learning as an outcome of actively and openly connecting and interacting with others (Ito et al., 2013; Jenkins, Ito, & boyd, 2016). A participatory approach may vary in intensity through linking, stretching, and amplifying. Teachers who link may manage their network interactivity by limiting the social technologies they use and by linking with fewer people. Teachers who stretch increase their participation by making more contributions and re-distributing information and resources throughout their PLN. Teachers who amplify are highly participatory, engaging in sharing and reciprocity. This enhances their credibility, encouraging trust and confidence (Hegarty, 2015). Examples of highly participatory learners were evidenced by participant observations such as "you

never have that sense of being isolated" and "that feeling of sharing and community that exists within (my PLN)."

In summary, teachers demonstrate a participatory approach by:

- linking with others on an as needed basis, offering advice and seeking support for the immediate resolution of day to day issues (linking).

- building confidence to stretch the number and quality of contributions to the PLN and engaging through consuming and redistributing information and resources (stretching).

- actively participating, through regular sharing of resources and information to amplify learning and collaborating with others to initiate or lead knowledge construction (amplifying).

The networked learner. Teachers who are networked learners understand the social construction of learning, as well as the influence of their connections and the strategies they employ to construct new knowledge (Jones & de Laat, 2016). Teachers who experience professional learning through linking may understand networked learning to be the simple connecting of information between two nodes. They view the PLN mainly as a source of information rather than as an interactive network of individuals. Teachers who stretch their professional learning see the value of dialogue and interaction through networks. They experiment with different ways to share and connect with others through their PLNs. Teachers who amplify their learning demonstrate a networked and connectivist perspective (Jones & de Laat, 2016; Siemens, 2005). They perceive learning not so much as the acquisition of a fixed body of knowledge, but as interaction with others to construct and access content. One participant expressed that through her connections, she felt able to construct personal knowledge, while also elevating collective knowledge: "it's that collective brain, with less and less barriers."

In summary, teachers understand networked learning as:

- direct connections and communications which enable knowledge transfer from one network node to another (linking).

- an increasing number of modes and channels as for dialogue with others in the network (stretching).

- collaboration to develop new ideas and understandings including consultation through multiple connections before actively sharing and promoting learning (amplifying).

The social network literate learner. Social network literacy involves the capacity to critically access, navigate, and make use of social networks for professional purposes, both online and offline (Bridgstock, 2016; Rheingold, 2012). Teachers exhibit different levels of social network literacy when engaging with their PLNs. For teachers who experience professional learning through linking, social network literacy is demonstrated by interactions with intentionally smaller networks, to manage information flow. As teachers stretch their experiences, they explore different platforms, and develop strategies to leverage more diverse connections and information. Stretching practices associated with a growing level of social network literacy were displayed by one participant, who commented that when she saw others sharing inappropriate material online, she became concerned for them, as they may not be aware that "this is trackable, identifiable, potentially career destroying for you if you don't know how

to handle it." Teachers with higher levels of social network literacy amplify learning experiences by moving between online and offline, and across various platforms as needed.

In summary, teachers demonstrate social network literacy when they:

- create direct connections on a limited number of platforms or with smaller networks to manage information flow (linking).

- stretch interactions across different platforms within PLN and develop strategies to collaboratively co-construct knowledge (stretching).

- move between online and offline and various platforms seamlessly and as needed and evaluate activity across the PLN to identify patterns and trends which offer opportunities to amplify learning (amplifying).

Teachers manage their network connections and information within the network by:

- initiating and maintaining fewer connections on an as needed basis and accessing and sharing information of a technical nature (linking).

- working to expand diversity of network connections and developing relations which support reciprocity and trust within the network as well as actively developing strategies to manage information flow (stretching).

- curating their PLN by strategically evaluating potential connections and actively managing information flows using a range of strategies as well as modelling these strategies for others (amplifying).

The PLN

The third element of the model of learning as a connected professional is the PLN. The findings associate this element with two main categories, namely: social technologies and a network of diverse connections. Linking, stretching and amplifying practices are evident through the way teachers perceive social technologies within their PLN, and indicate the extent of diversity within their PLN connections.

Social technologies. As teachers expand their learning contexts to include not only the pedagogical arena, but also the personal and professional arenas, there appears to be a shift from recognising the social technologies as features of the PLN, towards a greater focus on the affordances of the technology. Thus, social technologies become less visible, and more an enabling infrastructure for the PLN. Teachers acknowledge social technologies as a defining feature of their PLN although there is variation in how they use and perceive this technology. This variation falls into two categories: a tool focus, and a people and learning focus (see Table 8). The research findings suggest that teachers who largely engage with linking practices tend to have a greater tool focus, while those who amplify their learning are more likely to have a people and learning focus. The variation was evidenced by participants' maps of their PLNs. Some structured their maps according to the tools they used, while others created maps that did not feature any social technologies, but which were constructed of the names of individuals.

Table 4

Categories of Social Technology Use in PLNs

	Tool focus	People and learning focus
Professional learning practices		
	Mostly linking, some stretching practices.	Some stretching, mostly amplifying practices.
Role of social technology in PLN		
	Social technologies at forefront—provides PLN with structure.	Social technologies largely invisible.
How interaction occurred		
	Tool choice determines mode of interaction.	Interaction determines tool choice.
How learning occurred		
	Learning episodes occur within one social technology tool/platform at a time.	Learning occurs across whatever social technology tool or platform required.

A network of diverse connections. This study shows that although teachers have the potential to connect with and learn from individuals all over the world, their connections are various and diverse (see Table 9). Some participants practiced linking with only a few others, while some participants stretched their learning by creating a wider range of connections. Others used very diverse connections to amplify their learning. For instance, while one participant observed that "a lot of it [interaction] is within the ghetto of the [Education] department" another described an expansive network, listing librarians, educators as well as commentators on popular culture, politics, and social action as sources of connection.

Table 5

Diverse Connections Within the PLN

The PLN is...	Created by connections who are:	Characterised by connections who provide:
Linking	Direct links, from similar contexts or who are teaching within similar roles.	Information and inspiration for current/near future teaching practice.
Stretching	Associated broadly, stretching from any aspect of teaching and education including commercial stakeholders.	Support, feedback, and encouragement in personal interest areas and general teaching experiences.
Amplifying	Amplified to include multi-disciplinary and diverse backgrounds including and beyond teaching and education.	Inspiration and serendipitous discovery of information to enhance the learning experience in general.

Discussion: Implications for the Model of Learning as a Connected Professional

The model of learning as a connected professional has empirical, conceptual, and pedagogical implications. By graphically representing the case study findings, it highlights new understanding about teachers' experience of professional learning through PLNs. It illustrates the complexity of this experience which integrates three key elements—arenas of learning, teacher as learner, and PLN—and involves diverse linking, stretching, and amplifying practices.

As the model indicates, the findings both complement and extend previous empirical research. For example, this study contributes further understanding about how teachers may engage with professional learning mediated through social technologies (Prestridge, 2019; Trust et al., 2016). Like Prestridge's study (2019), this model identifies opportunities for teacher professional learning through social media. While Prestridge identifies variation in teacher types, the present model highlights variation in teachers' practices of linking, stretching, and amplifying, as well as the ways teachers move between these practices according to personal need, desire, and capacity.

As a conceptual contribution, the model reveals a significant interrelationship between networked learning, connectivism, and connected learning. It shows how the attention to context (arenas of learning), the learner, and the PLN expand the notion of knowledge construction, distribution, and redistribution (Haythornthwaite & de Laat, 2012; Jones, 2015). By identifying the influence of diverse connections, interactivity, and autonomy, the model indicates the important role of connectivist principles in teachers' professional learning through PLNs (Downes, 2012). The openly networked nature of PLNs and the active, self-directed, and participatory attributes of teachers learning as

connected professionals embodies the learning and design principles of connected learning (Ito et al., 2013).

From a pedagogical perspective, the model supports the design and implementation of highly accessible professional learning through a PLN. It offers strategic, evidence-based pointers for teachers and professionals who value social learning that is flexible, mobile, and highly relevant to contemporary digitally mediated contexts (Ranieri et al., 2012; Visser et al., 2014). For example, teachers could use the model as a map to explore different learning opportunities, by linking, stretching, and amplifying their practices in new ways across the three arenas.

By raising awareness of the PLN as a conduit for multifaceted learning, the model proposes an innovative approach to professional learning that is empirically and conceptually informed. As the PLN is openly networked, it ensures inclusive learning opportunities that extend to learners who are isolated geographically, or who work remotely.

The model also provides the conceptual foundation for the development of a practice framework to guide educational systems or individuals who wish to initiate or enhance their PLN. The pedagogical potential of the model as a foundation to cultivate connectedness for students in higher education is also a rich area to be explored (Bridgstock, 2016). Future studies are needed to investigate how this model may be interpreted and applied within different professional and educational settings.

Conclusion

This paper has presented a model to enhance teachers' professional learning through personal learning networks. Case study findings of the experiences of 13 teachers, and the framing theories of networked learning, connectivism, and connected learning ensure the authenticity of the model. As a contribution to practice, the model offers teachers a guide for evaluating and extending their professional learning. When teachers experience learning through a PLN, they are no longer isolated teachers but connected professionals, supported by their personal learning networks.

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