Visualizing Teacher Tweets: Finding Professional Learning Networks in Topical Networks

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ABSTRACT
The data for this study is part of #teachertweets, an interdisciplinary quantitative and qualitative study that examines the networks that US-based teachers form on Twitter, the conversations they are having there, and the content of individual tweets. This poster uses data visualization to explore teachers tweeting about teaching as a topical network toward more understanding of the ways that teachers engage in professional learning on Twitter.

Keywords
Social network analysis, information visualization

RATIONALE: PERSONAL LEARNING NETWORKS AS TOPICAL NETWORKS
Research shows that Twitter, a social media ICT, is a unique space for teacher engagement, as it helps teachers build community, share ideas, and transcend the limitations of geography. On Twitter, teachers can form Professional Learning Networks (PLNs) and alliances beyond their school building, district, or state. Twitter’s affordances help teachers engage as learners, peer-to-peer educators and educators of those outside the teaching profession (Anderson, 2011; Ferguson, 2010; Fingal, 2011). Since teachers use Twitter as a space to build community and impact social discourse around teaching, this poster aims to demonstrate how teachers comprise a topical network of users who are using ICTs to promote social change.

Topical networks are discovered through charting discussion around an issue, event or subject within or across online spaces, noting the links between sites of engagement or users who engage (Highfield, Kirchoff & Nicolai, 2011). By focusing on one group and its online activities around a particular topic, researchers can make grounded claims about the ways that groups form and how their discourse impacts social and cultural actions (Rogers, 2009). By visualizing teachers’ tweets about their practice, we gain insight into how teachers’ conversations about teaching build networks of users. Further studies will show how these networks impact social change (Hara & Huang, 2011).

WHY NETWORKS?
This study uses Gephi and Tableau, two data visualization tools, to graphically represent quantitative data. Visualizations enhance the presentation of complex data, can aid or amplify cognition, and allow for a user to explore large amounts of data in one setting (Lin, 1997; Card, Mackinlay, & Shneiderman, 1999). Network visualizations, when used with social media analysis, can show relations among different actors in a social network, highlight smaller communities within a larger group, and convey influence of one or a few members of a community (Smith et al., 2014). In the context of our study, network visualizations make visible whether/how teachers’ tweets form topical networks, which helps researchers learn more about how teacher’s PLNs are formed on Twitter, and how discourse about education on Twitter is shaped by teachers.

RESEARCH QUESTIONS
• Are teachers forming conversational networks with one another and with educational stakeholders on Twitter?
• How do teachers use Twitter as a mode of professional learning?
• What professional learning networks, virtual and otherwise, are visible through the tweets of teachers?
• How can information professionals explore these changes using visualization?

METHODOLOGY
In June 2014, we collected the tweets of 100 Twitter users who self-identified as teachers in their brief Twitter biographies for 8 days using ScraperWiki. We used this initial list of 100 to create a larger list of 510 teachers, which yielded the data set for this poster.
We amassed the list active accounts of 510 self-identified teachers through snowballing techniques, including reading the tweets of known teachers and noting their connections through @mentions and viewing popular online chats (for example #engchat is a chat for English teachers). Account handles were stored in a .csv file. We used @mentions as a way to track engagement amongst accounts to structure our network. Using the scripting language Python, (library Twitter-python) and Twitter’s REST API, we acquired each account’s timeline going back to 2013 and stored each in a separate JSON file.

We used a second Python script to read each JSON file, extract and structure each instance of @mention within each account’s timeline, and recorded this information in a .csv file. Using Excel macros, we identified the handles of teachers and non-teachers, and then input the .csv file into Gephi. We ran the algorithm Force Atlas 2, which clustered nodes based on connections to one another, and a degree report, which sized nodes based on the number of connections they have to other nodes; larger nodes have more mentions whereas smaller nodes have fewer mentions. Finally, we ran a modularity report, which identifies different communities within the network. We colored nodes based on whether the individual was one of the 510 identified teachers. Teacher’s nodes were colored as red, to differentiate them from other nodes, which were colored a dark blue, for contrast.

**FINDINGS AND ANALYSIS**

Our findings indicate that teachers are talking to one another on Twitter and are closely related, indicated by their proximity to one another in the overall network (see Figure 1). In multiple locations within the network, clusters of red nodes indicate conversations among teachers. Our findings also show that teachers are in conversation with other educational stakeholders. For example, one teacher, @theJLV (see Figure 2), is connected to educational activist Diane Ravitch (@DianeRavitch) and education news outlet Education Week (@educationweek); reading @theJLV’s tweets shows him in conversation with both.

![Figure 1. Full network zoomed out in Gephi](image)

![Figure 2. Network Visualization made with Gephi featuring activist @TheJLV as the central node](image)
Finally, the sizing of teacher nodes, relative to one another, show the potential influence of individual actors within the network. Based on these observations, teachers are using ICTs such as Twitter to participate in and create topical networks, with both teachers and non-teacher education-related entities. As they form topical networks, teachers on Twitter form PLNs, as it facilitates connections and information sharing with other teachers, as well as influential members of the education activist community.

**FUTURE STEPS**
Future steps for this study are to acquire and visualize more tweets from the same 510 accounts, as well as qualitative coding of tweets according to subject matter. This would allow for a more granular exploration into what teachers discuss within topical networks, to what extent teachers are using Twitter to participate in PLNs, and how the tweets of teachers impact public discourse related to education. Analysis of individual tweets could give insight into how teachers are using ICTs such as Twitter individually as a place to make claims about their practice, and engage in resistance and activism.

**SIGNIFICANCE TO THE FIELD**
The study of ICTs, such as Twitter, through the use of visualization software, allows for analysis at a macro level. Visualizations show patterns in communication among teachers on Twitter, indicate communities of teachers within a larger social network, and highlight connections between teachers and other education community members. Through researching this topical network, we add to the growing body of literature on the ways that social movements are using ICTs. ICT’s such as Twitter help users share resources, support group identity formation, and help groups to mobilize. (Hara & Huang, 2011). These practices are occurring among the topical network of teachers on Twitter, and raise further questions for further study about how topical networks impact social discourse around education and whether and how they influence social change in this area. Our work also provides an example of one way that information visualization helps information professionals and scholars gain purchase on both particular user groups, and also makes important contributions to the theorizing the relationships that are developing between ICTs and social movements.

**REFERENCES**