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Extending the Learning Space: Cultivating an Online Learning Community in Support of District Professional Learning

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Abstract

With the impact of COVID-19 on classrooms around the world, how teachers engage in professional learning is continuing to evolve. While many existing online learning communities (OLCs) have grown rapidly during this period of change, others have been newly initiated. These nascent OLCs have arisen to meet the needs of educators as they navigate new and often unforeseen challenges. The purpose of this study was to examine an emergent OLC initiated by a school district using a social network lens to better understand who is participating in this group and the flow of resources through the patterns of connection within it. Educators within this OLC emphasized the fostering of a culture of community through interactions that sought to strengthen social bonds. The findings of this study indicate that if OLCs are to be harnessed fully to shape teacher practice, the establishment of strong

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social connections within the community may be an essential precondition to its development.

Keywords: leadership, professional learning communities, school districts, social media, social network analysis

Introduction

With the widespread adoption of social media platforms throughout the early 2000s, educators have been increasingly drawn to professional learning (PL) opportunities afforded in virtual communities (Carpenter, 2016; Lundgren et al., 2021). While online PL initiatives and communities are incredibly diverse, there appears to be a relationship between type of organization and the purpose of the community. Top-down or formally-organized PL initiatives and communities, usually hosted by institutional platforms and in tandem with in-person activities, are often designed to meet predetermined needs through a fixed process. Conversely, individually-led or informally-organized PL initiatives and communities usually have the capacity to adapt to meet educators' learning needs as they are identified throughout the learning process (Lantz-Andersson et al., 2018).

Informal learning, facilitated by the widespread use of social media and portable devices, allows for educators to share first-hand experiences, knowledge, and ideas while also sharing resources (Macià & García, 2016). Active participation within these communities allows individual educators to draw on the community to address problems of practice in a dynamic and rapid manner (Greenhalgh & Koehler, 2017). While joining an existing online learning community (OLC) is of great benefit to individual educators, understanding how organizations (e.g., school districts) can harness social media technology to cultivate organizational OLCs is not well understood.

Cultivating an Online Learning Community

The context for this study was an emerging OLC of educators in a large school district in Atlantic Canada serving approximately 63,000 students, with about 45% of students situated in rural contexts. The catalyst for the inception and growth of this OLC was a summer learning institute, delivered synchronously and asynchronously, and led by school district employees, educators, and community members covering a wide variety of topics identified by the educators themselves. The purpose of these virtual PL sessions was to facilitate educator growth along four dimensions that aligned with the stated goals of the school district: (1) developing an inclusive learning environment, (2) expanding learning partnerships, (3) leveraging digital technologies to support teaching and learning, (4) supporting high-quality pedagogical practices. Participation was voluntary and on the educator's own time.

Participants were familiar with online PL initiatives as leveraging digital technologies is a frequently used strategy used to overcome in a district that covers a very large geographical region.

The organizers of the institute promoted the use of a single Twitter hashtag to facilitate the development of a complementary learning space with hopes of extending the learning opportunities and cultivating relationships and knowledge exchange among educators across the province. The use of Twitter was a next step in leveraging digital tools to support PL in the district. Twitter was used because the organizing team recognized that a district-focused online learning community was already coalescing in this context. The use of a dedicated hashtag was a tool used to harness that energy within the context of the summer institute.

Many studies have examined established OLCs facilitated through social media (e.g., Carpenter & Krutka, 2014; Lantz-Andersson et al., 2018; Rehm & Notten, 2016), yet few studies examine the characteristics of these communities in their nascent form. Accordingly, the purpose of this study is to explore how an emerging OLC begins to take shape as educators utilize social media to support their learning during a district-led PL initiative. Three research questions guided this study:

(1) Who was involved in the online learning community?

(2) Who were the most influential actors within the group?

(3) What types of resources were exchanged within the OLC?

Educators' Professional Learning

A range of formal, facilitated activities targeting the development of teachers' knowledge and/or practice have been utilized since the 1940s to support educators in meeting their learning needs (Darling-Hammond et al., 2009). While various models of PL share a similar purpose of supporting the development of educators' professional practice, these models have evolved considerably in recent times. Historically, lectures and workshops presented by recognized experts have traditionally dominated teacher PL models (Guskey, 2014) as these formats have the capacity to reach a large number of individuals at a relatively low cost. However, the vertical transmission of knowledge has been shown to yield primarily short-term, limited changes in teacher practice (Darling-Hammond et al., 2009) and appears to be slowly falling out of favour (Darling-Hammond, 2021). District or school-level in-person professional learning communities (PLCs), in widespread use since the early 1980s, utilize a participatory "bottom up" approach (Patton, 2014, p. 221) so that

the knowledge created will be of maximum use to those it intends to serve: teachers and students. PLCs bring together groups of educators who, motivated by a common problem of practice, share and critically reflect on their ongoing work with a focus on supporting collective learning and growth (Stoll et al., 2006). However, some research on PLCs has shown mixed results in their effectiveness at supporting student achievement (Lomos et al., 2011). Most recently, new models such as professional learning networks (PLNs) and research-practice partnerships (RPPs) have emerged as approaches that expand on PLCs. They bring together practitioners with education researchers (and sometimes policy-makers) in longer term relationships where they collaborate to build the capacity of education systems to address mutually defined improvement goals by drawing on the expertise of the various partners in the PLN or RPP (Brown & Poortman, 2018; Coburn et al., 2021).

Within this evolving context, OLCs facilitated through social media are increasingly engaged by educators to meet their ever-evolving PL needs (Duncan-Howell, 2010). Social media enables teachers to collaborate, reflect, and learn from one another (Rehm et al., 2020) while still being able to draw on the resources and knowledge of other sources of expertise (Xing & Gao, 2018). Further, as these OLCs are shaped by the needs and interests of actively participating educators, individuals or small groups can rapidly pivot to new areas of learning as problems arise in their practice. In addition to the factors that are "pulling" educators into OLCs, the disruption caused by COVID-19 has "pushed" educators to seek them out (Carpenter et al., 2020).

Numerous studies have examined teacher' use of social media for professional development (e.g., Greenhalgh et al., 2021; Liljekvist et al., 2021), but only a small subset of studies relying on data collected during the COVID-19 pandemic have yet been published. Greenhow et al. (2021) noted that teachers harnessed the power of social media for ongoing support during professional emergencies (e.g., pandemic-induced emergency remote teaching). The supports within the #EDchat community were inherently flexible in nature as online learning community discourse(s) shifted according to the needs of educators in a just-in-time manner. Carpenter et al. (2020) examined how teachers utilized supports with the #RemoteTeaching and #RemoteLearning online PLCs, noting that teachers have utilized Twitter during the COVID-19 pandemic to exchange resources, build knowledge, and to facilitate just-in-time professional development.

Simply put, with educators around the world physically isolated from one another and/or with traditional models of in-person professional development suspended, educators' have been forced to rely more heavily on social media to meet

their PL needs (Greenhow et al. 2021; Oddone et al., 2019). How educators engage with these OLCs and the access they are afforded to the resources within these social spaces can vary considerably.

Conceptual Framework: Social Capital and Social Networks

To better understand the early development of an online learning community, we drew upon theories of social capital and social networks. Social capital refers to the resources embedded and exchanged through relationships within a social network (Bourdieu, 1986; Coleman, 1990; Lin, 2001). It includes, for example, resources such as information, expertise, social support, and trust. Taking a social network approach supports the understanding of access to social capital by recognizing the interdependence of actors, relationships, and resources as mechanisms of social action (Perry et al., 2018). Expressive ties are those in which the actors in the network share norms and foster similar sentiments by maintaining valued resources such as trust and emotional support (Granovetter, 1973; Lin, 2001) whereas instrumental ties are formed to obtain and mobilize resources such as information, expertise, advice to be used to achieve desired outcomes (Burt, 1992; Lin, 2001). It is through our expressive and instrumental ties to others that resources are transformed into social capital (Lin, 2001).

Social capital resides within three very distinct dimensions: structural, cognitive, and relational social capital (Nahapiet & Ghoshal, 1998). Structural social capital refers to the configuration of social networks that facilitate (or constrain) access to resources. Cognitive social capital depends upon shared narratives and understandings as mechanisms that also facilitate (or constrain) resource exchange. Relational social capital focuses on the quality and characteristics of relationships established through trust, norms, and identification. In order to understand how educators contribute to a developing online learning community, we have operationalized social capital in relation to the structure (i.e., structural social capital) of an online professional community, as well as the instrumental (i.e., cognitive social capital) and expressive ties (i.e., relational social capital) identified through their social media interactions.

Social networks are the vehicle through which social capital is exchanged. Social network analysis enables researchers to understand these patterns of relationship in robust ways (Wasserman & Faust, 1994). In this study, we focused on the social network concept of centrality to explore who is participating in this network and to

what extent their activity bears influence on others. Centrality focuses on the position of actors (i.e., people) in social networks, identifying those of structural importance or individuals whose activity within the network bears influence on the overall patterns of interaction (Borgatti et al., 2018; Scott, 2017).

Because this study is focused on a social media network, we use the concepts of transmitters, transceivers, and transcenders (Daly et al., 2019) to understand the development of a PLC initiated by a school district. *Transmitters* refer to people who create messages and share them on Twitter. These individuals are identified using the network concept of *outdegree centrality*, a raw measure of the number of interactions (i.e., tweets) initiated by each person. The greater an individual's outdegree score, the higher the volume of content they produce on Twitter. *Transceivers*, on the other hand, are individuals who possess high indegree. *Indegree centrality*, in a social media context, focuses on the number of times a person's original tweet was retweeted within the network and/or the number of times a person is mentioned in the tweet of another network actor. In other words, transceivers are the people whose work and network presence is recognized by others. *Transcenders* are those individuals who contribute content (i.e., high outdegree) and whose content is recognized (i.e., high indegree) by others.

Methods

Data Collection

Data was collected from Twitter using NodeXL (Smith et al., 2016), a network analysis tool that collects and analyzes network data from social media platforms. Data scraping (i.e., the process of pulling down the identified tweets from the Twitter platform) ran for five weeks in August-September 2021, beginning a week before the start of the two-week learning institute and continuing for two weeks following the event. Relevant tweets were identified by using the dedicated hashtag (#ULearnNL) and the district Twitter handle (@NLESDCA). Data were retrieved on a weekly basis and merged into a single master dataset.

Overall, this process yielded 2038 interactions among 201 individuals. The interactions included in the dataset were formed by tweets (short messages no longer than 280 characters), re-tweets (sharing someone else's tweet for your followers/friends to see), mentions (messages about someone by adding @username), and replies (subset of mentions where the messages are intended specifically for someone

by adding @username) (Hansen et al., 2011). Of these exchanges, 289 original content introductions—that is, original tweets created by an individual member and mobilized within the network—were identified. The original content introductions were created by a subset of 146 network members, identifying 55 people who were passive participants in the network (i.e., people who were mentioned in other people's tweets, but who did not contribute any unique content of their own).

Data Analysis

Data analysis involved two distinct phases: (1) social network analysis to explore the structure of the network, identifying who is participating in the OLC and who holds the most influence within the group; and (2) content analysis to examine the types of resources (i.e., social capital) exchanged within the OLC.

Social Network Analysis

Social network analysis was used to explore the structure of the OLC with a specific focus on the most influential actors within the network (i.e., transmitters and transceivers) using NodeXL software (Smith et al., 2016). To do so, the analysis focused on measures of degree centrality (i.e., frequency of interaction) and tie strength (measured by edge weight). Centrality is a family of concepts that encompasses a variety of measures that each focus on different types of importance of identified actors within a social network (Freeman, 1978). This analysis focused specifically on the most common centrality measure: degree centrality (Carolan, 2014). Outdegree measures the number of instances where a network actor sends a tie (or in the Twitter context, [re-]sends a tweet) and indegree measures the number of instances where a network actor receives a tie (in this case, is re-tweeted or mentioned by another) (Hansen et al., 2011). Outdegree measures were used to categorize transmitter activity, while indegree measures were used to identify transceivers within this network (Supovitz et al., 2018). Tie strength is an important network concept (Granovetter, 1973) as different types of ties facilitate the exchange of different types of resources (Lin, 2001). Edge weight, which measures the number of interactions between two actors in the network, was used to determine the strength of the tie: the more frequently actors interacted with each other, the stronger the network tie (Hansen et al., 2011).

Content Analysis

Content analysis is one way researchers can examine the resources exchanged on Twitter (e.g., Chew & Eysenbach, 2010). In this study, content analysis was used to consider the types of resources exchanged by members of this online community. Because retweets repeatedly shared the same content, they were considered as duplicates and therefore removed from this data set; only the 289 original content introductions were used for this phase of the analysis, which included written text, visual images, graphics interchange format (GIF) files, videos, and Portable Document Format (PDF) documents.

Two rounds of data analysis were conducted using both deductive and inductive approaches. Initially, a deductive approach was used where the original content introductions were divided into three categories based on the text content: instrumental ties, expressive ties, or a combination of both. The "combination" category comprises tweets where the text included both instrumental and expressive statements. The second round of data analysis used an inductive approach to thematic analysis, identifying emerging themes and patterns in the tweets (Saldaña, 2016). The text content of each original content introduction was analyzed at the sentence level using NVivo 12 qualitative data analysis software (QSR International Pty Ltd., 2020). Other tweet components (i.e., images, videos, attached documents) were analyzed independently. Many tweets contained multiple components (e.g., written text, image) and each individual component that comprised the tweet was referred to as a "reference". As such, the total number of references (N = 712) exceeds the total number of original content introductions (N = 289); the totality of these references were the focus of the second round of coding during the content analysis.

Findings

Patterns of Interaction in the Online Learning Community

The analysis of the Twitter network (i.e., the OLC) identified an emerging learning community that included 201 users and 2038 tweets. OLC members were predominantly provincial educators (n = 143, 71%), including school district personnel (n = 24), school-based educators (e.g., teachers, school administrators, n = 105), government and other educational organizations (n = 14). The remaining 29% of members included non-educators in the province (n = 10), people from outside

the province including educators (n = 22), and non-educators (n = 8). Nearly 10% of the Twitter users' bios lacked sufficient detail to determine their profession and/or location (n = 18).

The network was most active during the two weeks of the institute with 81% of the total network activity occurring during this timeframe. Degree centrality measures indicated that, on average, network members were implicated in 10 ties (*SD* = 16.05) with the majority of network activity occurring among OLC members who were educators/staff within the educational jurisdiction. Given the directed nature of the collected data (i.e., the team's ability to identify who tweeted content and who was re-tweeted or mentioned), these interactions were analyzed taking tie direction into account. The more times a person tweeted, mentioned, or replied to a tweet, the higher their outdegree score. The more times a person's content was retweeted or an actor was mentioned, the higher their indegree score. Overall, network participants possess similar outdegree (*M* = 6.03, *SD* = 11.65) and indegree scores (*M* = 6.03, *SD* = 11.44). These scores were used to identify the most influential OLC members.

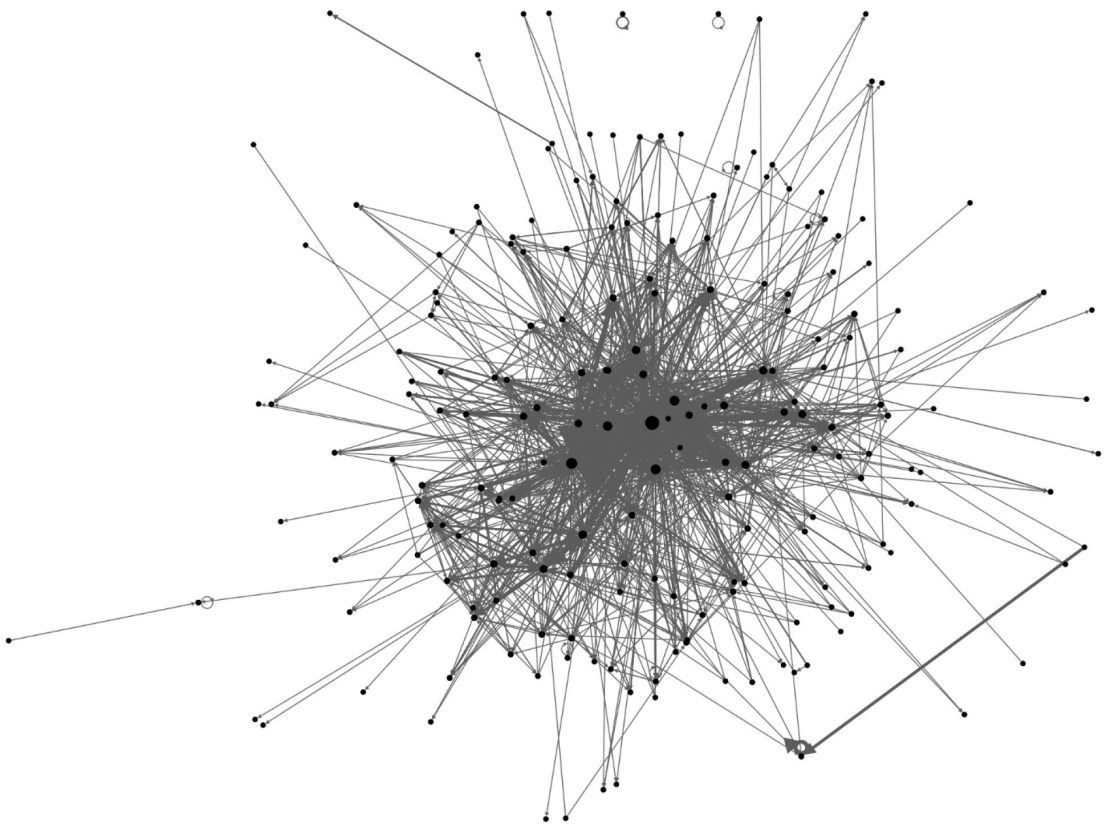
To measure the strength of connection between two network actors, edge weight (i.e., the number of times two actors connect with each other through Twitter activity) was calculated. The average edge weight was 5.02 (*SD* = 8.93), ranging in value from one through 51. The median edge weight was two indicating that half of the ties in the network comprised one to two interactions, suggesting that connections among the people participating in this online community is an area for continued growth. Stronger ties (i.e., ties with upper range edge weights) typically included the school district Twitter handle in the pair, identifying that many individuals active in the network were connecting with the school district more broadly. Figure 1 presents a visualization of the network with the thickness of the lines representing the edge weights of the ties.

Influential Actors in the Network

Recall that transmitters are those people who create and/or circulate content within the network; they are identified by their outdegree scores. The higher their outdegree score, the more influential they are as a transmitter. Similarly, transceivers are individuals whose tweets have been retweeted or who have been mentioned in other participants' tweets; they are identified using indegree scores. Transcenders refers to those individuals who are highly active creators and whose work is often mentioned and/or retweeted. The top two deciles of out/indegree scores were used to identify highly influential individuals (n = 61, 30%) within the OLC, including

Figure 1

Visualization of the Summer Learning Institute Twitter Network



Note. Black circles represent each Twitter account active in this network. Node size is based on degree centrality scores; the bigger the circle, the more active the account. Lines represent the ties between the accounts (i.e., mentions, retweets, replies). The thicker the line, the more often the two accounted were connected. Circles refer to self-loops, or tweets that were not connected to any other account. Arrowheads refer to the direction of the tie. An incoming arrowhead identifies that the receiving account was implicated in a mention, retweet, or reply by the content originator.

transmitters (n = 19, 31%), transceivers (n = 19, 31%), and transcenders (n = 23, 38%). The majority of these individuals (n = 52, 85%) were educators within the provincial system, with school-based educators being the most represented (n = 38, 73%). A further 10 influencers (16%) were located outside the province, six (60%) of whom were educators. Table 1 provides an overview of who comprised each category of influence based on their organizational (or personal) location within or outside

the provincial educational jurisdiction. These findings demonstrate that despite the emergent nature of the group, a social media presence has already enabled the group to connect with educators beyond their district boundary.

Table 1
Key Influences in the Online Learning Community

Location	Overall Influence (*N* = 61)	Transmitters (n = 19)	Transceivers (n = 19)	Transcenders (n = 23)
Province – District staff	14 (23%)	2 (10.5%)	4 (21%)	8 (34.7%)
Province – School staff	38 (62.2%)	13 (68.4%)	13 (21.3%)	12 (52.2%)
Province – Other education organization	0 (0%)	0 (0%)	1 (5.2%)	0 (0%)
Province – Non-education	1 (1.6%)	2 (10.5%)	0 (0%)	0 (0%)
Out of province – Education	3 (4.9%)	0 (0%)	1 (5.2%)	2 (8.9%)
Out of province – Non-education	2 (3.3%)	0 (0%)	0 (0%)	0 (0%)
Indeterminant	3 (4.9%)	2 (10.5%)	0 (0%)	1 (4.3%)

The SNA results identify nearly a third of the people emerge as key influencers in terms of content creation and whose content is recognized by peers (i.e., content that has been re-tweeted and/or mentioned). Many school-based educators and district staff from within the provincial education system were among this group, which is integral to meeting the overall goal of the development of this OLC. Network analyses suggest that the movement of resources in this Twitter network was facilitated by a subset of active users. Despite being so few in number (n = 23), these key individuals—classified as transmitters, transceivers, and transcenders as per the conceptual framework—collectively accounted for 64% of the original content introduction (n = 184/289 original tweets). Of the 184 original content introductions, the majority (n = 113) were provided by transcenders, followed by transmitters (n = 57) and transceivers (n = 14). Thus, transcenders were the primary source of all types of original content introductions, yielding these individuals a disproportionate amount of influence on knowledge sharing in this network.

Types of Resource Exchange on Twitter

The second phase of data analysis concentrated on the content analysis of the

tweets, exploring the types of resources exchanged through the Twitter interactions. The first round of content analysis focused on categorizing the 289 tweets that introduced original content into the network according to the type of tie they were creating (i.e., expressive, instrumental, or a combination of both). Of these tweets, 70% (n = 203) were categorized as expressive ties (e.g., expressions of social support), 12% (n = 35) were instrumental ties (e.g., information, materials), with the remaining 18% (n = 51) containing a combination of both expressive and instrumental resources. Overall, the majority of tweets focused on positive sentiments related to the summer learning institute.

During the second round, 712 distinct references (i.e., sentence level components) were examined. Consistent with the initial analyses at the tweet level (i.e., the entire tweet as a whole was categorized), 60% the references identified expressive resources (n = 429). About 30% of the references contained instrumental information (n = 211) with the remaining 10% (n = 72) of the references serving decorative purposes. The 'decorative' category included images and GIFs (i.e., animated images) that did not offer any meaningful information for educators' PL or their community building; they were purely ornamental. In fact, more than one third of the images and GIFs used in tweets were used for decorative purposes. Images that were used for instrumental purposes took up 36% (n = 71), leaving the smallest share to expressive ties with 27% (n = 54). References categorized as expressive or instrumental were further examined to identify emerging themes within the OLC. Each of these groups is further elaborated below.

Building Relationships

Expressive ties facilitate community building and the sharing of affective resources such as trust and emotional support. They constitute the majority of interactions within this OLC, with just under three quarters of network activity focused solely on the affective domain. Among these exchanges, five themes were identified: enjoyment, excitement, gratitude, inspiration, and humour. Table 2 provides an overview of the distribution of these types of resources, including a description of the extent to which the tweet focused on textual and/or non-textual content.

Three dominant themes—enjoyment, gratitude, and excitement—accounted for 85% of the tweets in this category. Tweets in these categories, which were comprised predominantly of written text with very few images, included statements such as "THIS is AWESOME!", "Honoured to partner with some exceptional colleagues to

Table 2
Distribution of Expressive Resources within the OLC

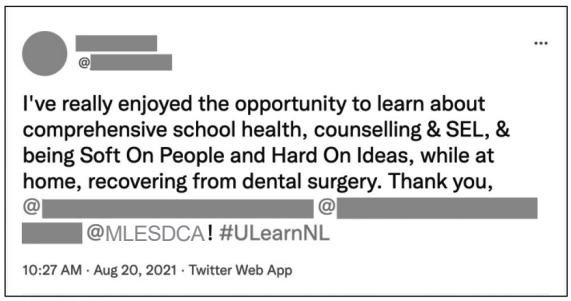
Expressive Ties (n = 429 references)	Content Description	Reference Count (Total)	Reference count (Textual)	Reference count (Non-textual)
Enjoyment	Tweet content includes expressions of gratification, compliment, and approval.	136 (32%)	136 (100%)	0(0%)
Excitement	Tweet content includes the expression of passion and enthusiasm.	110 (26%)	104(95%)	6(5%)
Gratitude	Tweet content includes the expression of acknowledgement, gratefulness, and honour	118 (27%)	117(99%)	1(1%)
Humor	Tweets content includes expressions of fun and lightheartedness.	17 (4%)	7(41%)	10(59%)
Inspiration	Tweet content contains the expression of vision, encouragement. The tweet content was to provide motivation and provoke new thoughts.	48(11%)	11(23%)	37(77%)

share our #DeepLearning journey", and "So excited to learn alongside so many great educators over the next two weeks!" Only 11% of the content references contained inspirational statements such as, "Let's help our Ss [students] see the possibilities instead of the limitations. Assessment must create hope! #UDL #selfefficacy".

Four percent of the references fall under the theme of humor, which included statements such as "My list for reading has been greatly expanded. Now to find time to read them all. I need a week on an island alone 😅" and "The unexpected benefit to at home virtual conferences–there are always tasty gluten free snacks for between session breaks." Some of the tweets also contain humorous images. Although the humorous statements took up only a small percentage, it reflects the atmosphere of the online learning community being friendly, relaxing, and lighthearted. These latter two thematic groups—inspiration and humour—were much more likely to contain images in support of the text. Figure 2 provides further examples of actual tweets that were included in the analysis. Overall, these findings suggest that the main use of the OLC was to build community within the group mostly through the sharing of excitement, enjoyment, and gratitude.

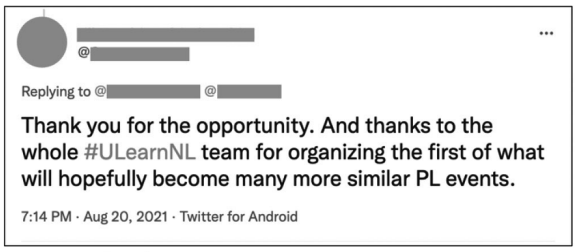
Figure 2

Examples of Themes under Expressive Ties

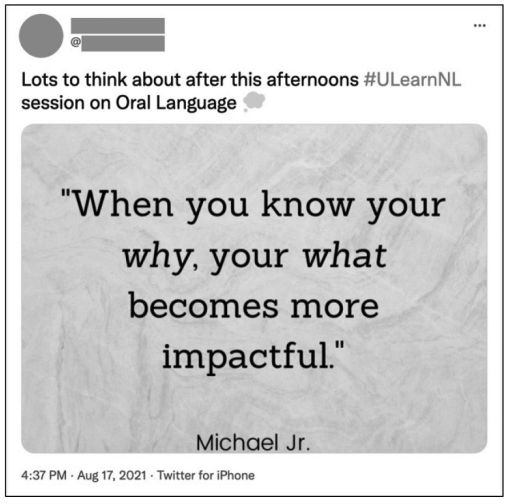


A. Enjoyment

B. Excitement



C. Gratitude



E. Inspiration

D. Humor

Mobilizing Knowledge and Information

While much less frequent, about one in every ten Twitter interactions was classified as an instrumental tie. These are important ties as they provide actors in the network with access to resources such as information and materials used in developing professional knowledge and expertise. Educators contributed to the OLC in five different ways to share and access additional knowledge: materials, promotion, reflection, feedback, and learning log. Table 3 provides an overview of these five themes falling under instrumental interactions.

Table 3
Distribution of Instrumental Resources within the OLC

Instrumental Ties (n = 212 references)	Content Description	Reference Count (Total)	Reference count (Textual)	Reference count (Non-textual)
Materials	Tweet content includes resources that can help teachers' practice in the classroom.	58 (27%)	10 (18%)	48 (82%)
Promotion	Tweet content advertised professional development sessions.	55 (26%)	36 (65%)	19 (35%)
Reflection	Tweet content includes the participants' thoughts and understanding of the content during the professional development sessions.	52 (25%)	49 (94%)	3 (6%)
Feedback	Tweet content includes the comments, evaluations, and reactions to the Professional Development initiative.	28 (13%)	28 (100%)	0 (0%)
Learning log	Tweet content includes the description of the participants' progress during the professional development initiative.	19 (9%)	19 (100%)	0 (0%)

Compared with the distribution of expressive ties, the tweet content under instrumental ties spreads more evenly. Three-quarters of the tweet content classified as instrumental ties are shared evenly among three resource types: materials (27%), promotion (26%), and reflection (25%). Materials tweets included comments such as, "Created this visual after I had time to reflect on the information and knowledge shared in this mornings #ULearnNL A Toolbox for Building Positive Relationships with Families" and "I created and shared this resource last year, but I thought it'd be a great time to re-share it with @NLESDCA educators after session this morning!"

These tweets shared specific resources to support teachers' practice. Promotional statements referred exclusively to sessions that were part of the summer institute or to the institute itself while those tweets categorized as reflection included comments like, "Quote of the day for me: 'The shift must be intentional'" where attendees were making sense of what they learned during the day's learning activities. Feedback takes up 13% of the tweet content while learning log has the smallest share (9%) of total Twitter interactions. Figure 3 provides further examples of tweets that demonstrate exchanges of instrumental resources.

Notably, images, GIFs and videos (82%) were the most used form of tweet content when materials were shared among the participants. Only 18% of the tweet content under the materials theme were expressed in the form of text; most tweets included external links to (an)other website(s) or a shared document in Google Drive. For the remaining themes, textual content is the most predominant type of content used in the tweets: promotion (65%), reflection (94%), feedback (100%), and learning log (100%).

Overall, existing instrumental interactions, although less dominant than expressive ties, offered opportunities for people in the Twitter network to share and access additional information related to the PL initiative (i.e., cognitive social capital). Nonetheless, expressive interactions were most notably mobilized in the Twitter network, which supported participants' contributions building community (i.e., relational social capital) within the emerging OLC.

Discussion

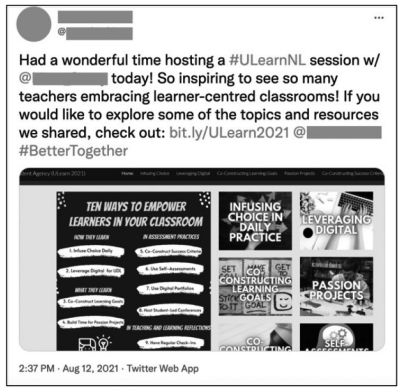
Many school districts are looking to digital tools as avenues for supporting continuous PL for educators. This study provides an example that can be used to inform next steps in helping district leaders cultivate online learning spaces. While these results are not generalizable, they do provide a context for learning where we offer three areas for future consideration for school districts engaged in this kind of work: building a culture of community, diversifying resources with intentionality, and modernizing PL.

Building a Culture of Community

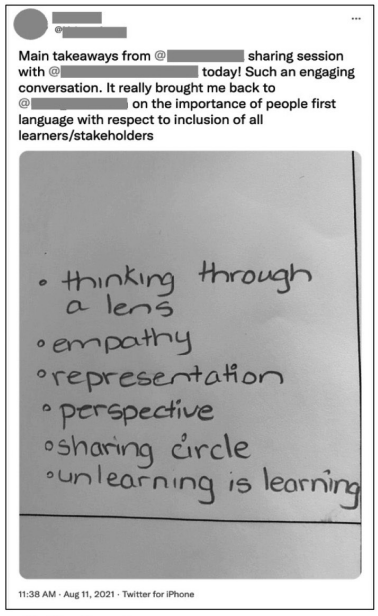
In their work on communities of practice and "digital habitats", Wenger et al. (2009) suggest three dimensions—domain, practice, and community—that are fundamentally integral to learning. The context of the learning institute, albeit

Figure 3

Examples of Themes under Instrumental Ties



A. Materials



C. Reflection

E. Learning log

B. Promotion

D. Feedback

very broadly defined, provides the "domain" (i.e., the shared context that brings people together in a learning space) for this professional community. The "practice" dimension is embodied in the sharing of resources and learning among the group from people within and outside the host district. It is the community dimension, however, that is the most prominent domain within this OLC as it emphasizes the creation of "moments of togetherness" (Wenger et al., 2009, p. 8) and social interaction that are necessary conditions for learning.

Relationships support learning (Immordino-Yang, 2015). Educators' emotions bear influence on their PL and work on improving instructional practice (Datnow, 2018; Saunders, 2013). The emphasis on expressive resources in this OLC demonstrates how these educators used Twitter to express and share their emotional responses to their experiences at the summer institute—an important form of social support. Emotional capital borne of positive experiences with others builds relational capital, strengthening connections within a learning community (Liou & Canrinus, 2020). Strong relationships are the bedrock of robust professional communities, which are the necessary foundation of the complex work of facilitating meaningful learning (Little, 2012).

Research shows participation in PL may have positive effects on developing strong professional communities (Grodsky & Gamoran, 2003), which is essential to school and system improvement initiatives (Kruse et al., 1994). These seemingly simple expressions of enjoyment, excitement, inspiration, and humour might easily be dismissed or under-valued when, in fact, these exchanges are planting the seeds of trust—the most important relationship-building task in any organization (Bryk & Schneider, 2002). Educators' sense of social support is an integral part of their day-to-day work (Baker-Doyle, 2012) and social media platforms (e.g., Twitter) provide an accessible pathway for people to connect and learn from and with each other (Carpenter, 2016). This may be of particular importance, perhaps even a precondition, within nascent OLCs; if these communities are to support teacher practice fully, they must be spaces where teachers feel trust and social support from digital colleagues in order to engage in learning opportunities that may make them feel vulnerable (Kelly, 2013).

Diversifying Resources with Intentionality

When supporting the development of an OLC, it is important to consider both *who* is mobilizing resources and *what* kinds of resources are being mobilized. Activity patterns within social networks like OLCs can both facilitate and constrain

learning. That said, without attention to who is given voice in the space and what types of resources are being mobilized within it, social networks can easily become victim to "the echo chamber effect" (Cinelli et al., 2021) where people with shared values and similar dispositions towards particular sources of information get stuck in reinforcing particular viewpoints and knowledge sources.

Centralization—a concept that speaks to the phenomenon of network activity focusing on a specific subset of actors (Wasserman & Faust, 1994)—is one way that resource activity within a network can be constrained. Already in this community, the small group of transcenders produce more content and are recognized more often by peers. When actors occupy these central positions, they can function (un-/intentionally) as "gatekeepers", controlling what types of resources are mobilized in the network (Corra & Willer, 2002), creating unspoken power dynamics that may dis/encourage participation in the group. To some extent, this is a naturally occurring phenomenon; power, prestige, and influence are natural functions of social systems (Degenne & Forsé, 1999; Friedkin & Johnsen, 2011), and as networks grow, it is not uncommon for them to evolve into sub-groups, cliques, or factions (Borgatti et al., 2018; Supovitz et al., 2018).

However, in a context such as this where the goal is to cultivate a diverse community from across the district, intentional actions that support resource diversity may be warranted. This might include asking representatives from across various sessions to be tweeting content (i.e., sharing their learning) as a model for others, providing Twitter "how to" guides to ensure use of techniques such as mentioning to amplify messages, and ensuring educators working in contexts where Twitter may be less familiar could help support greater diversity in the voices participating in the network. Ultimately, much like in a classroom, in an intentionally cultivated OLC such as this one, the leadership team should keep these network principles in mind (e.g., the tendency towards homophily and centrality as a constraint) and ensure that they are taking action to cultivate resource diversity as much as possible.

Modernizing Professional Learning

The COVID-19 pandemic has brought to the fore the urgency for education systems to become more flexible and adept at offering learning opportunities through a range of modalities. It has also provided the context where many educators seek out PL and community using online platforms like Twitter whilst transitioning from face-to-face to remote learning (Carpenter et al., 2020). Digital learning tools facilitate these opportunities and are an important aspect of modernizing the PL landscape

(Hargreaves et al., 2015). While equitable access to educational technologies and the internet can be a challenge in rural and remote communities (Lai & Widmar, 2021), many governments are committing to improving access to digital infrastructures (e.g., Government of Canada, 2022) as they acknowledge the inequities inherent in limited internet access.

It is also easy to assume that people have the desire and knowledge to engage with these platforms given their ubiquity. However, the assumption that, in this technologically-enhanced world, many people inherently know how to use digital technologies needs to be questioned. In the context of PL, emphasis needs to be on building educators' digital literacies—their abilities to use technology in effective ways (Smith et al., 2020). Any attempt to build OLCs using social media tools should be accompanied by explicit attempts to build the skills of the people expected to use them. This was a part of this learning institute where a Twitter active educator in the province led a session focused on how to effectively use the platform in support of PL. Continued efforts to promote the development of these skills could not only draw more people into the OLC, but as importantly, strengthen the ways in which these tools are being used. This is an important area for planning and coordination for school and district leaders charged with developing and organizing PL.

A commitment to providing equitable, just, and effective learning environments for all students is predicated on the learning, unlearning, and relearning of educational professionals working within school systems (Lopez, 2020). As teaching and learning in pandemic times has shown us, multiple pathways for learning are required for *all learners*—children, youth, and adults alike. At its best, online social media platforms like Twitter can provide easier access and easy-to-use technologies that can facilitate learning interactions that extend beyond an educators' daily workplace (Carpenter, 2016; Rehm & Notten, 2016). They can expand awareness and access to educators across wide educational contexts, enriching professional learning opportunities for teachers (Krutka et al., 2017).

In this study, school district leaders recognized the potential of Twitter to build relationships and share resources among educators (mostly) within (but also beyond) the school district. Yet, these findings suggest that, just as is required in face-to-face PL environments, the development of OLCs requires explicit attention to cultivating and nurturing relationships in these digital spaces *with intention*. When coordinating complementary online spaces to support formal PL initiatives, organizers could invite new members into the space, especially when they notice that the community may be facing challenges such as ideological siloes or a lack of representation (Carpenter, 2016). Attempts to do so were evident in this network through the use of mentioning

and additional education-related hashtags—practices that should be encouraged and expanded over time. Ultimately, social media platforms are spaces where leaders can model innovation and risk-taking while cultivating digital learning cultures (Carpenter & Krutka, 2014). This requires intentional action on behalf of leaders when the goal is to complement formal PL with complementary digital learning spaces; it will not automatically happen in effective ways on its own.

Implications

The rapid shift toward greater inclusion of digital tools in schools during the COVID-19 pandemic has accelerated the use of various educational technologies in educators' professional practice. The use of Twitter in support of PL is only one example of the multiple ways that the learning cultures are shifting to include readily available digital tools. For policy makers and school leaders, this shift will require an audit of current policies and procedures that may inhibit their access and use. Many districts have strict social media policies—often prohibiting their use—that may be wielding unintended consequences, namely prohibiting access to valuable learning spaces.

District and school leaders need to maintain their openness to investigating how these tools can be used to benefit learning, focusing on the educational opportunities they offer while also addressing the potential inequities that may follow if access to the internet and digital devices are not available to all. It is important that these issues not be employed as barriers to their use, but rather framed as possibilities that will evolve a more inclusive education system. As the body of literature examining educators' use of social media in shaping professional learning continues to grow, researchers must continue to draw on theories and tools such as social capital and social network analysis to understand who is participating, what resources are being mobilized in service of what purposes, and with what outcomes. With increased computational ability, these studies should evolve to examine larger temporal frames yielding richer insights to how the social dynamics change over time and with what consequences. The use of quantitative and qualitative methodologies in concert will enrich our understanding of how these tools are used, and more importantly, their impact on educational practice.

Limitations and Future Directions

The data collected for this study was limited to a single social media platform (i.e., Twitter) with a very particular context thereby limiting the generalizability of these findings. Collecting similar data across multiple platforms and contexts and comparing results could shed light on how different types of platforms influence how educators build online communities more broadly. This data study was also limited to the use of a specific hashtag; it is possible that educators connected with one another on Twitter using a different hashtag or on another social media platform altogether in relation to their learning at the summer institute. This limitation provides an opportunity to explore how educators utilize social media (especially those who are unfamiliar with a specific platform) given that, without the use of key phrases or hashtags, data collection for a study such as this one is impractical. Similarly, these analyses capture a specific moment in time; there is no examination of relationship building over time. Adding a longitudinal perspective to this work could also form the basis of future research.

A major limitation of this study is the inherent bias in that the study design naturally skews to include individuals who feel comfortable including digital spaces as part of their PL. This will vary from context to context depending on the extent to which social media platforms are considered locally as a viable means of support for PL and development. The pandemic necessarily forced educators globally to engage with digital tools to support classroom learning, but the extent to which these educators perceive digital tools as relevant to their own learning remains an area for future study. While in this context Twitter presented itself as a platform for examination, we recognize that engagement with various platforms is dependent on local dispositions towards their inclusion as valued learning tools. It is important to recognize that, even in the context of this study, there may be a wide range of attitudes towards social media and PL both within and across educational jurisdictions that may affect the impact of these platforms.

Conclusion

Educators' use of social media and other digital learning tools to support their learning is becoming increasingly popular among the general population of educators. Whereas once online participation may have been the exclusive purview of those early adopters of digital technologies, as society moves further into the technological

age and global circumstances are pushing education systems to modernize, the use of social media as a PL tool is becoming more mainstream. This opens up important opportunities for school district leaders to think about how they can harness these tools to build stronger professional communities across their systems. While a wide range of knowledge, skills, and expertise exists across an education system, too often, these valuable resources are under-utilized because of a lack of awareness and access among faculty and staff. Social media tools such as Twitter can provide an accessible pathway to bridge that divide. In this case, an organizing team sought to promote the development of an OLC to complement its summer learning institute—and, to some extent, they were successful. With these data and insights in hand, these school and district leaders can now plan for next steps in maximizing the potential of social media platforms as a viable tool to support continuous professional learning.

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