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English Language Educators Developing Learning Networks via Technology: A Qualitative Multiple Case Study

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Abstract

Teacher informal learning proves to be a powerful means for professional development. The professional development opportunities of those teaching English as a second language in different countries are often particularly limited, causing many of them to resort to informal learning actions. The purpose of this qualitative multiple case study was to describe how ideas, materials, and social interactions form a 'professional learning network (PLN)' through online, informal pedagogical dialogues among English language educators as it relates to professional learning. Five participants took part in the study with data being collected from an online survey, a content analysis of their public interactions, and an in-depth interview focused on their PLN structure and changes. The findings indicated that professional knowledge, skills sets, and overall dispositions emerge in unique ways based on how ideas, technologies, and personal contacts interrelate with each other over time, and that an individual's PLN provides unanticipated benefits when sharing publicly online.

One of the most effective means of teacher professional development is through informal dialogues about teaching and learning (Organization for Economic Co-operation and Development [OECD], 2011). Although current research supports the need for both informal learning (e.g., teacher networks and mentoring) and formal learning (e.g., workshops and conferences), the tendency is to rely on the latter as the primary means for promoting professional learning (Chung Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009; OECD, 2011). Informal learning becomes a necessary complement to more traditional, formal styles of professional learning that provide educators the support needed to achieve professional learning goals. Professional learning goals are reflected in communities of practice.

Communities of practice (CoPs) are groups of people who share a concern, a set of problems, or a passion, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis (Wenger, McDermott, & Snyder, 2002). In higher education, CoPs have been found to have "analytical purchase" when it comes to teaching and learning in the particular academic classroom; however, instructor-student roles within the institution oftentimes remain hierarchical in nature (Morton, 2012). The collaboration that takes place within the classroom setting is limited to interactions between the instructor and individual students. Actor-network

theory (ANT)—understanding ideas, materials, and human relationships in aggregate—provides a more useful lens for framing change and innovation when it comes to understanding and analyzing social relationships (Fenwick & Edwards, 2012). Along with complexity theory, ANT has been used to study how professional learning is assessed (Fenwick, 2009). "Complexity theory is an appropriate lens through which to view the dynamics at work within schools, not in order to predict and control but to enable more responsive and dynamic processes which accommodate existing and emerging possibilities" (Phelps, Graham, & Watts, 2011, p. 60). Other research has concluded that complexity theory is ideal for teacher development facilitators who support a bottom-up, emergent, and self-organizing approach to professional learning experiences among staff (Fazio & Gallagher, 2009). Employing ANT and complexity theory as complementary conceptualizations, the term *personal learning network* (PLN) will provide a basis for closing the gap in current literature by exploring the non-linear and emergent characteristics of professional learning in education. Understanding the use of the term PLN provides context that underpins the overall purpose of this study. The term is derived from *personal learning environment*, which was first used at the personal learning environments session at a JISC/ CETIS Conference in 2004 (Warlick, 2012). Siemens (2005) also uses the term briefly when defining networks as connections between human and non-human devices: computer networks, individuals, groups, etc. When researching PLNs and virtual learning environments, Nikolaou and Tsolakidis (2013) specifically define a PLN as simply "… a network of people with whom one is connected with the aim to learn" (p. 79).

Due to the lack of empirical evidence around the complexity of reifying the term *personal learning network* (PLN), a theoretically based explanation follows that frames the term, PLN, specifically for the purposes of this study. To reify the notion of complex change through informal pedagogical dialogues, we can view concepts, materials, and social interaction as an aggregation. Based on actor-network theory (ANT), associations in the aggregate exist between actors, or "*anything* that … modifies a state of affairs by making a difference" (Latour, 2005, loc. 933). Actors, or network nodes, then can be ideational (e.g., concepts), material (e.g., technologies), or interpersonal (e.g., social interactions) collectives of interrelated network nodes. The objective of applying actor-network theory within research is to understand how network nodes (or actors) come together, how they manage to hold together, and how they form associations that produce agency: identities, rules, routines, policies, instruments, and reforms (Fenwick & Edwards, 2010). To this end, and for the purpose of this study, nodal associations will be viewed in terms of ideas, technologies, and online social interactions, which collectively will be referred to as a PLN.

For the purpose of this article, a PLN will be defined in greater terms than Nikolaou & Tsolakidis's (2013) simplified definition, which mainly limits it to a human network. To understand the meaning of a PLN as it relates to this study is to take each of the three terms in turn, beginning with *network*. A PLN is a network just as ANT is a network of associative and interrelated entities or nodes: ideational (i.e., ideas, concepts, notions, feelings, etc.), physical (objects, material, technologies, etc.), and social (i.e., short-distance interactions among human beings). The theoretical basis for the idea of *learning* is rooted in complexity theory: learning as being emergent, non-linear, diverse, political, etc. Finally, a PLN is, more than anything, *personal* in that it refers to the unit of analysis for this research; that is, the individual educator. Indeed, the learning network becomes personal since the individual remains the center of a surrounding learning network of connecting nodes.

Specifically, this study analyzed how five English as Foreign Language (EFL) educators

from different countries interacted online, using detailed observations and participants' own accounts of individual changes in response to ideational, material, and social relationships (i.e., an observance and description of a PLN). To conduct such an analysis, various data collection strategies were employed: (a) an online survey, (b) content analysis of informal pedagogical dialogues published publicly online, and (c) a semi-structured interview. These strategies were designed to understand (a) how participants perceived open, online, informal pedagogical dialogues within their personal learning networks and (b) how participants perceived changes to their personal learning networks during the 10-week data collection process. Participants of the study interacted online throughout the 10-week period, as they normally would have. Two main research questions guided the study:

1. How do PLNs of EFL educators emerge through open, online, informal pedagogical dialogues?

2. How do EFL educators explain changes to their personal learning networks over time?

Method

This multiple case study employed a qualitative research design. A qualitative research design allows participants to share interpretations through an inductive, emergent, and holistic approach (Creswell, 2009). Qualitative methods focus primarily on what people say and what people do that enables researchers to understand the meaning of a particular phenomenon, event, or activity (Gillham, 2010). A qualitative approach also allows for a greater wealth of detailed descriptive data on a smaller number of case studies in comparison to quantitative approaches (Patton, 2002). From an ANT perspective, qualitative data provides a rich, descriptive narrative to facilitate understanding the related attributes between network nodes (McCormick, Fox, Carmichael, and Procter, 2011). Although most of the data used in this study was qualitative (e.g., content analysis from electronic artifacts, forum posts, and personal discussions), frequencies and other types of descriptive, numeric data were used to compare and contrast the demographic information obtained from the multiple case study.

Participants

The participants for this study included five EFL educators from different educational contexts. The participants were chosen based on their willingness to openly share personal teaching and learning experiences with other colleagues through open interactions in online web sites; this also necessitated that they demonstrate a level of technological readiness. Evidence taken from the online survey was used to determine whether participants had posted or replied to a personal blog or contributed to a wiki, Twitter account, Google+ account, or any other social media that was open to the public within the last year. The criteria for scoring the potential participants was to (a) count the number of different technologies they used (i.e., blogs, microblogs, wikis, open Facebook pages, etc.) and (b) determine the frequency with which they publicly published their posts and replies to colleagues within the last year; that is, to measure the level of interaction that takes place between individuals. The online survey items included

items such as: *How comfortable are you sharing your successes either as a teacher or learner with a fellow educator with whom you work?* and *Copy and paste any URLs (website addresses) to any personal websites that you either own or online communities that you participate in…* among others. The participants for the study must also have been currently teaching one class (general English, academic English, or English for specific purposes) for English language learners.

Instruments

Online survey. In order to choose the participants for this study, an online survey was implemented. The EFL/ESL Teacher Network Survey was adapted from the Open Educational Resources planning group (eduMOOC OERu Planning Group, 2011) for the purposes of obtaining information on learning preferences of individuals who engage in open, online learning experiences.

Interview. The final data collection technique involved a 30 to 45-minute semi-structured interview with each participant. Analysis of data as it emerged throughout the study provided the basis for each interview, while still respecting the semi-structured interview guide and ultimately the research questions.

Data Analysis

For this study, all of the data obtained from the online surveys, the 10-week interaction period of open and online posts and replies, and one-and-one interviews underwent a content analysis using the computer application, HyperSearch. This study adhered to a collaborative social research approach by using open codes and coding frames, categorizing key concepts, and identifying patterns and relationships (Berg & Lune, 2011).

A pre-established coding system was used as a directed content approach. Under a directed content analysis approach, theory and prior research guide the determination of codes beforehand and during data analysis (Hsieh & Shannon, 2005). For this study, pre-determined, first-level coding included labels based on types of interactions (i.e., ideational, material, and social), types of communication (i.e., synchronous, asynchronous, and semi-synchronous), delivery (i.e., face to face and online) and openness (i.e., public and private). Within these codes, more specific codes that related to each other provided further details. Additional predetermined codes that linked to theoretical concepts related to this study included teacher pedagogical knowledge, teacher dispositions, and concepts related to complexity and actor network theory, among others. Although most codes were predetermined based on the literature, additional codes emerged when analyzing data.

Findings

Five English language educators responded to an invitation to participate in this study, which was sent out via social media (Twitter, Google+, and a Wiki); and included individuals from various parts of the world from different educational contexts (see Table 1). Also, Amber, Barry, Carl, Donna, and Erik (pseudonyms) completed an online survey; participated in public, online interactions between November 15, 2014 through January 31, 2015; and took part in an

online (private) interview via Skype and Google+ hangouts. Participants were a diverse group based on the types of classes they teach, where they reside, nationality, education, and experience using technology. Although specific findings show many points of contrast between each case (i.e., participant), the diversity of backgrounds was no indication of any lack of purpose when using a PLN to further professional learning. Anna and Donna were the only ones who indicated that they began using social media from the time they began teaching.

Table 1

Overall Participant Demographics

	Amber	Barry	Carl	Donna	Erik
Gender	Female	Male	Male	Female	Male
Teaches	CLIL	TEFL	TEFL	TESL	TESL
Resides	Europe	North America	Asia	Australia/Oceana	North America
Nationality	North America	Europe	North America	Australia/Oceana	North America
Last Degree	PhD Candidate	Bachelor's	Master's	Bachelor's	Master's
Experience Teaching (years)	5-7 years	+10 years	+10 years	+10 years	+10 years
Experience with Social Media (years)	5-7 years	7-10 years	3-5 years	+10 years	5-7 years
Tech. Change	Laggard	Early adapter	Laggard	Early adapter	Early adapter
Hrs./Week	10-20	+40	10-20	30-40	20-30

Twitter was the tool most often used by the five participants for the study. A Twitter summary of each of the five participants shows a comparison of how the tool was being used at the time of the study (see Table 2). Only Carl and Erik have followers-to-following ratio of greater than 100% (i.e., 259% and 299% respectively) while the other three participants have ratios between 90%-100%.

Table 2

Twitter Usage per Participant

	Amber	Barry	Carl	Donna	Erik
Total tweets	7,398	2,665	18,978	14,718	24,851
Following	772	1,409	910	1,911	904
Followers	767	1,271	2,355	1,856	2,705
Listed	31	40	103	96	159
Joined	Apr., 2009	Feb., 2009	Oct., 2011	Oct., 2008	Feb., 2009
Location	UK	Mexico	Seoul	New Zealand	Canada
Followers / Following	99%	90%	259%	97%	299%
Analyzed Tweets	495	87	556	634	424

Amber's PLN

The material, or technological, aspects of Amber's PLN included Twitter, a personal blog, and online forums. The ideas that made up most of her interactions were based on writing, research, and personal reflection. The relationships were several close ties with PhD students and colleagues with a shared interest in writing and research as well as with perfect strangers who offered support and encouragement in her academic endeavors. Regarding Twitter, Amber had the following mentions, replies, links, and hashtags (count/ratio to total tweets): mentions – 100/495=20%; replies – 61/495= 12%; links – 110/495=22%; and hashtags – 154/495=31%. When compared to the other participants, Amber demonstrated an ability to use mentions, replies, links, and hashtags within her PLN, yet perceived her own understanding of microblogging as intermediate, or less than how others perceived their level of understanding of microblogs (see Table 3).

Table 3

Twitter Ratios of Mentions, Replies, Links, and Hashtags to Total Number of Tweets

	Amber	Barry	Carl	Donna	Erik
Understanding of Microblogs	Intermediate	Advanced	Advanced	Advanced	Advanced
Mentions	100/495=20%	71/87=82%	370/556=67%	1136/634=179%	392/424=93%
Replies	61/495=12%	19/87=22%	241/556=43%	396/634=62%	232/424=55%
Links	110/495=22%	54/87=62%	86/556=16%	188/634=30%	110/424=26%
Hashtags	154/495=31%	64/87=74%	138/556=25%	360/634=57%	106/424=25%

Example: 100/495=20% is the same as taking the total number of mentions (or replies, links, and hashtags) and dividing this number into the total number of tweets in order to achieve a ratio expressed as a percentage.

Amber showed mixed numbers in certain areas of how she used Twitter when compared to the other participants. For example, the number of mentions per tweet and the percentage of tweets being replies are low while the percentage of tweets being retweeted is quite high (see Table 4).

Table 4

Twitter Mentions, Replies, and Retweets as a Percentage of Tweets

	Amber	Barry	Carl	Donna	Erik
Mentions per Tweet	20%	82%	67%	179%	92%
% of Tweets being Replies	12%	22%	43%	62%	55%
% of Tweets being Retweets	59%	16%	39%	19%	13%

Although these numbers indicate fewer mentions and replies, she stated,

> … [I was] surprised at how much people actually pay attention to what I'm tweeting…because I´ve got replies [and] responses from others, particularly in January…when I…made a comment or…news about my forthcoming [doctoral oral defense], I actually got some feedback. I would say [I was] presently surprised because often I don´t normally have a back and forth with people [via social media]. It's just more like, "Oh, I´ll talk about this …," or "This is interesting …," but nothing necessarily like a Q&A, as much as it [took place] in January. It was a nice change I would say.

Amber's focus on skill-based professional learning is evident in the writing hashtags used to post to Twitter. Of the 28 hashtags used by Amber during the 10-week data collection period, seven of those hashtags contained some derivative of the word *write*. Tweets using hashtags with the word *write* mainly pertained to grammar use, writing creatively, writing principles, writing schedules, writers, writing goals, writing meetings, thesis writing, PhD writing, writing quotes, writing attitudes, academic writing, writing obstacles, and writing support. One particular hashtag is associated with a global, online writing project that occurs each November. Amber uses this hashtag in Twitter to offer writing support to others. "I … engage with the [online] community or if I need to get things out that had to do with academic writing, they would be [my] first go to account." Amber also used Twitter hashtags related to her studies.

Barry's PLN

Of all the participants, Barry showed the least amount of Twitter activity. During the data collection period (November 15, 2014 – January 31, 2015), Barry had just 87 tweets compared to Amber (496), Carl (556), Donna (632), and Erik (421). When asked if becoming a competent speaker and writer were part of his professional learning goals, he was the only participant to answer *not important at all* on both accounts. When it came to maintaining his own personal blog, he stated,

> Yeah, I used to be much more active ... I used to blog. But then I realized that so many other people had so many better blogs, that I just gave up. I thought there´s no point in wasting my time. I might as well just let them do the talking.

Moreover, when answering Internet-related questions, Barry had the greatest differential overall in how he thought about how useful the Internet was and how he used it in terms of his own teaching, lesson planning, and connecting his students to the local and global community (see Table 5).

Table 5

Internet Usefulness and Use (Barry)

	How useful is the Internet in your own teaching?	Overall, how often do you use the Internet in your own teaching?	Difference
Response	5	2	3
	How useful is the Internet when implementing your lessons?	How often do you use the Internet when implementing your lessons?	Difference
Response	4	2	2
	How useful is the Internet for connecting your students with the local/global community?	How often do you use the Internet to connect your students with the local/global community?	Difference
Response	3	1	2

Note: Scale for usefulness questions: 5=extremely useful, 1=Not useful at all; Scale for Internet use: 5=Almost continuously, 1=Never.

Another aspect of Barry's PLN that distinguished him from other participants related to the type of tweets he produced (see Table 6). Dividing tweets into new tweets, replies, and retweets, Barry had the largest percentage of new tweets with 61% (Amber with 31%, Carl with 21, Donna with 37%, and Erik with 43%). Barry also had a higher percentage increase in how often he included Twitter mentions, replies, links, and hashtags. For instance, over his entire Twitter history, Barry included 1,322 mentions out of 2,627 total tweets (i.e., 50%) and 71 mentions out of 87 total tweets (i.e., 82%) between November 15, 2014 through January 31, 2015, which was the data collection period allotted for this study. The percentage change from 50% to 82% was an increase of 64%, which was more than any other participant. He was also the only participant to show an increase of mentions, replies, links, and hashtags collectively.

Table 6

Barry's Use of Twitter Mentions, Replies, Links, and Hashtags

	Amber	Barry	Carl	Donna	Erik
Mentions	31%-20% (-36%)	50%-82% (64%)	69%-67% (-3%)	208%-179% (-14%)	84%-92% (10%)
Replies	10%-12% (20%)	16%-22% (38%)	45%-43% (-4%)	63%-62% (-2%)	45%-55% (22%)
Links	28%-22% (-21%)	49%-62% (27%)	20%-15% (-25%)	30%-30% (0%)	33%-26% (-21%)
Hashtags	45%-31% (-31%)	51%-74% (45%)	28%-25% (-11%)	64%-57% (-11%)	23%-25% (9%)

When compared to the other participants, Barry not only included hashtags more frequently (74% of the time), but also showed the highest increase of hashtag use with 45%. Most of the hashtags were related to English language teaching and learning and business English. He used 10 different hashtags ranging from posting a hashtag once to the most frequently used hashtag being used 17 times. In comparison, Amber used hashtags less frequently as a percentage of total tweets and focused hashtags more on topics related to academic writing and her own doctoral research. She used 25 different hashtags ranging from posting a hashtag once to the most frequently used hashtag being used 31 times. In both cases, several hashtags were chosen to reference two or three general topics related to one's PLN. Barry's integration of social media (i.e., primarily Twitter, Scoop.it, Pulse, and Falcon Pro) were used to discuss ideas related to English language teaching and learning and business English by interacting with colleagues publicly online.

Over the 10-week data collection period, Barry included 15 different Twitter mentions. A Twitter mention, using the symbol @ followed by the person's Twitter handle, is the equivalent to sending a direct message to a person publicly; that is, the message sent from one person to the other remains a public post in Twitter for all to see. During this time period, Barry posted 15 different mentions anywhere from posting one mention to Twitter in one single occurrence—which happened nine times—up to using one particular mention five times. Compared to hashtags, which are more ideational, the 15 different mentions were used 26 times while 10 different hashtags were used 53 times.

Carl's PLN

Carl indicated in the online survey that he was a laggard when it came to implementing new technologies. He has used social media three-to-five years, which was less than the other participants, and only used technology 10-20 hours per week (See Table 1 above). Carl was the only participant who felt uncomfortable sharing successes and failures as either a teacher or

learner with a fellow educator with whom he worked. When asked the same question but sharing with a perfect stranger publicly online, he remained neutral. When it comes to interacting with his colleagues face to face, who make up his PLN, Carl admitted that that does not happen, "… my main job here at the university … I have zero interactions online [with those whom I work], aside from [correspondence via] email. He went on to clarify,

> [I have] no connections with my colleagues. But to be fair, I really don't have too many colleagues in my job … it's an isolated thing. So I don't really have much face-to-face interaction either, I should say. I have contacts with two people, and one of whom is normally not my boss but … actually really is. We don't interact too much face-to-face and sometimes by email if there is an issue or something. Or if I need to do some extra work, but...I have one other colleague. We kind of share responsibilities, but there's no crossover, there's not a lot of discussion about work stuff, more of a social friendship, but definitely not online.

Carl concluded by saying that these two colleagues with whom he worked were either not interested in professional development or were really into academic topics of translation and interpretation but nothing online.

Of those participants with more than 400 tweets (i.e., Amber, Carl, Donna, and Erik), Carl had the lowest variance and standard deviation between the number of new, reply, and retweet tweets (see Table 7). Although Carl had the lowest percentage of new tweets, he had the highest percentage and number of reply and retweet tweets when both were taken together; that is, 79% of Carl's tweets were either a reply or retweet, and he was just as likely to post a reply as he was to post a retweet. When using Twitter, Carl used the fewest tools to send out tweets.

Table 7

New, Reply, and Retweets per Total Tweets

	Amber	Barry	Carl	Donna	Erik
New	148 (30%)	58 (67%)	114 (21%)	231 (36%)	177 (42%)
Reply	57 (12%)	15 (17%)	223 (40%)	284 (45%)	191 (45%)
Retweet	290 (59%)	14 (16%)	219 (39%)	119 (19%)	56 (13%)

Carl demonstrated a clear preference in the platform used to send out tweets. The Twitter web client was the preferred method with 87% (see Table 8). The only two other Twitter platforms Carl used were Twitter for websites (3%) and Twitter for Android (10%).

Table 8

Twitter Platforms by Participant

	Amber	Barry	Carl	Donna	Erik
Twitter Web Client	43 (9%)	13 (15%)	482 (87%)	350 (55%)	349 (82%)
Twitter for iPad				142 (22%)	4 (1%)
Twitter for iPhone				98 (15%)	19 (4%)
TweepsMap				1 (0%)	
Twitter for Websites	1 (0%)		19 (3%)	5 (1%)	32 (8%)
Instagram	14 (3%)			6 (1%)	
TweetDeck				16 (3%)	
Mobile Web				10 (2%)	
Vine				5 (1%)	
Google				1 (0%)	15 (4%)
iOS					3 (1%)
Foursquare					1 (0%)
Facebook					1 (0%)
Twitter for Android		22 (25%)	55 (10%)		
Buffer	178 (36%)				
Tweetbot for iOS	253 (51%)				
WordPress	6 (1%)				
Scoop.it		40 (46%)			
Twitter for Android tablets		9 (10%)			
Pulse News		2 (2%)			
Spotify		1 (1%)			

In addition to the different platforms used to send out tweets to his PLN, Carl also used Twitter to notify others when he posted to his blog. Carl explained it this way,

> … I'd say probably like an average of 1.5 tweets per blog post or something, or if it's something I thought was kind of cool that didn't get read much, I might … do a little bit more. I don't like to tweet too much.

Like Amber, Carl used Twitter to promote ideas shared in his blog publicly through his PLN.

Carl used his blog to share various ideas about the field of teaching and learning an additional language. He posted twice between November 15-30, 2014, four times in December, and twice again in January of 2015. For each blog post, readers had the option of sharing the post using the following social media: Twitter, Facebook, Google+, LinkedIn, Tumblr, and Pinterest. Readers could also email the post to others or print the post directly from the web page to a designated printer. And although Carl uses Facebook, of the three (i.e., Facebook, his personal blog, and Twitter), he prefers to interact with others publicly online via Twitter.

The ideas expressed as hashtags Carl shared in Twitter, like Barry, were mainly related to the field of teaching and learning English as an additional language. Eleven different hashtags were managed 202 times throughout the 10-week data collection period. Hashtags that were mainly related to the teaching and learning of English as an additional language related to teacher associations, geographic location (i.e., South Korea), English for academic purposes, and English teaching and learning in general. One hashtag referred to the professional learning of teaching English to students of other languages (TESOL). Much in the same way that Barry used 10 different hashtags, Carl used 11 to share more detailed topics around curriculum, assessment, and instruction. Many topics were also related to professional learning opportunities for other educators, such as massive open online courses (MOOCs) and other educational conferences that were being held face to face. However, Carl had an average of 18.4 posts per hashtag whereas Barry had an average of 5.3.

Donna's PLN

Donna had more analyzed tweets during the study (i.e., 634) than any other participant, and was following the largest number of people when compared to the other participants (see Table 2 above). When asked how she felt sharing successes and failures with strangers publicly online, she was the only participant to answer *extremely comfortable* on both accounts. Donna was also the only participant to consider herself advanced when it came to using blogs, microblogs, social bookmarks, wikis, forums, search engines, and emails. When using Twitter (i.e., a microblog), she had the highest percentage of mentions and replies to total tweets: mentions with 179% and replies with 62% (see Table 3). And when it came to posting to Twitter, Donna used 10 different Twitter platforms, which was more than any other participant (See Table 8 above). The three most used Twitter platforms that Donna used were the Twitter web client (55%), Twitter for iPad (22%), and Twitter for iPhone (15%). Her overall comfort level in using social media and sharing ideas publicly online was evident in her recollection of online interactions that took place during the study.

Donna made a clear distinction between her teaching practice and her own professional learning. When asked whether there was any change to her PLN between November 15, 2014 and January 31, 2015, began by distinguishing between her teaching practice and professional learning this way,

> … I'm in New Zealand and between the months of December [of 2014] and January [2015], that's our summer break. So it's generally in education, it can be quiet, but because of what I do, it's never quiet. I'm going flat out, so if you're just speaking about my online connections with my personal learning network, it doesn't slow down.

During the interview, Donna mentioned several times that what she was explaining she also shared in her personal blog. Between the period of November 15, 2014 and January 31, 2015, Donna posted two blog posts in November of 2014, two in December of 2014, and six in January of 2015. Indeed, many of the topics discussed in the interview were shared in her personal blog, which included not only the same ideas, but the same Twitter hashtags and mentions that were also included in posts found in Twitter. Topics included associations with the global learning community (with associating hashtag), global citizenship, personal and professional reflections, links to public online chats (e.g., Google+ Hangouts), professional accomplishments, and cultural reviews, and changing from Blogger to WordPress for hosting her personal blog. When asked about changing from Blogger to WordPress, she said it was "easy" and "seamless" (personal communication, March 13, 2015). She mentioned that both Blogger and WordPress had come a long way and that it really did not matter when it came to deciding which to use to host a personal blog.

The Wiki Donna promoted was a completely public wiki for any educator interested in collaborating with others. Not only could anyone view the wiki, but anyone could edit the wiki as well. Because it was completely public, contributors were able to modify the document anonymously, or if they were signed in, may make changes that were associated with a wiki profile. Instructors were provided to educators wishing to present along with a signup register and respective dates for each presenter. Even though Donna made many of the over 200 page edits to the wiki main page (not including the page edits to all wiki subpages), it was set up so that the planning, implementation, and sharing of all the different presentations resulted from the educators themselves. The first entry to the wiki was April 24, 2013 and since then had added over 250 pages and files that made up the entire wiki website. The wiki primarily hosted short, three-minute presentations from mainly New Zealand educators who participated in a Google+ Hangout where they shared their presentations publicly. The wiki also included Slideshare presentations as Donna mentioned in her interview.

Erik's PLN

Erik relied heavily on Twitter as part of an overall PLN, which was similar among all participants of the study. Mentions and hashtags were employed frequently, but Erik—like Donna—had a much higher percentage of mentions to total tweets than hashtags to total tweets. Erik included mentions 392 times out of a total number of tweets of 424 (i.e., 93%), and Donna included mentions 1136 times out of a total number of tweets of 634 (i.e., 179%). Conversely, Erik included hashtags 106 times out of 424 total tweets (i.e., 25%) while Donna included hashtags 360 times out of 634 total tweets (i.e., 57%). Both Erik and Donna had the greatest difference between mention and hashtag ratios than the other participants at 68% and 122% respectively (see Table 3). In addition to Twitter, Erik also maintained a personal blog to share ideas related to the field of English language teaching and learning.

During the data collection period, Erik had only three blog posts that all occurred in January of 2015. He stated in one blog post about being away from his personal blog for most of

2014 due to his commitment pursuing a master's degree (his last post of 2014 was posted in June), and he also mentioned how others should follow a fellow-colleague publicly online who happens to be Carl, another participant of this study. The other two posts related to ideas around using social media to promote academic writing skills and the complexity of language variation when it comes to learning and using English. Although Erik's personal blog was not used extensively during the study, he provided insight into how he leveraged various social media tools to promote his ideas shared on his blog.

The main change that occurred to Erik's PLN during the study was related to him completing a master's degree program towards the end of November of 2014. He explained it this way:

> … I think my focus shifted … from using my PLN to talk about my research to moving [to] reading more about what [others in my PLN] were doing. So, I had been subsumed with just my own research for such a long time that I gave up on blogs and I gave up on Twitter and all those things for about a year in terms of interacting. So during that exact time period is when I kind of got back into reading other people's blogs and reading what they were doing and interacting with them more like I had more than a year earlier … I too had started blogging as well, so it was nice to kind of get back in that groove where I had to rebuild relationships…with some newer people in the online universe and then see where all the people who were part of my PLN [before] were and what they were doing. I would say that happened [during the end of November of 2014].

When asked a follow up question related to any unexpected events or occurrences to his PLN during this time, he stated,

> … I think because I had been part of research for such a long time, my focus had moved from … really just communicating ideas to each other to actually looking for best practices in our field. And I had known of Randy's blog [#EFL topic] for a while, and we had talked a few times as well, but I think my focus and interests had shifted more towards finding out what he was talking about, and I think that I have come around to caring a lot more about [#EFL topic]-based things that I had before that period. So, the way that focused on Randy's blog posts, more so than before…maybe it's not surprising there was definitely a shift in my professional development. Not only was I really looking for general commentary on the [#EFL topic] or sharing that type of information with the PLN, I was now looking for and trying to share more commentary that was based on action research or you know dispelling pseudoscience or … those types of topics. So, hopefully that translated in my blog posts as well.

The way Erik shared ideas publicly online were similar to how the other participants shared their ideas. Erik and Donna both felt more comfortable sharing successes and failures with strangers publicly online. Erik, Donna, and Carl all had higher frequencies of sharing concepts related to teacher conferences. And when it came down to the four language skills (i.e., reading, writing, listening, and speaking), Erik, Donna, Carl, and Amber shared ideas mainly related to literacy or reading and writing (see Table 9).

Table 9

Key Words from Twitter Posts (Tweets)

	Amber	Barry	Carl	Donna	Erik
Blogs	9	5	47	45	34
Business English		4			
Conferences	3	1	21	15	17
Facebook			8	6	
Listening	2	2	18		5
Pedagogy	9	16	107	87	25
Professional Development	4	6	1	6	
Reading	18	5	36	41	18
Research	18				
Scoop.it		38			
Speaking	2	1	14		4
Technology		2			
Twitter	5	12	12	15	
Twitter for Android		31			
WeChat				3	
Wiki Material				17	
Writing	26	1	14	33	23

Discussion and Conclusion

This qualitative, multiple case study revealed the complexity of public online interactions between English language educators over a period of 10 weeks. The different themes that emerged from this study related to how ICTs were resorted to when interacting between individuals, what ideas were shared while interactions took place, and how interactions emerged over time; that is, how language educators cultivated the materialist, ideational, and relational tenets of a PLN emerged over time between five different individuals. The findings indicated that individuals who choose to interact publicly online can come from various professional backgrounds and contexts yet still share common approaches as to how ICTs, ideas, and individuals come together for a particular purpose.

The five participants of the study demonstrated variations of knowledge in the field of English language teaching (ELT). All participants came from ELT-related areas—content and language integrated learning (CLIL), teaching English as a foreign language (TEFL), and teaching English as a second language (TESL)—but each had an ideological approach to the way they revealed their respective knowledge about teaching and learning. Amber, Carl, Donna, and Erik exhibited a great deal of self-knowledge, coming primarily from a learner standpoint in that most of the knowledge being shared publicly online related to their own professional learning. Self-knowledge is one of the six facets of understanding that helps the learner see the big idea or big picture (Wiggins & McTighe, 2005). The willingness to openly share professional-related topics with others requires the appropriate disposition necessary to become a productive teacher leader (Bond, 2011). All five participants shared this willingness even though they each had varying comfort levels when it came to sharing either failures or successes with strangers openly online.

When it came to demonstrating teaching knowledge, Barry's understandings were unique to the other four participants who were coming more from a learner perspective. Barry's pedagogical explanation of how an idea for a lesson plan emerged within his PLN displayed examples of higher order thinking when it came to providing a learning experience for his students. Barry's consideration for his students (i.e., knowing their backgrounds, objectives, and limitations) and the school where he taught was evident in his pedagogical understanding as he provided clear examples of how he applied an idea, showed perspective and empathy for his students with regard to the implementation of the lesson, and interpreted an idea from someone else within his own educational context. A higher level of understanding of pedagogy came from implementing a learning scenario with students where the professional learner (i.e., the language educator) could explain, interpret, apply concepts, have empathy, perspective, and self-knowledge, which collectively form one's overall understanding (Wiggins & McTighe, 2005). Barry's recollection of how his PLN emerged from being an external idea to a learning experience for his students, to ultimately a learning experience for himself, exposed his understanding and how the role of each of the six facets.

The PLN of each participant and how the PLN transpired over time in certain respects can be described as a kind of learning community based on a virtual community of practice (CoP). Participants of this study had between 767 – 2,705 Twitter followers and nearly this amount of individuals whom participants followed themselves, which could only exist by having some common domain. Having a shared domain or ideas around what is being shared publicly online provides a common ground from which to build one's identity, thus giving a purpose for exchanging ideas and generating value among those involved (May, 2009). However, from an institutional standpoint, since many of the language educators the participants interacted with were both individuals with whom they had met and those whom they had never met, the degree that a professional learning community existed from an institutional standpoint could be questioned. A professional learning community from an organizational point of view rests on establishing four interrelated pillars: mission statement, vision statement, shared values, and common goals (DuFour, DuFour, & Eaker, 2008). Within the context of this study, the manner in which participants interacted with others in some ways was characteristic of a CoP and overall professional learning community but from an organizational perspective, to a lesser degree.

On several occasions, participants shared stories regarding how either a new understanding about something, a new tool they learned something about, or a new relationship emerged from a totally unexpected set of circumstances which ultimate resulted in change.

Donna's story about connecting a school principal with a particular learning community project, with a collaborative book project, etc. was not uncommon throughout this study among all participants. Given Johnson's (2007) definition of complexity science as "the study of the phenomena which emerge from a collection of interacting objects" (pp. 3-4), and taking slight liberties in accepting a variety of substitutes for the noun *objects* (e.g., *individuals, materials, technologies,* and *ideas*), one can see how the serendipitous nature of cultivating a PLN can be quite multifarious. Specifically, feedback loops—or the interactions between objects, individuals, materials, technologies, and ideas—entail an iterative and recursive relationship between cause and effect (Kay, 2008). Carl, in describing his interactions with others publicly online, mentioned how common reflective practice and sharing ideas can inspire professional learning. In this example, Carl exchanging ideas, interacting using different technologies, and conversing with different individuals might begin iterative, circular, and back-and-forth which might not generate a change in behavior or new knowledge. Nevertheless, over time, this iterative process could lead to a recursive process when a change in behavior or change in ideas might result. As memory formation builds over time (as a result of these feedback loops), these recursive relationships have a synergistic effect; in other words, when faced with the nonlinearity of professional learning, the whole becomes more than the sum of its parts which is a key tenet to complex systems (Strogatz, 2003).

The final example of complexity of learning within the context of this study was how Donna used a fractal, which helped strengthen the sustainability of the learning experience. She explained how she had teachers create short, three-minute video presentations, which were conducted live using Google+ hangouts and subsequently uploaded to a public wiki for anyone to view. In social organizations, this example of a fractal exists when day-to-day leadership patterns connect with similar patterns observed over the course of weeks, month, and years (Dooley & Lichtenstein, 2008). In Donna's case, the similar (and simple) pattern was having each teacher prepare a three-minute presentation about a particular topic and having them each share their presentations openly online via a Google+ hangout. As this fractal is repeated on different occasions with other teachers the process is also iterative and recursive.

The ideas that make up one's knowledge about teaching, the formation of a professional learning community, and the notion that learning is complex lead to a final theoretical concept that best articulates the fluid nature of a PLN: actor-network theory (ANT). The idiosyncratic quality of how each participant interacted and explained their PLN throughout the study was pervasive. Donna and Erik used and explained social media more than the others while Amber and Barry focused more on an appreciation of human interaction over technology use. From an ideational perspective, Amber focused more on research and writing; Barry on business English; Carl and Donna on pedagogy and blogs; and Erik on blogs, pedagogy, and writing. Without exception, each participant provided clear evidence of how humans and non-humans (i.e., materials) come together as a network. Human and non-human actors are networks and networks are an association of human and non-human actors (Fenwick & Edwards, 2010). The authors also state that these associations of actors not only form agencies but also ideas, identities, rules, routines, policies, instruments, and reforms as well (Fenwick & Edwards, 2010). An actor (i.e., an idea, material, or human being) is anything that has an effect on some other actor (Latour & Harmon, 2010). Much in the same way that feedback loops in complex systems form memories that affect change over time, translation is an ontological frame that recognizes that actors transform from one set of associations to another (Latour, 2005). In terms of a PLN, findings

showed that ideas, materials, and human interaction changed shape over time, which was purposeful and meaningful for each respective participant of this study.

To conclude, the findings showed that all participants viewed the personal contacts they maintained openly online as being a part of a whole network of personal learning. Some contacts were more professional in nature while others were more personal; some contacts also included face-to-face meetings while others did not. Some contacts served a particular purpose around certain goals or projects that participants were interested in, while other interactions with contacts were more emergent. The ties that participants formed with their personal contacts were both strong and weak. Strong ties are those formed among friends or colleagues who sustain close contact with each other; whereas, weak ties are those one has little contact with and can also include interacting with a friend of a friend, for instance (Granovetter, 1973).

The implications of this study are that professional development is a collective network of ideas, materials, and social interactions. Professional learning implies an ongoing process of personal growth that depends on ideas being shared, the materials used to share such ideas, and the human relationships that are formed to use the materials to share the ideas. These implications have practical applications that underpin the following recommendations:

1. The first recommendation is for educators to assess their own PLN and how it might help assist in ongoing professional learning.
2. The second recommendation is for instructional leaders, administrators, and supervisors to assess the PLNs of teachers within the school and how they might yield affordances for more effective, efficient, and engaging professional learning experiences for teachers.
3. The third recommendation is for conference and workshop organizers to assess how individual sessions might integrate within a teacher's PLN before, during, and after the actual event. Instead of looking at a conference as an isolated event, it becomes more an extension of professional learning via social media, sharing discussions before a session and extending the discussions and personal relationships after the event.

For further research, a social network analysis (SNA) could be applied to individual PLNs so to better understand the greater complexities and patterns between ideational, material, and human nodes within a given network, and to numerically identify prestige and other power relationships that might exist. Complementing the SNA with qualitative data via a mixed method study would provide even greater insight into how and possibly why networks grow, deplete, and remain constant.

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