Teachers Turning to Teachers: Teacherpreneurial Behaviors in Social Media

Abstract

Today, there is growing evidence that educators engage in social media and virtual social networks across formal and informal settings to direct the trajectory of their curriculum. Interactions within and across virtual spaces provide opportunities to flatten hierarchical structures as teachers may directly and/or indirectly engage with educational decision making and the reform implementation (e.g., Supervitz, Daly, del Fresno, 2015). This paper examines an educational phenomenon, the emergence of a teacherpreneurial guild, in which teachers create and define knowledge underlying the landscape of educational practices and behaviors within the classroom. Using a sample of Midwestern elementary teachers, this work identifies patterns of online educational resource access over four years across 135,000 pins shared within Pinterest, a social media platform. Results indicate teachers most often turn to one another for resources and professional materials. This may have implications for trust developed within teacherpreneurial guilds and teachers' ability to exert agency within their profession at large.

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Over time, education policy has endeavored to connect teachers to one another. Established school communities with collaborative climates, including relational trust amongst teacher colleagues, positively impacts schools' stability and students' success (Bryk & Schneider, 2002). Furthermore, teachers' opportunities to interact shape what and how they learn (Coburn, 2001; Spillane, 1999). Education literature has explored various aspects of teacher community and collaboration in and across schools (Bryk & Schneider, 2002; Penuel, Riel, Krause, & Frank, 2009). Yet, the notion of teachers working in isolation, behind closed doors, persists (Lortie, 1975). Today, where and how teachers professionally engage and collaborate extends beyond the schoolhouse to a world of social media. To date, little effort has been devoted to systematically study teachers' engagement with social media. Though engagement in social media continues to grow, there remains a gap in the literature regarding how information and knowledge diffuse in virtual spaces, contribute to teachers' professional growth, or impact—both directly or indirectly—classroom teaching and students' success.

This work examines a fundamental shift in behaviors as teachers explore professional community and supplemental instructional resources in virtual spaces. Examining trends in teachers' behaviors within social media, we propose an emergent reorientation to resources and professional practices as teachers drive engagement with one another and professional organizations at large.

Literature Review

Recently, educational reformers have attempted to formalize and distribute improvement in teachers' practices and learning, with some success, through professional learning communities (PLCs) (Archinstein, 2002). Teachers in PLCs routinely meet to

discuss professional practices (Mitchell & Sackney, 2000; Toole & Louis, 2002), making meaning of their practices and learning from one another (Lave & Wenger, 1991). Though teacher professional community is a key factor to consider among school organizational conditions (Desimone, 2002; Youngs & King, 2002), teachers also informally seek advice and instructional support from their peers. These interactions and collaborations, to exchange and gain professional knowledge or improve teaching practices (Lave & Wenger, 1991; Frank, Zhao & Borman, 2004; Baker-Doyle & Yoon, 2010; Frank, Zhao, Penuel, Ellefson, & Porter, 2011) may influence their development and social capital over time (Spillane, Kim, & Frank, 2012).

Increasingly, accessible technology has expanded boundaries of teacher collaboration shifting some interactions to virtual spaces. For many teachers, social media has become part of one's professional and personal life. Social media allow individuals to keep in contact with one another easily, maintaining relationships and a presence in one another's life (Hampton, 2016). Professionally, relationships with other teachers may inform how one conceptualizes teaching, instruction, or their subject matter.

This paper provides an overall perspective of teachers' engagement in social media, as it situates within a larger ecology of sources on teaching and education professionalism. Examining teachers' behaviors within Pinterest, a predominate platform amongst teachers (Opfer, Kaufman, & Thompson, 2016), we illustrate the agents driving professional information and instructional resource sharing and discuss potential impacts for the field at large. As such, we focus on the teacherpreneur, a phenomenon in the current educational landscape.

Educational Phenomenon in Social Media

Teacher's instructional learning is situated in the social context to which they are exposed. Informal network ties among teachers may be developed through interactions across virtual and physical spaces, with one's physical social network expanding into virtual space. (Baker-Doyle & Yoon, 2010; Frank, Zhao & Borman, 2004). In other work, Wellman (2001) finds individuals may meet and connect online seamlessly with others who share similar interests. Teachers, like others, may engage online with those who share professional resources or teaching dispositions (Identifying Reference, 2018). The virtual and physical ties teachers maintain, facilitate the diffusion of knowledge across their social network (Wellman, 2004; Jimerson, 2014).

Teachers' engagement within social media is a prevalent, persistent phenomenon. Social media is frequently used by teachers for the purposes of teaching and procuring standards aligned resources. Research finds social media is a key part of changes in teaching and learning inside and outside of the school day (National Council of Supervisors of Mathematics, 2015). Amazon Education finds teachers spend up to 12 hours per week seeking out and accessing instructional resources online (Nguyen, 2016). In particular, a majority of elementary and secondary teachers consult social media sites including Pinterest and TeachersPayTeachers.com (TPT) when seeking out ELA and mathematics instructional materials (Opfer, Kaufman, & Thompson, 2016).

Teachers may choose to access online resources to meet a specific purpose or need for their instruction (Will, 2016). Many of these resources are pre-packaged and explicitly illustrate an instructional need. Furthermore, teachers' virtual collegial social

networks allow one to seek out advice and help without the social stigma of turning to their in-school colleagues (Will, 2016).

Given both the prevalence and the importance of resources found virtually, those invested in teacher preparation, educational research, and policymaking need a better understanding of how how teachers seek out and choose instructional resources. Expanding virtual collegial social networks facilitate a grass roots phenomenon of teachers turning to one another for help or ideas, rather than historically trusted organizations or industry. This may have implications for education policy and curricular coherence as communities of teachers become more connected, permeating physical boundaries.

The Case of Pinterest

Pinterest is a predominate virtual space for teacher interaction, knowledge, and information diffusion (Zhong et al., 2014). As a popular social media site, it allows teachers to scrapbook ideas: pinning lessons, exemplary teaching, and resources in personalized libraries for later reference. Within Pinterest, teachers may customize their newsfeed to follow those people with whom they are connected and the pins and boards they post. Teachers, accessing and sharing resources, build curated archives of instructional resources. Through curation, teachers present the ideas and resources of others as a coherent set situated throughout their boards, representing their professional perspectives on that worth knowing and sharing. This situative learning may allow teachers to connect with resources and their colleagues, engaging in both self-directed and incidental learning in social media (Schugurensky, 2000).

Pinterest affords the brokerage of information and social collegial networks (Burt, 2005) bridging teachers to teachers and to a conglomeration of teaching resources, across various virtual resource pools (VRPs). Many classroom teachers, taking initiative to find, share, and sell materials or ideas related to their teaching practice may be considered entrepreneurs. Given risks in wasting time, effort, and investment in resources of unknown quality inhering in their district materials and social networks, these teacherpreneurs independently seek supplemental materials and practices. For example, Miss Giraffe, a teacherpreneur and blogger from missgiraffesclass.blogpot.com writes,

> For now, I'll just tell you that this blog is for me to share teaching ideas and snippets from my world. I hope that you can use some of the ideas from this blog in your classroom! I am so excited to be able to connect with teachers around the world and share ideas. Thanks for visiting! (Miss Giraffe, 2016).

Jenny, a follower of Miss Giraffe's blog responds, "You are amazing! I see wonderful ideas on Pinterest and the ideas are almost always from your stuff! Thank you for making amazing products to help first graders!!! I would buy your whole TPT store if I could!" (Miss Giraffe, 2016). Teachers develop trust in one another and often seek advice regarding teaching practice; trusting peers more than experts or publishers (Education Week Research Center, 2014). Within Pinterest, we find teachers turning to teachers to identify pertinent instructional resources, seek advice, and further their professional practices. This study examines the entrepreneurial behavior of those teachers early in their career and their experienced counterparts.

Theoretical Framing

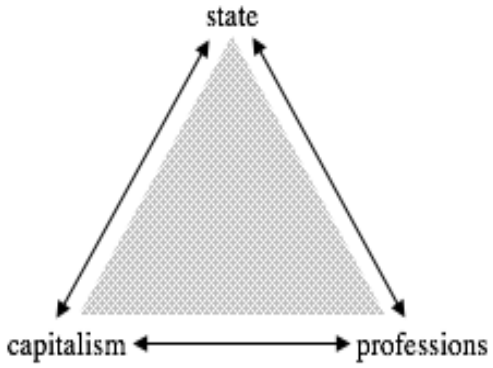
Educational reform and other "top-down approaches" are often used in an attempt to change teachers' practices and school quality (Gottfried, Stecher, Hoover, & Cross, 2011). Yet, historically, schools at large, are impermeable to change (Lortie, 2009; Ravitch, 2001). As educational reforms diffuse through federal, state, and district purviews, schools may intentionally or unintentionally loosely couple policy enactment with instructional practices (Coburn & Russel, 2008; Bidwell, Frank, & Quiroz, 1997; Weick, 1976). Loose coupling generally relates to increased variation in reform enactment (Meyer and Rowan, 1978), and therefore teachers' practices within the classroom (Coburn, 2004; Bidwell, Frank, & Quiroz, 1997).

Today, loose coupling of reforms may occur as teachers exercise agency as street level bureaucrats (Lipsky, 1980). There is growing evidence that educators engage in social media and virtual social networks across formal and informal settings. Interactions across virtual spaces offer the potential to flatten hierarchical structures as individuals may directly engage with educational decision makers and educational reform ideology. Across VRPs, teachers acquire and share instructional resources, circumventing traditional stakeholders within the field, such as universities, textbook companies, and special interest groups. Teachers seek advice and instructional resources from one another within and outside their direct social network to further their professional practices. Thus, social media facilitates teachers' agency and enactment in reforms as they curate instructional resources outside district purview.

The emergence of teachers' virtual collegial social networks may constitute a new form of professional community, a teacherpreneurial guild. Professional guilds have a

long-established history extending several hundred years. Krause (1996) defines guilds as "social groups, institutions created by groups of workers around their work, their skill or craft" (2). Professional associations or guilds often emerge organically in an effort to institutionalize a field or practice (Faulconbridge & Muzio, 2012). These groups establish norms, share expertise, and create consensus around quality professional practices (Krause, 1996; Faulconbridge & Muzio, 2012). Furthermore, through combined membership, guilds allow professionals to directly engage in decision making regarding various factors that may impact their work (Krause, 1996). Krause describes a triadic relationship between state or governmental authority, capitalistic market forces, and professions as illustrated in Figure 1.

Figure 1. Dynamics of Professional Guilds



Here professional guilds exercise power and influence directly through interactions within the marketplace and with state authorities regarding oversight and autonomy (Krause, 1996). The state may require change through mandate or law while the capitalistic market organizes finance and production (Krause, 1996). "A model of guild power…should have the following dimensions: power and control over the *association,* the *workplace,* the *market*, and the relation to the *state.*" (Krause, 1996, 3).

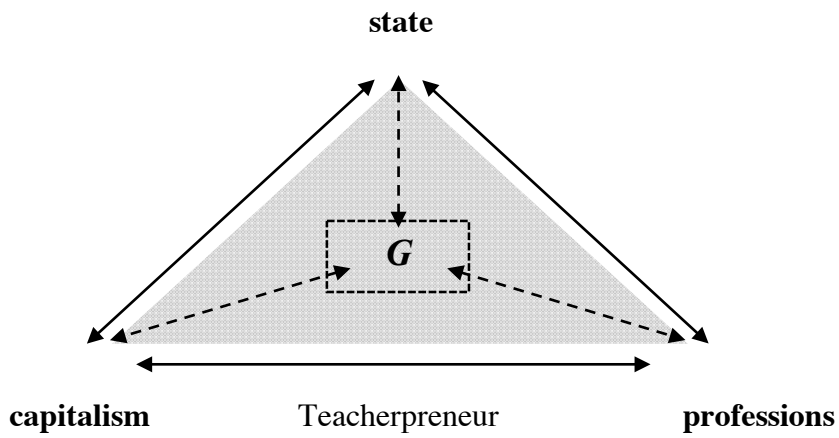
Guild association sustains professionalism and the ability to impact state or capitalistic forces (Krause, 1996) while preserving professional liberties such as independence, autonomy, discretion, collegiality, partnership, and self-regulation (Faulconbridge & Muzio, 2012). The dynamic interaction between market, government, and profession suggest that as state or capitalistic power increase, authority within the profession declines (Walker, 1971; Krause, 1996).

Over the past twenty years, schools have experienced significant increases in state oversight including, No Child Left Behind accountability requirements, a peremptory Race to the Top focus on teacher evaluation reform, and market-based approaches to educational reform which have directly challenged longstanding association privileges such as teacher tenure, teacher certification, and the traditional public school (Ingersol, 2009). Through these changes, professional education associations, in many states now have less purview over educational decisions (Ingersol, 2009). Perhaps in response, teachers have contemporaneously increasingly turned to one another within virtual spaces, seeking instructional advice and professional improvement.

Teacherpreneurial behaviors within virtual platforms intersect the space between capitalism and professions. A new form of professional guild, teacherpreneurs circumvent traditional hierarchical diffusion mechanisms and interact directly with peers and educational reformers (Supovitz, Daly, & del Fresno, 2015). Through virtual spaces such as Twitter and Facebook, teacherpreneurs can interact directly with educational authorities and decision makers (Supovitz, Daly, & del Fresno, 2015). As a collective, teacherpreneurial guilds may exercise influence on the educational market through VRPs and the profession as a whole, as they self-regulate quality resources through online

reviews and collegial social networks. Figure 2 illustrates the dynamics of teacherpreneurial guilds as they are facilitated across virtual spaces.

Figure 2. Dynamics of Teacherpreneurial Guilds



In Figure 2, the teacherpreneurial guild, represented by ***G***, intersects capitalism and the profession. Leveraging marketplace mechanisms, teachers can freely choose to procure and share materials to anyone within or across connected virtual spaces. Teachers engaging with one another across their virtual network may build collegiality, partnership, and discretion leading to an increased sense of belonging. As teacherpreneurial membership increases so goes the ability to influence the marketplace, state, and the profession. For example, within Pinterest, teacherpreneurs choosing to access, purchase, or share materials from trusted educational bloggers may influence the types of instructional resources being distributed and potentially implemented in classrooms across the country. Rather than accessing state promoted educational resources, a teacher seeking out Common Core State Standards (CCSS) aligned materials may trust those materials created by a fellow teacher within his or her virtual social network. At scale, these resources may compete with for-profit producers of educational

materials, enact state levied educational reforms, and provide a secondary community for educators. Singularly, teachers may seek one instructional task for a supplemental classroom activity (Identifying Reference, 2018). In mass, resource seeking and sharing presents a new type of connectivity and information diffusion—from teachers to teachers—and, in many cases, from cloud to class.

Our work seeks to identify patterns of teacher professionalism within social media. We situate our research in a sociological perspective of professional practices found in guilds and leverage big data within Pinterest to identify and characterize teachers' engagement with one another and curation of instructional resources.

Methods

We examine teachers' curation and sharing of resources across Pinterest. As aforementioned, teachers may "pin" pictures or videos (posted by others or found by themselves) of pertinent materials they would like to save for future reference. Teachers can pin "pins," (resources) post them on "boards," (organizational folders) and "follow" (stay notified of these users' pins) other users. For example, a Pinterest user may have a board of "Smartboard Technology" or "Addition Strategies." Through exploring teachers' curation of instructional resources and archival within and across boards we may learn provide valuable insights into what teachers are thinking, how they change their practices, and who they learn from as they do so (Identifying Reference, 2018). See Figure 3 below for an example of a teacher's Pinterest page.

Figure 3. An Example Teacher's Pinterest Page

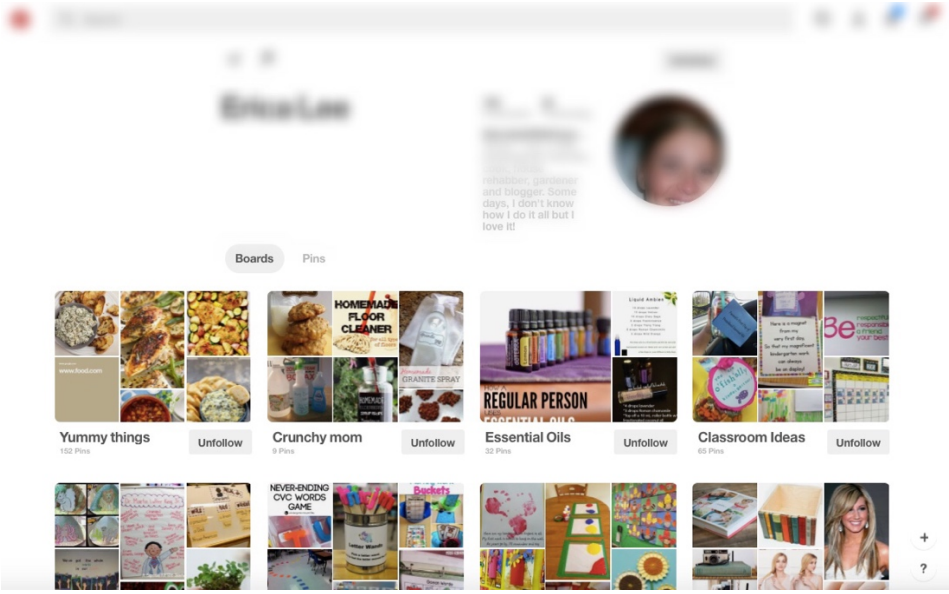


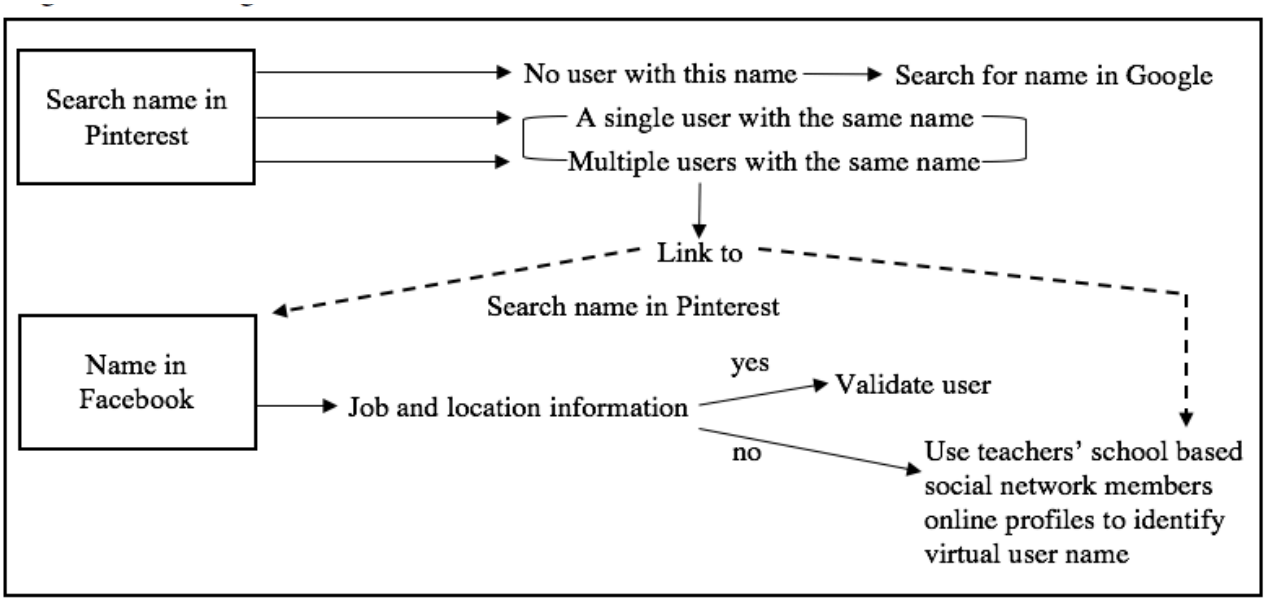
Figure 3 displays an example teacher's Pinterest page. Here, she has curated boards organizing relevant pins across personal and professional interests including recipes, parenting strategies, and classroom ideas and materials. Her virtual network is indicated by her followers and those who she follows (185 and 22 respectively). Resources are organized and saved for later reference or to be shared with others across her virtual network.

Sample

This study used a sample of teachers from a National Science Foundation (NSF) funded research grant studying early career teachers' (ECTs) planning and enactment of elementary mathematics across three Midwestern states. Through teacher survey, sampled ECTs indicate regular Pinterest use to acquire and share instructional resources.

We combined sampled teacher surveys, with their Pinterest handles to examine trends within Pinterest. We identified Pinterest handles in a multi-step approach, as illustrated in Figure 4 below. For those teachers we could not identify, we sent email requests for their Pinterest handles. Overall, we identified and analyzed Pinterest accounts for 197 teachers from the origination of their Pinterest account to November 2016.

Figure 4. Validating Teachers' Pinterest Accounts

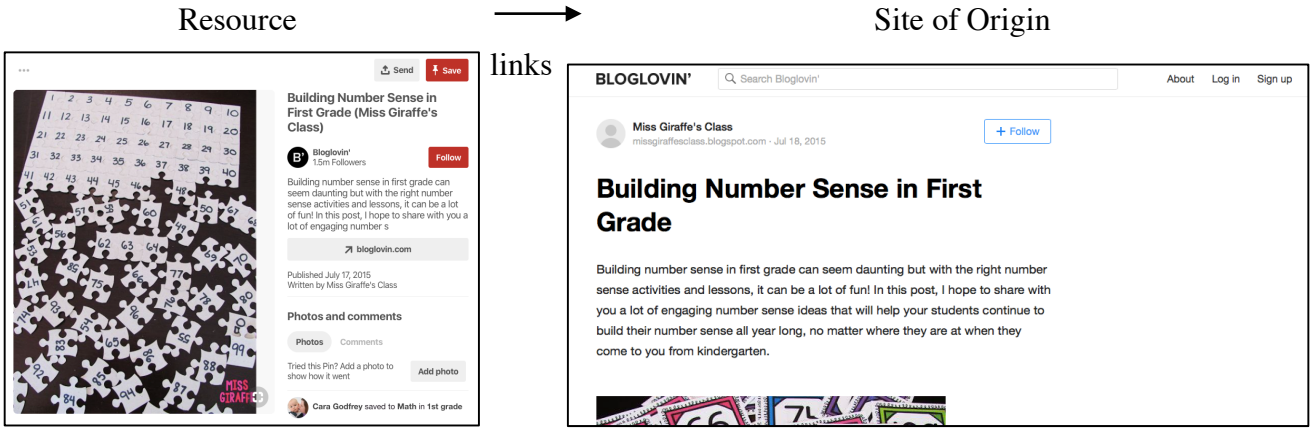


In Figure 4 above, we illustrate our approach to teacher identification within Pinterest. Pinterest is a fast-changing social media platform, with affordances being added, revised, and deleted. Therefore, some of the approaches we employed, such as cross-referencing teachers' Pinterest and public Facebook page, can no longer be conducted. Overall, we relied on geographic and demographic information including grade level taught, district, and photo recognition, to validate teachers' Pinterest accounts.

To build a data set of teachers' curated archives within Pinterest, we began by sampling only educational resources pinned by teachers. We approached this top down from board to pin. First, we create a list of educational keywords to flag educational boards within Pinterest. These keywords relate to the classroom, instructional topic, and holiday themes within education (as many teachers seek out holiday related activities). Then, we download teachers' educational pins pertaining to those flagged boards. It is possible teachers pinned educational resources outside a board explicitly labeled in relation to school or academic content. Therefore, this sample represents a conservative estimate of sampled teachers' professional resources within Pinterest.

We sought to identify from whom, that is where in the virtual world, teachers were curating instructional resources. To characterize the source of information pins linked through to, we used click through technology to identify the secondary online source from which each pin originated. We consider teachers professionals and therefore we choose to follow links back to the primary source to consider the type of resource being acquired and shared. Figure 5 below depicts the information flow across virtual space.

Figure 5. Instructional Resource Connections from Pinterest to the Virtual Universe



In Figure 5 above, Cara Godfrey[1] pins a mathematics resource from Miss Giraffe's Class and archives it within her "Math" board within a larger archive of "First Grade" on her personal Pinterest page. The pin, Building Number Sense in First Grade, links to www.bloglovin.com. The author listed is Miss Giraffe's Class. Importantly, this is not the only virtual space she has to promote her work, her primary website is listed below, missgiraffesclass.blogspot.com. In both cases, we consider the source an educator blog since the identified producers for the blog is an educator's.

Table 1 describes the overall pins downloaded across 197 teachers over a maximum five-year time frame (June 2011-November 2016).

Table 1. Pins and Secondary Source Origins Across Teachers Over Time

	Year						
	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
Teachers	48	161	179	180	173	166	197
Unique Secondary							
Online Site	1,315	5,888	6,832	5,712	5,226	3,871	16,082
Pins	2,650	32,704	34,560	28,364	25,074	16,935	140,287

*Pins sampled from 197 teachers

Table 1 shows teachers' within our sampled total pins and secondary online sites of origin over time. Totals do not sum across years, as sampled teachers and secondary sites may be reflected across years, or drop out of particular time points, depending on

[1] This pin was chosen randomly and does not represent a pin or teacher in our sampled data.

pinning behavior. Overall, our sample includes 140,287 pins from across 16,082 unique secondary online sites.

We used large scale data mining techniques and retroductive (Ragan, 1994) analysis to develop a set of categories to describe teacherpreneurial behavior. Through this approach, we engaged in "empirically driven theorizing" (Salganik, 2018) to build a system of classification that would enable us to identify patterns across teachers' curation within social media. We began by hand labeling (Salganik, 2018) a sample of 3,528 unique secondary online sites. Through this process, we use retroductive analysis to define mutually exclusive teacherpreneurial sources of information that encompassed the full sample of instructional resources curated. Merged hand labeled classified online sites matched to 67,435 of 140,287 sampled pins. To label the remaining pins, we used keywords indexing over domain name and suffix to characterize an additional 5,115 online sources (31,410 pins; see Appendix A for keyword lists). Finally, we hand labeled the remaining 7,439 unique secondary sources accounting for the remainder of pins unclassified. This coding provides full coverage of teachers' pins over time.

Results

Our results illustrate from whom teachers receive instructional resources and professional information. Teachers behavior within social media presents a window into the state of the field (Choi and Varian, 2012) as it relates to teachers' engagement with curricular planning and exists within teaching and social media.

Analysis included an iterative coding process to identify teachers' acquired resources as representing in pinning behavior. We found secondary online sources pattern across three large clusters of operational type including, teacher-to-teacher

markets (TTMs), teacher blogs, and educational organizations. Within these three clusters, we further defined unique attributes of online sources. Table 2 defines teacherpreneurial online source categories and characteristics.

Table 2. Defining and Describing Teacherpreneurial Online Sources

Secondary Online Source Category	
Teacher to Teacher Consumption Markets (TTM)	
TTMs define online platforms where teachers share and sell classroom resources; comparing products directly across vendors	
TeacherPayTeachers.com	TeachersPayTeachers (TpT): The teacher-to-teacher consumption markets are online platforms where teachers share and sell classroom resources; comparing products directly across vendors. This category defines content from TeachersPayTeachers.com
Other teacher market website	Websites that are not TeacherspayTeachers.com but are TTM websites such as, teachersnotebook.com
Educator Blogs	
Teacher blogs include independent websites created by individuals or groups of teachers who openly reflect and share their professional values	
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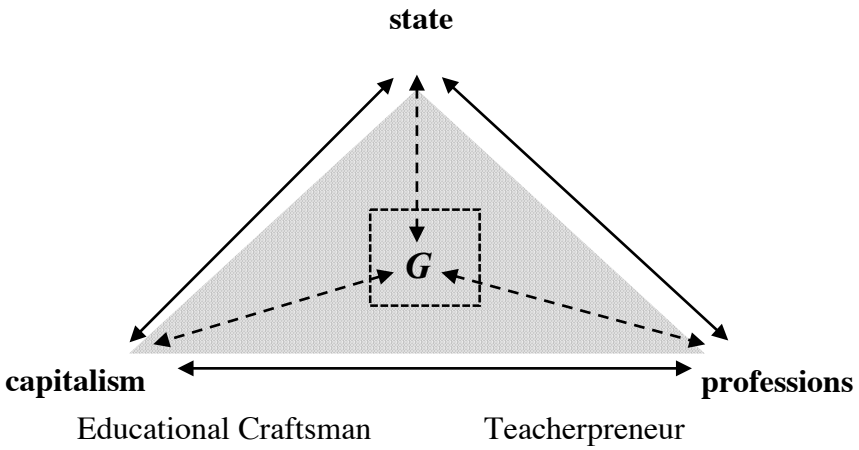
Educational Organizations	
Organizations refer to companies or other groups of experts diffusing knowledge under an organizational enterprise	
For Profit Educational Organization	Education companies that sell products to teachers or schools. For example, scholastic.com
Not For Profit Educational Organization	Educational associations and state/school education agencies. For example, National Councils of Teachers of Mathematics
Periphery Online Secondary Sites	
The primary purpose of periphery online secondary sites do not predominately focus on educational content	
Non-Educational Sites	Though there may be an educational section, the primary purpose of these sites are not educational. These sites are individuals or organizations that generally employ contacted writers and do not allow individuals to upload resources outside of a discussion board format. For example, Huffington Post
Teachers' Original Created Pins	Uploaded by the pinner him/herself
Other Original Uploads	This category includes other educators' uploads on google doc, flickr, YouTube, Tumblr, Twitter, Facebook, or sites that resemble Pinterest, e.g. teachhub. These sites are all for individuals to share information or resources across one another

Within curated resources, we found teachers turning to other teachers for professional content and instructional tasks. TTMs, similar to an education eBay, provided a space for teachers to create and sell instructional resources directly to one another. Education resources sold ranged in prices, from free to over $100 per download. The most highly pinned TTM was Teachers Pay Teachers (TPT). To date, TPT reports four million active members and over $330 million earned by teachers alone. TTMs linked to other online spaces such as Pinterest and educator blogs. Educator bloggers often linked content for sale directly to their TTM site, driving traffic and potential for resource purchase. Other teachers may favorite vendors and follow their TPT store as new materials are added for purchase. As referenced in the exchange between Miss Giraffe and Jenny, both teacherpreneurs, TPT represented a prominent resource from which to curate instruction tailored by teachers, for teachers.

To capture the monetization of instructional resource creation and sharing within social media, we extend our conceptualization of teacherpreneurial guilds to encompass educational craftsmen. Many of these individuals are active teachers and engage in teacherpreneurial behavior to direct the trajectory of their classroom. While others, may not be directly engaged in the education of youth, but in the development of teacher resources. Educational craftsmen including teachers, home schooling parents, retired educators, and educational support personnel—selling education resources online are represented within this group. Teacherpreneurs may rely on educational craftsmen resources to supplement their instruction. Figure 6 below depicts educational craftsmen as they situate across teacherpreneurial guilds and the larger social structure.

Figure 7. Evidence of Startupreneurial Behavior within a Subset of Teacherpreneurs

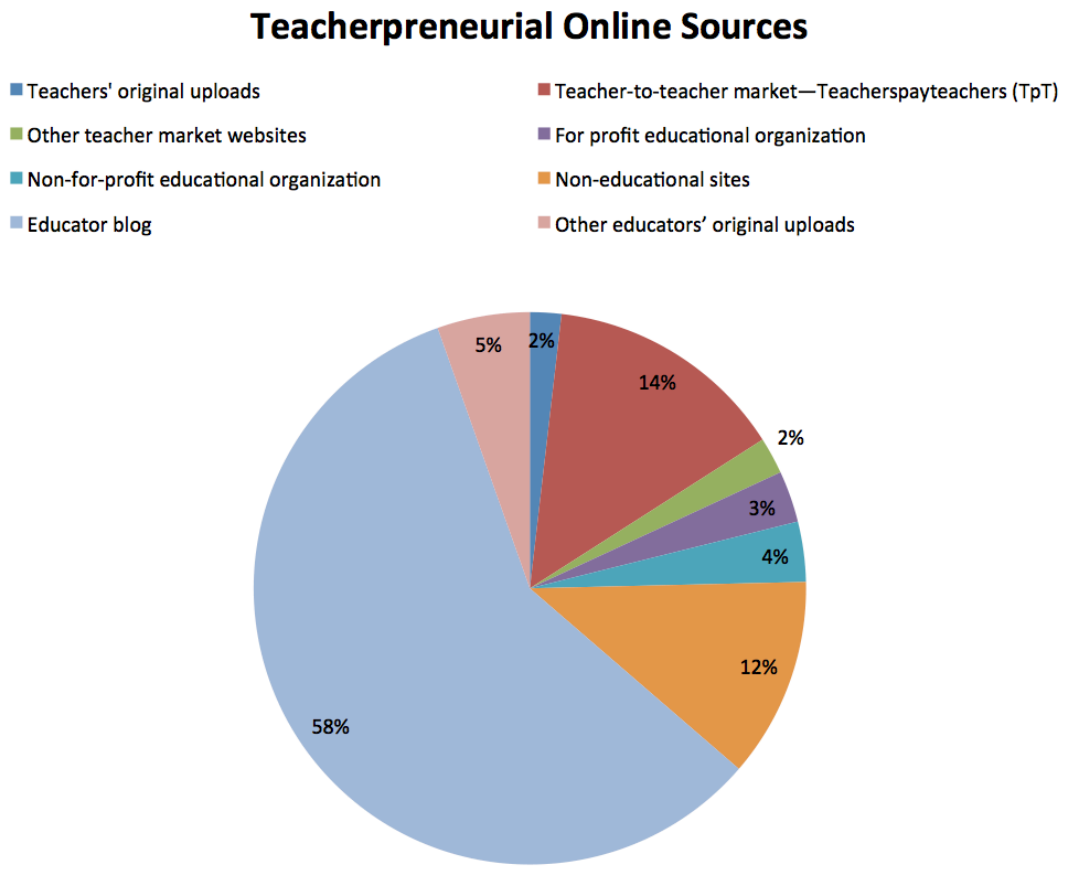


G represents the teacherpreneurial guild centering within the ecological structure of education. Educational craftsmen are those educators invested in promoting, sharing, and diffusing information and resources, for profit, across their network. Rather than predominately acquiring online resources, educational craftsmen actively engage in for-profit market transactions within Pinterest and beyond. As they monetize sharing and collaboration with others, they situate themselves closer to market mechanisms and a capitalistic influence in education (Singer, 2017). While, teacherpreneurs focusing on instructional resource curation for their local students' needs, may more closely relate to traditional conceptions of professional development. Teacherpreneurs may also engage in creation and sharing of instructional resources across social media. As they do so, one may conceptualize this behavior as sliding along a continuum (depicted above), more closely resembling a free market approach to educational resource curation. Yet, educational craftsman go further to monetize the education resource market.

As part of a teacherpreneurial guild, educational craftsmen may gain access to collegial social networks and ideas, information, and resources through virtual collegial ties. This additional social media space affords greater connectivity than TpT which does not afford visible social networking through public or semi-public social ties (Ellison & Boyd, 2013; Greenhow & Askari, 2017). Thus, teacherpreneurial relationships and educational craftsmen resources often extend across virtual platforms, including Pinterest.

We examined teachers' pinning behavior as reflected across teacherpreneurial categories defined in Table 2. Due to dropped urls, or changes in domain, three percent of pins (3,816) could not be opened and are therefore restricted from analysis. Our remaining sample contained 136,471 pins. Figure 8 below depicts pinning behavior across teacherpreneurial category.

Figure 8. Teacherpreneurial Information Seeking Across Pinterest VRPs



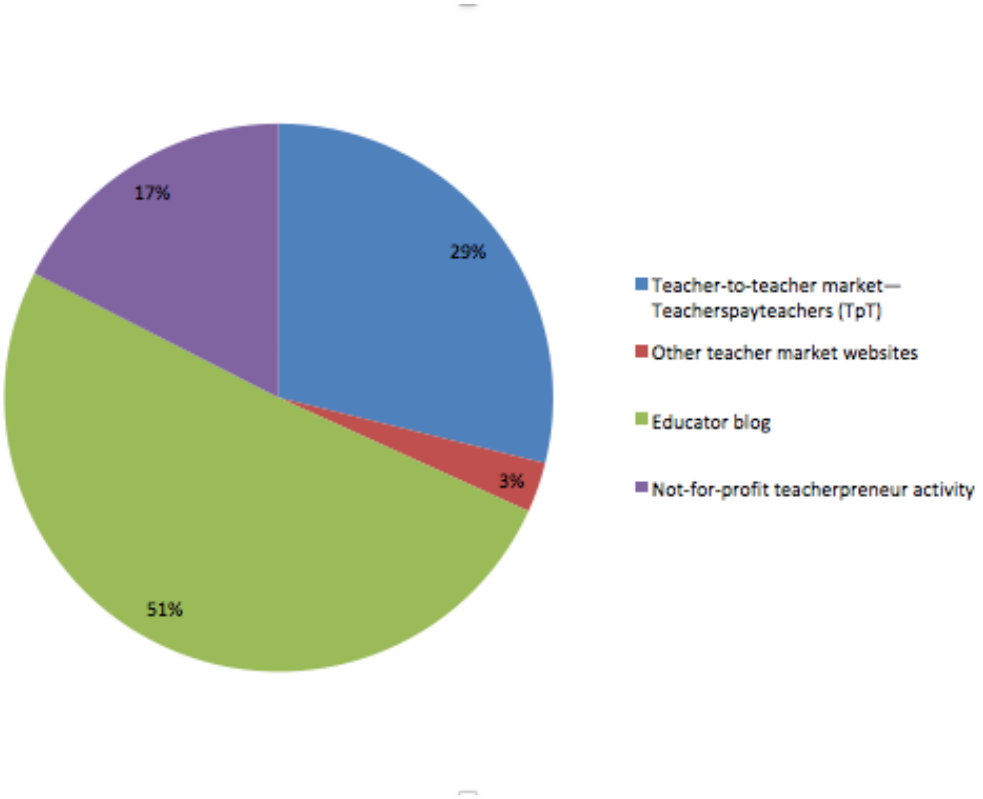
We found TTMs and educator blogs accounted for 74% or 101,679 of all teachers' pins. When combined with other teacher to teacher resource seeking, such as youtube.com and other teacher original uploads (eg. google docs), the proportion of pins described by teacherpreneurial online sites increased to 79%. Therefore, across 197 teachers seeking instructional resources, the majority of the time, teachers are turning toward one another for help and support.

Few resources reflected teachers curating information from organizational sources. Only 7% out of 136,471 pins reflected resources teachers acquired originating from educational organizations, such as NCTM, state departments of education, or for

profit organizations such as IXL. Though these organizations have historically preponderated instructional resources available to teachers in schools, they represent a small minority of those resources being exchanged in virtual spaces.

To identify the proportion of resources monetized through educational craftsmen activities, we examined two thirds of instructional resources pinned within Pinterest (66,988 pins). Educator blogs and TTMs provided the platform for educational craftsmen enterprises. We followed pins linked site of origin and analyzed if it provided teachers' an opportunity to purchase resources. We considered these pins evidence of an educational craftsmen marketplace in which resources may be bought and sold. Figure 8 below provides results on the proportion of resources monetized across online spaces.

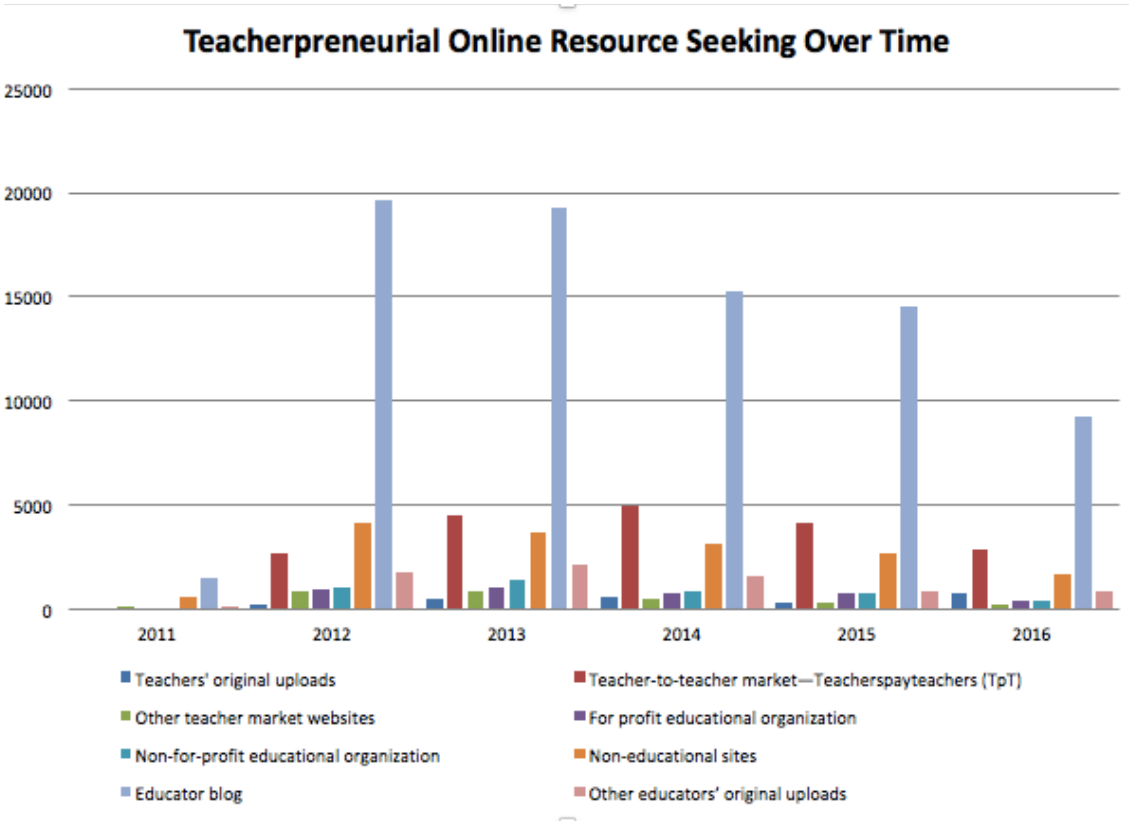
Figure 8. Educational Craftsmen Resource Selling Across Pinterest VRPs



We found 82.19% (55,060 pins) allowed teachers to access an educational craftsman (i.e. for-profit) marketplace. Within these monetized pins, we identified their site origin and found the majority of pins originated from educator blogs that provided teachers an opportunity to buy resources (51%). The second largest space pins linked to was Teachers Pay Teachers, the largest VRP within our data (29%). Finally, only 17% of pins subsampled did not originate from teacherpreneurs that monetized resources.

The prominence of educational craftsman resources observed within teacher to teacher networks and knowledge curation may reflect a movement of educational craftsmen—those teachers financially motivated to promote, share, and diffuse information and resources across their network. Given the relatively recent advent of teacherpreneurial behavior within virtual spaces, we examined online resource seeking over time. Figure 9 illustrates changes in online pinning behavior.

Figure 9. Change in Teacherpreneurial Information Seeking Across Pinterest VRPs: 2011-2016



Descriptive results indicated educator blogs continue to be a predominate resource from which teachers procure instructional help and materials. Across years we see a decline in the resources procured from educational organizations. Finally, we identify a rise in TTM resource sharing. Overall and across five years of teachers' pins, findings suggest teachers pin more resources from other educators, through teacher blogs and TTMs.

To understand what teachers are pinning and how these resources may shape students learning experiences, in other work (Identifying Reference, 2018) we examined the quality of instructional content using the revised Bloom's taxonomy framework

(Anderson & Krathawal, 2001). Using a a sub-sample of 1,303 mathematical pins from 26 ECTs on Pinterest, we evaluated the potential for cognitive demand required of students to complete a particular task. Using the rubric, we characterized each task within teachers' pinned resources. Table 3 below shows the number of coded pins in each cognitive demand level.

Table 3. Counts of Pins at Each Cognitive Process Level from 26 ECTs

Level 1 Remember	**Level 2 Understand**	**Level 3 Apply**	**Level 4 Analyze**	**Level 5 Evaluate**	**Level 6 Create**	**Not applicable**
493	471	207	85	4	16	651

** Other math pins include content resources (a conglomerate of tasks, worksheets, or assessment items), pedagogical tips, and classroom organization/decoration ideas. Content resources make up the majority of this column.

We found pins to predominantly reflect potential for cognitive demand in the lower two categories—remembering and understanding, of the revised Bloom's Taxonomy. This suggests that the potential of instructional tasks ECTs access are largely requiring students to engage in lower thinking order activities. This may relate to sampling ECTs who may be less practiced at identifying high quality instructional resources. Furthermore, it could also be the case that ECTs are seeking easily enacted resources to supplement their curriculum.

Discussion

For many teachers, the 21st century ushered in a new world of professional engagement across online and social media platforms. Who teachers are and how they engage relate to how information and educational reform diffuse within and across schools (Zhao & Frank, 2003). Teachers who are more open to innovation or are provided with professional support may be more likely to change their classroom practices (Rogers, 2010). Their conceptualizations of instruction or good practice vary across subject and topic, over time. Observation and survey may inform understandings but are limited to a snapshot or retrospective considerations of one's instruction. This work examines teachers' conceptualization of instruction as evidenced, in real time, by social media engagement. Teachers' curation of instructional resources within social media provides a window into their consideration of instruction and planning.

Through an examination of teachers' pinning of resources, we consider the potential impacts of teacherpreneurs taking initiative to curate instructional resources and direct the trajectory of their classroom curriculum as it relates to state, market, and professional forces. Sampling a subset of resources curated, we find teachers pin a majority of low quality mathematics tasks. Taken in mass, lower quality resources implemented within classrooms may decrease teachers' professional learning and development within the profession and may negatively impact state attempts to increase teaching quality and student achievement. While, grass roots teacherpreneurial behavior at scale suggests a mass of resource curation by teachers to teachers that could shift market share of curriculum resources within schools. As teacherpreneurs continue to turn to one another for professional resources and instructional tasks, curriculum may shift

from that developed by publishers toward educational craftsmen and teacher driven products.

Another movement of educator generated instructional resources and curriculum parallel teacherpreneurial guilds. #GoOpen, an open educational resource (OER) movement, is a federally backed initiative seeks to develop, high quality, open, commonly licensed educational resources nationwide. Often led by participating states and districts, one may conceptualize OER as situating more closely to a state based influence of instructional resource curation. Similar to autonomous teacherpreneurial behavior, teachers within OER districts are encouraged to be share the same tenets of a teacherpreneurial guild, curating instructional resources and adapting it to their own local student needs. However, diverging with grass roots teacherpreneurial engagement, OER requires teachers use only open resources and encourages teachers to share openly with others any high quality instructional resources they create.

Social norms differ within teacherpreneurial guilds and monetized TTMs. Educational craftsman, those teachers who choose to seek profit in sharing professional advice, information, and instructional resources surface within Pinterest and other VRPs. Though teachers may find a great deal of resources across virtual space, we find them explicitly investing in one another's professional wisdom and instructional materials through purchased resources. This reflects a vote of confidence in the producer of materials and overall suggests teachers prefer to turn to one another for professional support. This phenomenon may be a manifestation of teacher-to-teacher trust and the formation of a teacherpreneurial guild. This professional guild of teachers may extend across geography, school demographics, and other professional affiliation.

Observing educators' online discourse and exchange of information and resources, we contribute to conceptions of current teaching, learning, and educational practices occurring within and around educational reform. In other work, we examine impacts of the Common Core State Standards on teachers' curation within Pinterest, the influence of teachers' social networks on their likelihood to access resources within Pinterest as well as their likelihood to share resources from the same producer within the virtual universe.

To identify and characterize resources curated within the teacherpreneurial guild, we examine mathematical tasks within Pinterest and their quality and alignment to CCSS standards. Finally, we seek to understand the impact of teacherpreneurial behaviors within the classroom. Through both qualitative and quantitative analysis, we examine teachers' sense-making as they curate instructional resources for their students. To identify relationships between the quality of curated resources and teachers' enactment of ambitious mathematics, we connect sampled teachers classroom observations to their Pinterest curation. In future work, we will explore in more detail entrepreneurial behaviors of teacherpreneurs and those educational craftsmen, invested in promoting, sharing, and diffusing information and resources across their network.

As teachers enter the profession with a priori understandings of VRPs and instructional resource curation, we expect greater shifts in the educational landscape. Though the notion of teacherpreneur is novel, the principle—that is, a teacher independently directing his/or her own classroom initiatives—is not (Lortie, 1972; Kennedy, 2005). Social media provides greater affordance for teachers to connect and engage with one another. Through increased understandings of this phenomenon, we may

find better understand approaches to breach research to practice boundaries, provide quality educational resources, and support stronger teaching quality—across geography, over time.

References

Achinstein, B. (2002). Conflict amid community: The micropolitics of teacher collaboration. *Teachers College Record*, *104*(3), 421-455.

Anderson, L.W. & Krathwohl, D. R. (2001) *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. Boston, MA: Allyn & Bacon (Pearson Education Group).

Baker-Doyle, K. J., & Yoon, S. A. (2010). Making expertise transparent: Using technology to strengthen social networks in teacher professional development. *Social network theory and educational change*, 115-126.

Bidwell, C., Frank, K. & Quiroz, P. (1997). Teacher types, workplace controls, and the organization of schools. *Sociology of Education*, 70(4), p. 285-307.

Bryk, A., & Schneider, B. (2002). *Trust in schools: A core resource for improvement*. Russell Sage Foundation.

Burt, R. S. (2005). Brokerage and closure: An introduction to social capital. Oxford university press.

Choi, H., & Varian, H. (2012). Predicting the present with Google Trends. *Economic Record*, *88*, 2-9.

Coburn, C. (2001). Collective sense-making about reading: How teachers mediate reading policy in their professional communities. *Educational evaluation and policy analysis, 23*(2), 145-170.

Coburn, C. (2004). Beyond decoupling: Rethinking the relationship between the institutional environment and the classroom. *Sociology of Education*, 77(33), 211-244.

Coburn, C. & Russell, J. (2008). District policy and teachers' social networks. *Educational Evaluation and Policy Analysis*, 30(3), 203-235.

Desimone, L. (2002). How can comprehensive school reform models be successfully implemented? *Review of Educational Research, 73*(3), 433-479.

Education Week Research Center (2014). From Adoption to Practice: Findings from a National Survey of Teachers.

Ellison, N. B., & Boyd, D. M. (2013). Sociality through social network sites. In *The Oxford handbook of internet studies*.

Frank, K.A., Penuel, W.R., Sun, M. Kim, C., & Singleton, C. (2013). "The Organization as a Filter of Institutional Diffusion. *Teacher's College Record*. Volume 115(1). Social Networks on Social Media Sites and Use of Social Media

Frank, K.A., Zhao, Y., Penuel, W.R., Ellefson, N.C., and Porter, S. (2011). Focus, Fiddle and Friends: Sources of Knowledge to Perform the Complex Task of Teaching. *Sociology of Education*, Vol 84(2): 137-156.

Frank, K. A., Zhao, Y., & Borman, K. (2004). Social capital and the diffusion of innovations within organizations: The case of computer technology in schools. *Sociology of Education*, *77*(2), 148-171.

Faulconbridge, J. R., & Muzio, D. (2012). Professions in a globalizing world: Towards a transnational sociology of the professions. *International Sociology*, *27*(1), 136-152.

Greenhow, C., & Askari, E. (2017). Learning and teaching with social network sites: A decade of research in K-12 related education. *Education and information technologies*, *22*(2), 623-645.

Gottfried, M. A., Stecher, B. M., Hoover, M., & Cross, A. B. (2011). Federal and State Roles and Capacity for Improving Schools. Technical Report. *RAND Corporation*.

Hampton, K. N. (2016). Persistent and pervasive community: New communication technologies and the future of community. *American Behavioral Scientist*, *60*(1), 101-124.

Ingersoll, R. M. (2009). *Who controls teachers' work?: Power and accountability in America's schools*. Harvard University Press.

Jimerson, Jo Beth. (2014). Thinking about data: Exploring the development of mental models for "data use" among teachers and school leaders. *Studies in Educational Evaluation* 42: 5-14.

Krause, E. A. (1996). Death of the guilds: professions, states, and the advances of capitalism. 1930 to the present. New Haven (CT) and London (UK): Yale University Press.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge university press.

Lortie, D. C. (2009). *School principal: Managing in public*. University of Chicago Press.

Meyer, J.W., & Rowan, B. (1978). The structure of educational organizations. In M.W. Meyer (Ed.), *Environments and Organizations*. San Francisco: Jossey Bass.

Miss Giraffe. (2016). About Me. [Blog post]. Retrieved from https://missgiraffesclass.blogspot.com/p/about-me.html

Mitchell, C., & Sackney, L. (2000). Profound improvement. *The Netherlands: Swets & Zeitlinger*.

National Council of Supervisors of Mathematics. "Mathematics Education in the Digital Age." 2015.

Nguyen, J. (2016, October 17). A Teacher's New Best Friend: Amazon Inspire. *Edudemic*. Retrieved from: http://www.edudemic.com/amazon-inspire/

Opfer, V. D., Kaufman, J. H., & Thompson, L. E. (2016). Implementation of K-12 state standards for mathematics and English Language Arts and literacy. Santa Monica, CA:RAND Corporation.

Penuel, W., Riel, M., Krause, A., & Frank, K. A. 2009. Analyzing Teachers' Professional Interactions in a School as Social Capital: A Social Network Approach. Teachers College Record Vol 111 Number 1. pp.124-163.

Ragin, C. (1994). *Constructing Social Research*. Thousand Oaks, CA: Pine Forge.

Ravitch, D. (2001). *Left back: A century of battles over school reform*. Simon and Schuster.

Rogers, E. M. (2010). Diffusion of Innovations. New York, NY: Simon and Schuster.

Salganik, M. J. (2017). *Bit by bit: social research in the digital age*. Princeton University Press.

Schugurensky, D. (2000). The forms of informal learning: Towards a conceptualization of the field.

Singer, N. (May 13, 2017). How Google took over the classroom. *The New York Times*. Retrieved from https://www.nytimes.com/2017/05/13/technology/google-education-chromebooks-schools.html

Spillane, J. (1999). External reform initiatives and teachers' efforts to reconstruct their practice: The mediating role of teachers' zones of enactment. *Journal of Curriculum Studies, 31*(2), 143-175.

Spillane, J. P., Kim, C. M., & Frank, K. A. (2012). Instructional advice and information providing and receiving behavior in elementary schools: Exploring tie formation as a building block in social capital development. *American Educational Research Journal*, *49*(6), 1112-1145.

Supovitz, J. A., Daly, A. J., & del Fresno, M. (2015). # CommonCore: how social media is changing the politics of education.

Toole, J. C., & Louis, K. S. (2002). The role of professional learning communities in international education. *Second international handbook of educational leadership and administration*, 245-279.

Walker, M. (1971). *German home towns: community, state, and general estate, 1648–1871*. Cornell University Press.

Weick, K. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly*, 21, 1-19.

Wellman, Barry. "Connecting Communities: On and Offline". *Contexts* 3.4 (2004): 22–28. Web.

Will, M. (2016, October, 5). Looking for More Support, New Teachers Turn to Online Communities. *Education Week.* Retrieved from: http://www.edweek.org/tm/articles/2016/10/05/looking-for-more-support-new-teachers-turn.html?r=657076764

Youngs, P. & King, M. (2002). Principal leadership for professional development to build school capacity. *Educational Administration Quarterly, 38*(5), 643-670.

Zhao, Y., & Frank, K. A. (2003). Factors affecting technology uses in schools: An ecological perspective. *American educational research journal*, *40*(4), 807-840.

Zhong, C., Salehi, M., Shah, S., Cobzarenco, M., Sastry, N., & Cha, M. (2014, April). Social bootstrapping: how pinterest and last. fm social communities benefit by borrowing links from facebook. In *Proceedings of the 23rd international conference on World wide web* (pp. 305-314). ACM.

Appendix A

Keywords Used to Classify Online Sites into Teacherpreneurial Categories

Teacherpreneurial Categories	Domain Name Keywords	Domain Suffix Keywords
Teacher's original uploads		
Teacher to teacher consumption markets (TTM)	teacherspayteachers	
Other teacher market website	teachersnotebook teachhub	
For profit educational organization	IXL	
Not for profit educational organization	goodreads	.org .edu .gov
Educator blogs	blog wordpress weebly	.blogspot.com

Non-educational sites	vimeo
	amazon
	huffingtonpost
	buzzfeed
	yahoo
Other educators' original uploads	google
	flickr
	youtube
	tumblr
	twitter
	facebook
	pinterest