

## The Use of Blogging as a Practice to Support Ninth-Grade Science Teachers' Identity Development as Leaders

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### Abstract

Increasingly, teacher leadership is being recognized as an essential ingredient in education reforms (York-Barr & Duke, 2004); however, few teachers consider themselves leaders. For many teachers, becoming a leader is not just acquiring knowledge and skills for leadership, but developing a new *professional identity*. Recent literature notes a number of key challenges that teachers face in becoming leaders, and how their identity as a leader might put them at risk with dominant school culture where norms of egalitarianism, isolation, and seniority persist (Barth, 2006). Luehmann (2008) emphasizes the value in offering opportunities for safe spaces in which teachers can take risks as they 'try on' new identities, such as teacher leaders. We utilized a private online environment to support teachers in participating in a community that could nurture the development of common perspectives, commitments, and visions for teacher leadership (Luehmann & Tinelli, 2008). In this space, teachers blogged about their experience participating in professional development focused on leadership. Our findings illustrate the potential benefits of blogging for supporting teachers' identity development as leaders. Specifically, by participating in *pedagogical transactions*, *social interactions*, and *intellectual deliberations* via blogs, teachers were able to rethink their roles as teachers and leaders, and receive support and encouragement in their efforts to be leaders in their classrooms, schools, and districts.

### Introduction

Increasingly, teacher leadership is being recognized as an essential ingredient in education reforms (York-Barr & Duke, 2004); however, few teachers consider themselves leaders. Teachers may fail to recognize the need for multiple leaders at different levels and in different areas within the school (Danielson, 2007; Katzenmeyer & Moller, 2009) and may believe that being a leader requires a formal title or position (Rebello, Hanuscin, & Sinha, 2011). For many teachers, becoming a leader is not just acquiring knowledge and skills; rather, it is developing a new *professional identity* as a leader. Recent literature notes a number of key challenges that teachers face in becoming leaders, and how their role as a leader might put them at risk with dominant school culture where norms of egalitarianism, isolation, and seniority persist (Barth, 2006). Luehmann (2008) emphasizes the value in offering opportunities for safe spaces in which teachers can take risks as they 'try on' new identities. Whereas in her study the emphasis was on developing an identity as a reform-based teacher, we hypothesized the same would apply to developing an identity as a teacher leader. Based on the reported usefulness of weblogs or "blogs," we integrated blogging into a professional development program to support teachers in participating in a community that could nurture the development of common perspectives, commitments, and visions for teacher leadership (Luehmann & Tinelli, 2008). The overarching goal of this study is to identify the learning opportunities or "affordances" associated with blogging as a form of professional development for teacher leaders. More specifically, we hoped to identify ways blogging contributes to shaping teachers' identity as leaders:

- How does blogging influence the development of teachers' identity as leaders?
  - How did teachers engage in blogging as part of the professional development?

- What is the potential of teachers' blogging practices for facilitating their identity formation as leaders?
- What investments allow teachers to realize the affordances of blogging in supporting their identity development?

### **Theoretical Framework**

Identity is becoming an important theoretical concept in science education (Settlage, Southerland, Smith, & Ceglie, 2009). Various scholars have defined identity in different ways. Gee defines identity as the “kind of person one is recognized as being, at a given time and place” (2002, p 99). Others have defined identity as a persons' disposition under the context of culture or community (Aydeniz & Hodge, 2011); a sense of self (Helms, 1998); as an assumption of a status related to the social context formed by the interweaving of personal and social biographies (Clodron & Smith, 1999); “an ongoing internal construction that prepares one for taking action” (Volkmann & Zgagacz, 2004, p.600); the way a person perceives and represents one self (Hsieh, 2006); and an answer to the recurrent question: “Who am I at this moment?” (Beijaard, Meijer, & Verloop, 2004). In terms of teachers, identity has been defined as being perceived by self or others as a particular *kind* of teacher (Luehmann, 2007, 2008; Luehmann & Tinelli, 2008); the equilibrium between one's self image and the teacher image which one wants to portray (Volkmann & Anderson 1998); being described in terms of stories that describe teachers' personal and professional lives (Sfard & Prusak, 2005); and being shaped by both the personal views of the teacher and the attitude of “those who author their position” (McDougall, 2009).

Emerging research in new media literacies has explored the potential of web-based blogging as a means to engage in knowledge building and identity formation. Blogging involves “the authoring of a series of posts or entries, usually related to a given theme, constructed by a single author and organized in reverse chronological order” (Luehmann & Borasi, 2011, p. 3). Several studies have shown that blogging offers various supports that can assist pre-service teachers and in-service teachers in identity development. These include: a place to express their own voice (Narayan, Peker & Petty, 2011), giving/ receiving feedback (Narayan et al., 2011; Wopereis, Sloep & Poortman, 2010; Luehmann, 2008; Luehmann & Tinelli, 2008), enhancing reflection (Anderson et al., 2011; Narayan et al., 2011; Wopereis et al., 2010; Luehmann, 2008), and forming a professional community and meaningful discourse (Anderson et al., 2011; Narayan et al., 2011; Luehmann & Tinelli, 2008). Furthermore, virtual spaces and communities of practice also help in information-sharing and problem-solving (Yang, 2009), particularly when participants are geographically distributed and face-to-face discussions are not possible (Ahern et al., 2006; Al-Zoube, 2009). Studies have highlighted that blogs not only aid in reducing the geographical barrier between participants (Luehmann, 2008; Luehmann & Tinelli, 2008; Luehmann & Frink, 2009) but also decrease feelings of isolation due to distance (Dickey, 2004) and encourage reflective thinking (Chen et al., 2005).

Given the above, blogging has the potential to serve as a means for supporting teachers in developing their identity as leaders. Traditionally, the main path to leadership for teachers has been through entering school administration, which involves a significant shift in roles and responsibilities (Task Force on Teacher Leadership, 2001). In contrast, the notion of teacher-leadership encompasses teachers remaining in their classroom positions, while finding ways to act as advocates, innovators, and stewards of their profession (Lieberman & Miller, 2004). The challenge, then, becomes redefining one's role and rethinking one's identity as a teacher-leader.

Leadership is not handed out like blue books for a college examination. It is largely up to teachers themselves to locate and exploit opportunities for the professional growth and personal development that will increase their qualifications and credibility for leadership (Task Force on Teacher Leadership, 2001, p. 20).

To become teacher-leaders, teachers must develop a vision for leadership, establish their own credibility with peers, and develop skills and dispositions for leading and for working with others (Katzenmeyer & Moller, 2009). This will necessarily take time, and will benefit from support and collaboration with others as teachers begin to challenge existing professional and institutional norms and redefine their roles within and beyond their classrooms.

Calls have been made for improving the preparation of teachers for leadership; however, very little empirical work has been conducted in this area (York-Barr & Duke, 2004). The purpose of this study is to understand how a professional development program that utilizes blogging supports teachers' preparation to serve as teacher-leaders. Ultimately, our goal is to understand the ways in which blogging can support the realization of a new identity as a "teacher-leader" among the professional development program participants.

## Methods

### Context of the Study & Participants

A TIME for Physics First: *Leadership in Freshman Physics*, an NSF-supported Math and Science Partnership (MSP), is designed to create a cadre of 80 teacher-leaders who will become advocates for excellence in subject matter knowledge and research-based pedagogy as their districts implement 9<sup>th</sup> grade physics (NSF DUE 0928924). The MSP *Teacher Institutes for the 21st Century* specifically focus on "meeting national needs for teacher leaders/master teachers who have deep knowledge of disciplinary content for teaching and are fully prepared to be school- or district-based intellectual leaders in mathematics or the sciences" (NSF, 2010). In line with this, the program provides professional development focused on content, pedagogy, and leadership development. Two cohorts of teachers entered the program in a delayed-entry design. This paper reports on the findings from year one, cohort one.

36 teachers participated in the first cohort of the program. Of these, 18 (50%) were female. Years of teaching experience ranged from 1 to 18, with a mean of 4.3 years in the classroom. Teachers hailed from 20 different school districts throughout the state, including both rural and urban areas. All participants were certified to teach (with two holding temporary or provisional certificates) and 5 of the participants held certification to teach physics prior to joining the program. As part of the application process, teachers were asked to indicate their leadership experiences over the past 5 years. All but one of the 36 applicants reported having prior leadership experience. Of the 84 leadership experiences reported by teachers, the largest percentage (over 50%) were activities related to participation in school or district curriculum work, school improvement, and professional development of colleagues. Through use of a leadership inventory, we found many teachers had participated in activities related to the dimensions of teacher-leadership identified by York-Barr and Duke (2004), but did not necessarily recognize these activities as being "leadership" (Rebello, Hanuscin, & Sinha, 2011). In other words, they did not view themselves as 'leaders'.

Teachers participate in the program by attending a summer academy as well as both face-to-face and online interactions with other teachers and project staff throughout the academic year. The leadership component of the program, which is embedded throughout, is based on the

following assumptions, which are synthesized in York-Barr and Duke's (2004) review of over two decades of research on teacher leadership:

- Teacher leadership is an essential ingredient in the successful implementation and sustainability of school reforms
- Teacher leaders need a wide range of knowledge, skills, and dispositions which are derived from research, reflection on practice, and shared expertise
- Not all teacher leaders look the same or function in the same ways; teacher leadership is enacted both through formal and informal means, and cuts across a variety of domains of teachers' practice
- Teacher leaders need the support of others in similar positions to be fully successful. Experience in a supportive learning community enables teacher leaders to recreate such community in their own school contexts.
- Teacher leaders' learning must be embedded in their practice
- Teacher leaders assume responsibility for their professional development by pursuing their own learning goals in a variety of ways, including workshops, study groups, readings, and mentoring relationships
- The ultimate goal of teacher leadership is to improve student learning

As a central component of the professional development, teachers are guided in developing, implementing, and evaluating an individualized leadership action plan. Consistent with the above assumptions, the leadership action plan both supports and complements teachers' day-to-day efforts toward successful implementation of a freshman physics course and improvement of student learning. For example, teacher action plans focus on diverse activities such as instituting peer observation schedules to improve teaching, building parent and community support for the program through special events, and working with colleagues to develop and utilize common assessments to inform their instruction. Summer activities focus on assisting teachers in developing their action plans. During summer sessions, teachers engage in numerous activities that encourage them to refine their definition of teacher leadership, identify roles teacher-leaders can play in school reform, develop skills for leading, identify and address barriers to successful leadership, and build rapport with and reach reluctant colleagues.

Throughout the academic year, teachers are asked to blog about their experiences implementing their leadership action plans using the SAKAI learning management system, in which access was restricted to members of the program. At the summer sessions, teachers were introduced to blogging and guided in establishing a common vision for the purposes of blogs in supporting their professional growth through reflection. Participants were provided links to explore four public teacher-created blogs, one of which focused specifically on leadership, and were asked to consider the purpose and aim of the blog, the degree to which it represented productive means of reflection (moving beyond problems toward solutions), and the content of the blog entries. Teachers then engaged in establishing group norms for blogging by critiquing and evaluating a series of sample blog entries. These were created by the professional developers, and varied in length, level of detail provided, and tone/appropriateness of content. Teachers responded to each of the blogs, as well as to each other's comments, indicating whether they thought the sample blog exemplified an appropriate use of blogging. Teachers also discussed the kinds of comments they would find most helpful in response to a blog entry. In this manner, teachers collaboratively shaped the expectations and responsibilities of blogging.

During the academic year, teachers were expected to blog on a monthly basis (6 times), and to respond to at least one of their colleagues' blogs. In addition, they were encouraged to

revisit and reply to comments made on their own blogs. Outside of these requirements and the norms teachers had established, the use of blogs was largely open-ended. Teachers were free to write about any topics related to implementation of their leadership action plans and the physics first curriculum in their schools. Blogs are typically made available via the Web to a broad and undefined audience; because the SAKAI site was closed to participants in the program, the audience of teachers' blogs were their cohort members. The year round participation in blogging afforded them a means to connect with each other virtually to discuss problems, share success, and get support and encouragement from one another.

### Data Sources & Analysis

Primary data sources included each of the teachers' blogs and associated comments and replies over a 1 year period, as well as feedback on the blogging process collected from each teacher's final report on their action plan implementation. 32 of the 34 teachers who consented to participate in the research completed blogs, for a total of 154 entries; in addition there were a total of 588 comments written in response to blogs. Secondary data sources included teachers' mid-year and end-of-year reports on their implementation of their leadership action plans. These were utilized as a means to triangulate findings from analysis of primary data sources.

Analyses followed a grounded theory approach (Glaser & Strauss, 1967), with open-coding being used to characterize the blogging practices in which participants engaged. We employed several methodological strategies to establish trustworthiness of our findings including triangulation of data sources, negative case analysis, analysis of researcher's role, establishing an audit trail, and use of multiple data analysts (Lincoln & Guba, 1985). To examine the *content* of teachers' blogs, keywords were assigned to each of the blog entries to describe major topic(s) discussed within the post. Keyword assignments were reviewed by at least one other researcher. Keywords were grouped into categories based on redundancies and areas of intersection. In turn, these were tabulated in terms of frequency across participants.

To characterize the *blogging practices* in which teachers engaged, all authors randomly selected three blog transcripts to independently code. Next, the authors met to compare analysis and negotiate codes to 100% agreement. This session served as an opportunity for the researchers to calibrate their analyses for consistency. Remaining blog transcripts were divided among the team; each was coded by one researcher and reviewed by at least one other for an inter-rater agreement of 100%. As new codes emerged, the coding schema was modified to account for these in consultation with the entire group. Coded transcripts were re-reviewed by at least one researcher with the new coding schema. Codes were then organized into categories and grouped into three distinct areas with relevance to our research questions. When a category emerged, we investigated the data closely for any evidence refuting the emergent category.

Researchers have noted that groups of people who tend to come together around a particular blogger's practice do so because of shared interests and values, and that the size and variation of the "audience" may affect opportunities for interaction and recognition (Luehmann & Borasi, 2011). Thus, examining the *social dynamics and patterns of interaction* among the cohort was important to understand the affordances of blogging for identity formation. To examine this, we constructed sociograms to provide a visual representation of the interactions between participants and to identify subcommunities of "audiences" of individual teachers' blogs. Data were first entered into Excel to note each teacher's comments received and comments made for each blog entry. Microsoft NodeXL was then used to transform these data.

## Findings

### Teachers' Use of Blogs

We first sought to understand how teachers engaged in blogging as part of the professional development. Through blogging, teachers often shared success stories, concerns, solicited advice, and offered advice to their peers. To a lesser extent, teachers posted hyperlinks (such as suggested websites for rubric designs), shared documents (such as handouts or lessons), and posted images of student engaged in physics activities. Blogs were primarily the domain of teachers, though the professional developers and project support staff (i.e., coaches and mentors) would interact through posting comments on teachers' blogs, most frequently to provide encouragement or ask for clarification.

How bloggers choose to use their blog, i.e., what they write about and how—will affect the benefits of blogging for identity development (Luehmann, 2008). Our analysis examined whether teachers utilized their blogs as a venue to discuss topics related to leadership. The total 426 keywords assigned to teachers' blogs reveals a diverse set of topics were addressed by teachers throughout the year (see Figure 1). The top 5 categories were consistent with the program's focus on leadership; specifically, supporting implementation of 9<sup>th</sup> grade physics in teachers' schools and supporting student success. 16% of Blog keywords related to collaboration, communication, and support with colleagues/ parents /administrators/ students; 15.7% related to concerns for and success of implementing physics first and its impact on student learning; 11% related to issues of time or curriculum pacing and impact of student absences on learning; 10.8% related to use of whiteboarding and/or modeling pedagogy and Socratic questioning; and 10.3% related to teacher leadership roles or opportunities; for example, posts describing specific roles they are taking as a teacher leader, opportunities to lead within the school or district, or thoughts on how to implement change as a teacher leader. Each of these is consistent with the seven dimensions of practice of teacher leaders (York-Barr & Duke, 2004):

- Coordination, management
- School or district curriculum work
- Professional development of colleagues
- Participation in school improvement
- Parent and community involvement
- Contributions to the profession
- Preservice teacher education

For example, collaborations with colleagues, parents and administrators is reflective of teacher-leaders' involvement with parents and the community. Similarly, emphases on curriculum pacing, pedagogical strategies and assessment are all associated with school and district curriculum work.

### Teachers' Blogging Practices and Identity Formation

Our second research question was concerned with examining teachers' blogging practices in relation to identity formation. Through our analyses, we identified three major blogging practices that supported teachers' identity development as leaders. These included 1) pedagogical transactions, 2) intellectual deliberations, and 3) social interactions. Examples of each appear in Table 1.

***Pedagogical transactions*** enabled teachers to exchange strategies, information, and resources to address specific problems of practice (n=922). Such knowledge brokering occurred not only through the text of the blog itself, but also through the use of hyperlinks, images, and

other multimedia. Transactions involved knowledge brokering through both solicitations (explicit requests for information) as well as offerings (whether in response to solicitations or not). The two most frequent codes in this category included identifying specific problems or challenges (19%) and offering advice and assistance (28%). Asking for advice showed that teachers recognized potential expertise among the group and that they were willing to learn from one another. In return, teachers who offered advice/exchanged resources recognized in themselves that they had something of value to contribute. Teaching expertise, including subject matter knowledge, is critical to assuming leadership roles, such as providing professional development sessions, advising and assisting individual teachers, and offering peer support. Such expertise is tantamount to establishing credibility with others as a leader. Thus, the pedagogical transactions in which teachers engaged supported their identity development as leaders by allowing them to establish themselves as credible peers and sources of expertise. As one teacher expressed at the end of the year:

*I have been able to share new teaching techniques that I have learned, and I have gained confidence in myself, and I now feel that I have something valuable to share with my colleagues. [Teacher 3]*

As highlighted above, blogging can serve as a means to bridge teachers' current identity (how they are currently recognized by self or others) with their projected or desired identities (how one hopes to be recognized). In this manner, pedagogical transactions facilitate teachers being perceived as leaders by other cohort members. Such discourse is necessary in order for an identity to develop, as "it is in the interpretation or *recognition*... by self or others, that identities are actually formed" (Luehmann & Borasi, 2011).

**Intellectual deliberations** involved the exchange of ideas in terms of ideological positions, teaching philosophy, etc. (n=349). The major code in this category involved reflecting or self-assessing (34%). Through dialogue within the cohort, teachers reflected on their goals and clarified what it means to be a 'good teacher' or 'leader.' Developing such a vision is essential to the enactment of leadership (Katzenmeyer & Moller, 2009). Case studies of successful school leaders have characterized leaders as beginning by forming a vision, which could then be shared with colleagues in order to enlist their help in bringing about change. Thus, we view the intellectual deliberations taking place in the Blog as critical to teachers' identity development and enactment of leadership within their schools. Teachers' comments reiterate that forming such a vision takes time and a great deal of thought—Blogs allowed ideas to 'percolate', as one teacher commented:

*The blogs reminded me of the free writing assignments that the creative writing teacher gave us back in high school. Both of these give the opportunity to open up the part of the mind that has been chugging away at issue as we went through the weeks of organizing, presenting, and responding to the workshop activities. I would think about what I could do better, but some things would just need more time to percolate. Responding by answering the blog questions often gave me ideas that were surprising even to me as the author. [Teacher 20]*

**Social interactions** included teachers' contributions towards building a positive climate within the cohort, encouraging dialogue, or being supportive of others in the program (n=719). The major codes in this category included relating to others (32%) and encouraging others' efforts (27%). As stated previously, few of the teachers in the cohort initially viewed themselves as leaders. At the onset of the program, they expressed hesitation and concern about their ability

to fulfill the leadership expectations associated with participation in the program. Evident in the Blogs is the growing confidence teachers expressed in their ability to lead, and their willingness to persist in their leadership efforts despite setbacks and challenges. This was a direct result of the encouragement and support they received from others. As one teacher reflected in her final blog:

*I need to continue growing as a leader through education and communication. I've learned so much from listening to all of you. It takes a village . . . Go Team! [Teacher 5]*

Thus, developing a new identity involves a number of challenges and risks. In becoming 'teacher-leaders', teachers are challenging existing norms within their schools. For example, norms of autonomy (we each have our own right to decide how to teach), egalitarianism (we are peers and not above one another), and seniority (younger teachers are inexperienced and lack credibility) directly conflict with the notion of shared or distributed leadership within schools. Through social interactions, teachers could support one another in facing the challenges of becoming a teacher-leader, relate to one another, and even commiserate on common challenges and strategize solutions. Because the blogging environment and audience was confined to other members of the cohort, teachers were provided a relatively safe space which offered lower real-world consequences than that of a publicly available blog.

### **Investments of Teachers and Affordances of Blogging**

Our final research question was concerned with the investments in blogging that allowed teachers to realize its affordances for their identity formation. Teachers themselves identified blogging as playing a key role in their personal development as leaders:

*Transformation. Evolution. Metamorphosis. Those words might be a little dramatic, but my definition of leadership has definitely undergone a significant change ... There are many factors that have contributed to that .... However, I can easily point to my involvement in this [leadership development] as the major reason my viewpoint on leadership has shifted. The insights I have gained as I completed my action plan, blogged about my progress, and read about the experiences of others has been invaluable ...[Teacher 14, Final Blog Entry]*

Evident throughout teachers' blogs, and in particular in their final reports, is the recognition that blogging afforded an opportunity to reflect, gain new ideas, and connect with and learn from others.

*As the only teacher beginning the initiative for Physics First in my school district, it was extremely helpful to read the blogs of others. I also thought it was helpful to go back and read the things we have individually posted to see how we have changed and what we have learned through the course of the school year. I am a firm believer in reflection. It is the only way to truly know if what you are doing and or experiencing is working or is good for you [Teacher 31, final report]*

*I'm a firm believer in reflection. I loved posting blogs and allowing myself some time to think about the year. I also loved reading the blogs of others. It's great hearing others' successes and struggles. Ultimately we can take others' experiences and incorporate them in our classroom as well. [Teacher 8, final report]*

The teachers' comments above highlight how blogs provided an individual record of teachers' reflections over time. Unlike discussion boards, blogs are associated with the author, rather than



a topic. Because the blog posts appear in chronological order, individuals can use their blog to keep track of their evolving ideas and personal learning trajectory. Additionally, by examining the blogs of others, they can examine how their thinking compares to that of their peers, further supporting their professional growth.

Such affordances of blogging, however, required significant investments from teachers in terms of **time and effort** (ongoing and sustained participation throughout the year), **technological skills** (learning the tool and navigation), **personal commitment** (willingness to self-assess and reflect), and **social commitment** (being willing to interact and support the group). To fully benefit, teachers had to write their own blog, read the blogs of others, comment on others' blogs, as well as respond to comments made on their own blogs. We found, however, that teachers' level of participation and investment in blogging varied; some did not blog at all ( $n=4$ ) and only 5 exceeded the monthly required blog posts, while the majority composed blogs and posted comments to meet the minimum program requirements.

For some teachers, they entered the program predisposed to view blogs negatively, and concerned with the risks of sharing information online:

*I am not really sold on blogging and social media. I have seen friends and colleagues implement these strategies in their classrooms only to have them backfire, and sometimes with dire consequences. I grew up with huge restrictions in the technology department (the early years of the internet and AOL were completely lost on me) and was taught that communication is best done face to face; imagine years of being taught by nuns with no television or computers. I am simply not a fan of putting my information out into the void of cyber space. [Teacher 26]*

Other teachers acknowledged a preference for more immediate forms of communication rather than the asynchronous tool of blogging:

*Blogging was ok, but it sometimes felt like it was done just to do it, and was not as timely as a daily email. If I had a question of concern, I would much rather ask it in a timely manner and have it seen and responded to quickly. [Teacher 34]*

As alluded to in the comment above, some teachers simply viewed blogs as another task to complete, versus an opportunity for growth and reflection.

Nonetheless, through analysis of teachers' patterns of interactions, we found that subsets of participants initiated and sustained ongoing dialogue within the cohort through their blogs, offering them greater affordances in terms of their growth and identity development as leaders. For example, one group of participants stood out in terms of their willingness to comment broadly on the blogs of almost all other members of the cohort. These members, in turn, received responses from throughout the entire cohort as well. In contrast, other groups of participants were observed to interact most often with certain others. In turn, these participants were noted to have fewer comments on their blogs, in general, and few made by members from outside their group. There is evidence that this was a conscious choice by some teachers:

*... it seemed many times I and others only commented on the blogs of people that we were friends with during the summer academies. I enjoy the blogging but don't always feel I have something pertinent to say [Teacher 3]*

Several distinct subcommunities and social dynamics, revealed through the construction of sociograms (Figures 2 -5), provide evidence of teachers' meaningful interactions through blogging. Our analysis revealed that teachers who invested more in blogging (both posting their

own blog and commenting on others' blogs) received a greater number of comments from within the community. As shown in Figure 2, teacher 1 posted a total of 7 blogs and made 31 comments on others' blogs. In return, this teacher received 22 comments from others. In contrast, as shown in Figure 3, teacher 6 who wrote only 2 blogs, but posted 34 comments in response to others' blogs, received only 6 comments from peers. In the analysis of sociograms, we observed less reciprocal interaction for teacher 6 as well. Thus, teachers' own initial investment in creating their blog is important in creating meaningful and reciprocal interactions.

Additionally, we noted that teachers who invested highly in blogging also formed several subcommunities within the cohort. These teachers regularly and frequently interacted with one another through their blogs within the subcommunity. In Figure 4 and 5, we see that teachers 1 developed two subcommunities of bloggers within the cohort—commenting back and forth on one another's blogs to offer support and encouragement, exchange information, and discuss their ideas about leadership. This reciprocal interaction among the group included not only commenting on each other's blogs, but also responding to the comments they received from one another.

### Discussion

The overarching goal of this work is to understand the ways in which blogging can support the realization of a new identity as a “teacher-leader” among the professional development program participants. We hypothesized that blogs would be an important influence in shaping teachers' identities as leaders because this was the one project venue through which teachers could focus their discussions and interactions specifically on the leadership component of the professional development; that is, other project activities (e.g., summer courses, follow up sessions) were primarily focused on curriculum and developing teachers' content and pedagogical knowledge. Evidence from our analyses, supported by teachers' own testimonials, supports this assertion. As illustrated in Table 2, the blogging practices in which teachers engaged as part of the professional development provided support for key dimensions of their leadership development including 1) establishing their own credibility as leaders; 2) developing and clarifying their personal vision for leadership; 3) identifying roles and opportunities for leadership; 4) supporting teachers in taking risks and challenging existing norms; and 5) developing the necessary skills and dispositions to effectively collaborate with others.

A number of potential benefits of blogging for identity work have been identified in the literature; in what follows, we will critically examine the extent to which our data indicate each of these benefits was realized by the participants in our study as they worked toward developing their identities, specifically as ‘teacher-leaders’.

***Blogs provide teachers a place to express their own voice*** (Narayan et al., 2011). A unique aspect of our program is that teachers' Blogs were not public, but were instead hosted in a project-specific site restricted to participants and staff. In this manner teachers were provided a space to discuss problems and issues without fear of their administrators and/or evaluators having access. The overwhelming majority of teachers actively participated, using their blogs as an opportunity to express their challenges or frustrations, as well as their personal successes in leading the implementation freshman physics in their school and district. In doing so, they recognized both themselves, and others, as leaders. Only two teachers expressed concerns about sharing information within the group and discussing conflicts or challenges that involved colleagues in the program. Neither of these completed the Blogging requirement for the course.

Thus, while the majority of teachers found Blogs provided a place to express their own voice, the teachers who chose not to Blog did not benefit in this manner.

***Blogs provide an opportunity for giving/receiving feedback from others*** (Narayan et al., 2011; Woperis et al., 2010; Luehmann, 2008; Luehmann & Tinelli, 2008). Our findings illustrate a broad variety of pedagogical transactions through which teachers identified problems and in turn received feedback from their peers. Additionally, through such transactions, teachers were able to identify and appropriate new resources, tools, and practices to support their leadership efforts. Teachers realized this benefit most fully when they made an investment that included returning to comments made on their blogs and responding to questions. Blogs provided a source of encouragement and reassurance for teachers as they worked toward achieving their leadership action plans.

***Blogs enhance teachers' reflective capacity*** (Anderson et al., 2011; Narayan et al., 2011; Woperis et al., 2010; Luehmann, 2008). By providing access to diverse perspectives and to one's own prior writing, blogs enabled teachers to reflect on their leadership and implementation of freshman physics. These became a form of documentation of teachers' personal growth and development as leaders, which teachers were able to recognize as they revisited their blogs and prepared final reports of their leadership action plans. In this manner, reflection supported teachers' self-identification as leaders.

***Blogging helps teachers form a professional community and meaningful discourse*** (Anderson et al., 2011; Narayan et al., 2011; Luehmann & Tinelli, 2008). Teachers' blogs were made available throughout the program via the Web, enabling both the author and audience to interact at times other than when they are co-located in time and space. The subgroups identified through sociograms suggest that there was not one unified professional community among the cohort, but many smaller communities within the group. Participants often visited and commented on Blogs of a limited number of individuals. In terms of teachers, identity has been defined as being perceived by self or others as a particular *kind* of teacher (Luehmann, 2007, 2008; Luehmann & Tinelli, 2008); the subsets of bloggers within the group suggests that teachers, through their Blogs, were able to identify with others based on similar visions of leadership. This is supported by the frequency of social interactions focused on relating to others (32%) in terms of position, outlook, or situation.

### Implications

All teachers have the capacity to be leaders, through their efforts to bring about change in classrooms and schools (Barth, 2006). However, there is a recognized need to prepare individuals for teacher-leadership (York-Barr and Duke, 2004). Becoming a leader is not just acquiring knowledge and skills for leadership, but developing a new *professional identity*. This work supports the notion that blogging can provide a viable means for helping teachers develop their identity as leaders. Specifically, by participating in *pedagogical transactions*, *social interactions*, and *intellectual deliberations*, teachers were able to rethink their roles as teachers and leaders, and receive support and encouragement in their efforts to be leaders in their classrooms, schools, and districts. Blogs specifically allowed teachers an opportunity to extend their learning beyond the summer workshop, to revisit their thinking and progress regularly, and continue to interact with peers across time and space. Through the purposeful and meaningful interactions with peers, teachers are able to recognize themselves and others as 'leaders'.

Teacher educators and professional developers can draw on this work to inform the design of programs to support teacher leadership. Our findings underscore the importance of

offering opportunities for sustained reflection and social interaction, such as that afforded through blogging, to allow teachers to come to view themselves, and others, as leaders. In particular, blogs provide a flexible format for teachers to explore various forms of teacher leadership with peers who may be geographically distributed in different schools and districts, learning from one another in the process. The public nature of the blogs (even within a closed group and private space) exposes teachers to diverse viewpoints, experiences, and contexts. The individualized nature of blogs (i.e., they belong to the individual blogger) provides a means for personal growth and reflection, whereas the community nature of the space (i.e., others can comment on blogs) contributes to meaningful dialogue and social support. In this manner, blogs have the potential to facilitate the development of participants' identity as teacher-leaders. However, professional developers need to be aware that even within a cohort of teachers, structures of subcommunities may impact the overall affordances of blogging for participants by constraining opportunities for interaction with and recognition by peers.

Our findings, however, call attention to potential disconnects between how professional developers may view blogging and how teachers themselves may view this. For several of our teachers, engaging in blogging was another 'task' on their to-do list, and this form of communication was less preferred to other means, such as phone calls and email. Since teachers' level of investment in blogging can influence the degree to which they realize its benefits, it is important for professional developers to acknowledge differences in perspectives, and strategize appropriate ways to address teachers' concerns. Helping teachers understand the potential value of blogging and supporting develop facility in using new technologies may go a long way toward achieving both teachers' and professional developers' goals.

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**Table 1. Teachers' Blogging Practices and Types of Participation**

Major Category	Blogging Practices	Illustrative Excerpts from Posts/Responses
<b>Pedagogical Transactions</b>	Accepting advice	Both good points. We definitely need to meet with the math department and decide what we need from our administrator to make this happen. Thanks for the advice.
	Adopting ideas of others	Thank you for the information. I will pass this on to our district curriculum specialist/assistant to the superintendent. Hopefully she and I can work through the requirements.
	Sharing an activity	I have had the opportunity to present to the entire high school faculty the whiteboarding technique that I presented at our last meeting...
	Sharing resources	I learned how to use the materials at compadre: <a href="http://www.compadre.org/OSP/">http://www.compadre.org/OSP/</a> and the java simulations and tools at bqlearning: <a href="http://www.bqlearning.org/">http://www.bqlearning.org/</a> .
	Sharing success	I started out at the beginning of the year sending a survey to the elementary school teachers. They did complete the survey and the results were used to help persuade the school board to supply the teachers with a science budget.
	Identifying problems/challenges	I think the most frustrating/time consuming part is getting the students to understand the multimeters. I think the multimeters are great because they are a tool that mechanics and electricians actually use to solve problems and do work. But it seems a lot of students never fully understand, despite several labs and my best efforts.
	Offering assistance/advice	I have found that [in a case like yours] I have had to add more practice problems and note quizzes. These are graded with more accuracy...This usually shows me who still needs help or is not taking notes or paying attention.
	Asking for advice/input	...I would appreciate advice about how other teachers determine how far to take their kids [into the mathematics skills]. Although this discussion can quickly turn into a forum on vertical alignment and cross curricular competencies, I'd like to know how others have determined where to draw the line in the sand so to speak . . .
	Asking for resource	If any of you found the share-a-thon to be helpful and you are utilizing the stuff you heard, I would ask that you share that information in the comments.
	Describing strategies/plans	Right now I am looking for possible sources of funding and hope to write a grant...
<b>Intellectual Deliberations</b>	Acknowledging a different perspective	I like Darrell's idea of having the disrespectful students come up and present on someone else's board. It would be interesting to see how the higher level kids would react to that vs the lower level kids.
	Advocating for a common vision of leadership and effective teaching	I think as teachers, we have to be careful not to depend solely on the administration to be the compass for our buildings. We need to communicate and work together in a common direction to achieve

progress toward our goals for ourselves, our classrooms, and our buildings. We must also be dedicated to working together.

By setting up the observation schedule, I hope we'll be able to improve our practice

I have found that our department is really kind of unique and we all have different roles and everyone is not a leader. Whew, I said it, not everyone is leading far as I can tell, but these folks aren't really doing a bad job either.

My leadership role primarily involved implementing the PF program at our school, which went very smoothly. I only had a small group of PF students this year, and next year we are pushing more of our Freshmen into PF.

I have to say that I loved the Share-a-Thon from our get together a couple of weekends ago...

My biggest question is how heck am I going to fit four more units in next year????

I have found that the more I have explored out of my own classroom as a teacher leader in Physics and Special Education the more I am able to focus on the big picture. I see things differently and my response is more thoughtful of the community. I am able to do many things that I had always considered to be way out of my comfort zone.

I wish you the best of luck with your grants, and great job getting the school switched to Physics First. Way to Go Teacher Leader!

Somehow I got on their mailing list (possibly because of Jim – thank you, Jim, if that's so) and have been signing up for workshops ever since.

Given you have students with diverse interest levels, are you doing any special collaborative grouping assignments to address this?

In our district we have 2 levels of physics classes for special education students. One is taught in the regular classroom with the physics teacher who is supported by a learning specialist. The other is a self contained physics class that is using a modified curriculum.

There are times when I feel just as you have described it. Due dates, EOC, end of year projects and everything else....

I've heard you talk about your class and you're doing such an awesome job.

I also teach a class-within-a-class (CWC) this year...

## Social Interactions

Articulating goals/desired outcomes

Assessing school culture

Describing leadership roles

Drawing on professional development experiences

Posing rhetorical question

Reflecting/self assessing

Encouraging others

Expressing appreciation

Asking for clarification

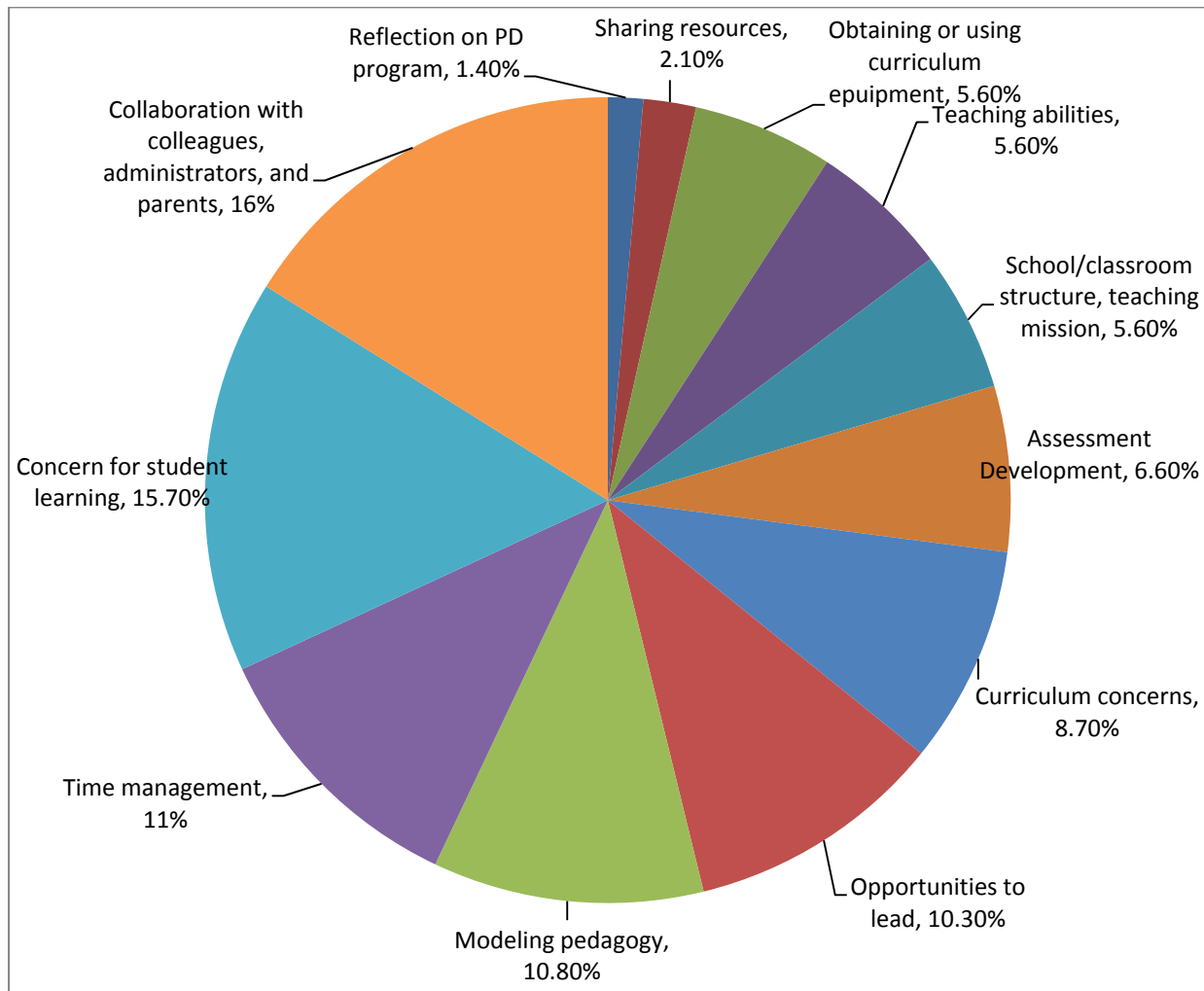
Providing clarification/  
responding to comments or  
questions

Commiserating with others

Congratulating others

Relating to others





**Figure 1. Percent of Teachers' Blogs Focuses on Various Topics**

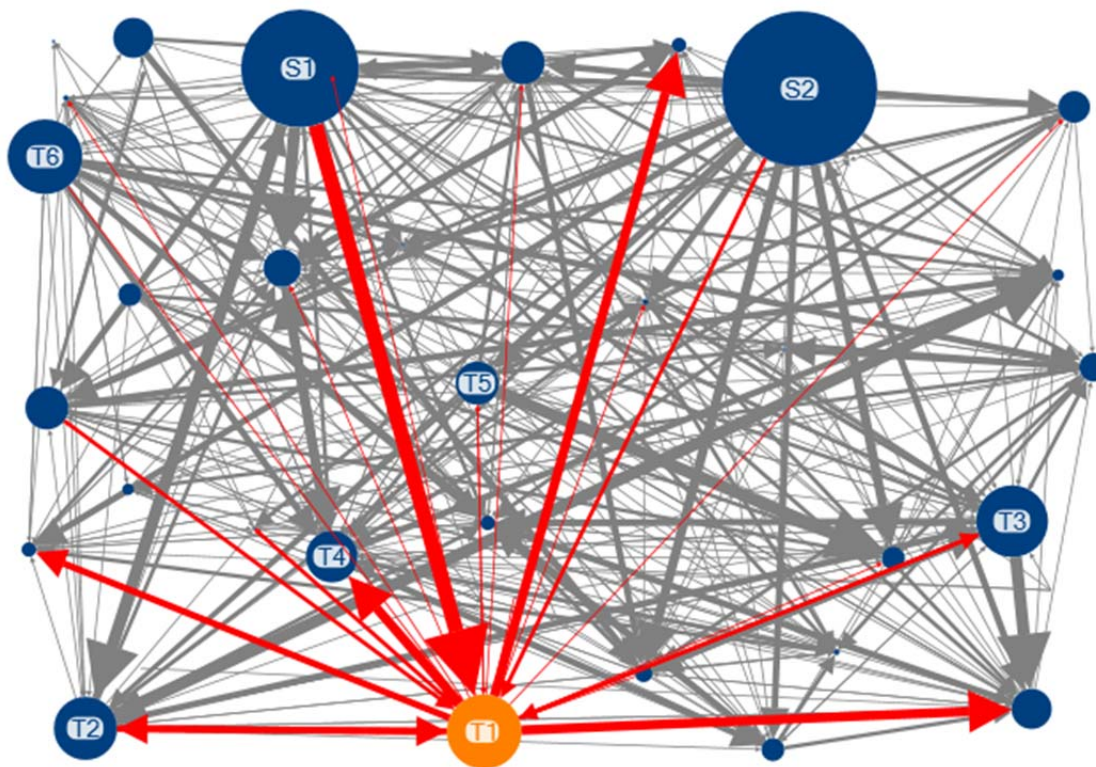


Figure 2. Representation showing high investment of blogging (Teacher 1)

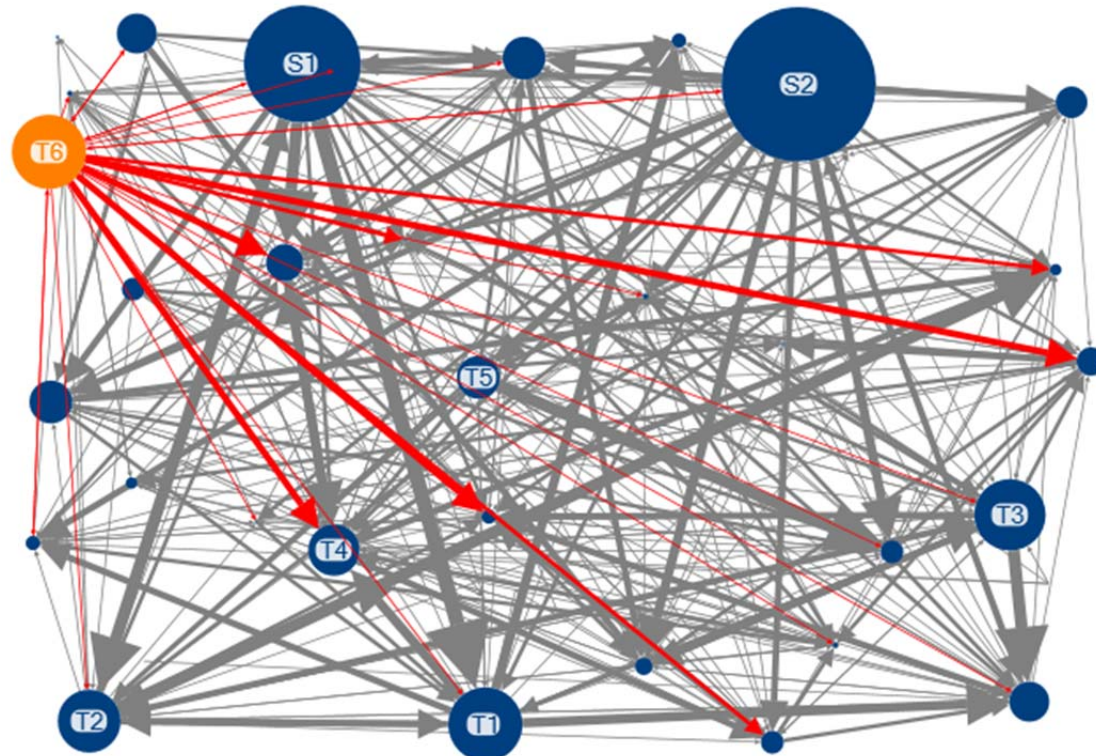


Figure 3. Representation showing low investment of blogging (Teacher 6)



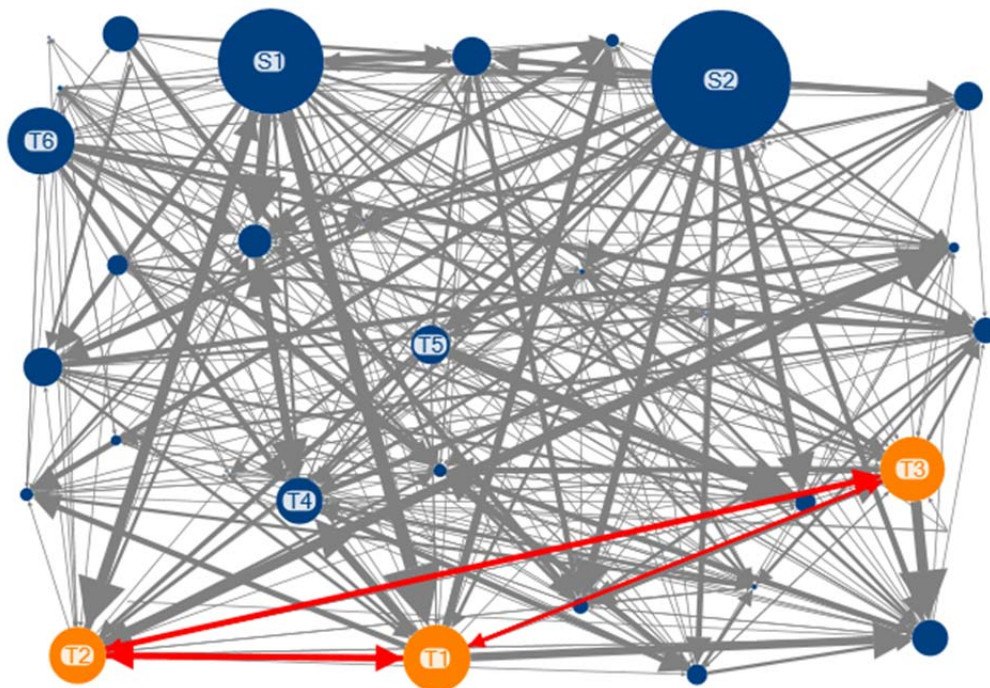


Figure 4. Subcommunity of Bloggers (Teachers 1, 2, and 3)

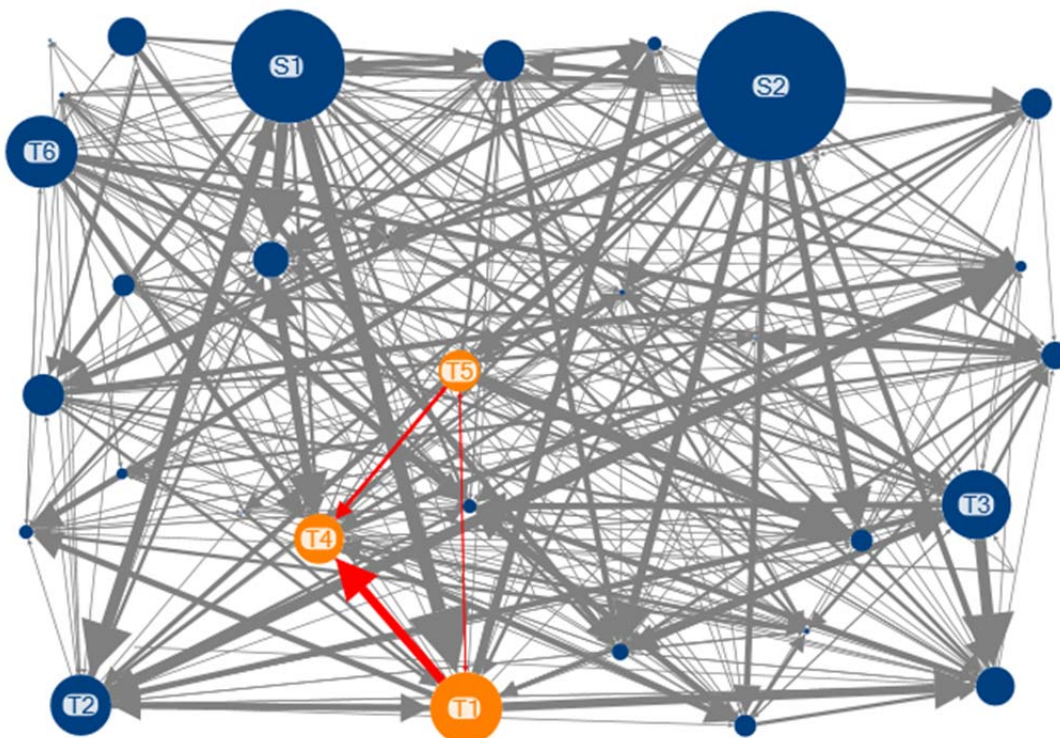


Figure 5. Subcommunity of bloggers (Teachers 1, 4, and 5)

**Table 2. Teacher Leadership and Blogging Practices**

<b>Dimensions of Teachers' Leadership Development</b>	<b>Blogging Practices Employed by Teachers that Support this Dimension</b>
Establishing personal credibility	<i>Pedagogical transactions</i> – recognizing and being recognized, in turn, by others as having something valuable to contribute <i>Social interactions</i> - giving and receiving recognition for one's teaching and leadership efforts
Developing and clarifying a personal <i>vision</i> for leadership	<i>Intellectual deliberations</i> – reflecting on what it means to be a leader and teacher; acknowledging and exploring differences between one's own vision and that of one's peers <i>Social interactions</i> - providing/ receiving affirmation for one's leadership efforts consistent with an emerging vision
Identifying roles and opportunities to lead, both formal and informal	<i>Social interactions</i> – Relating with others in terms of school context and opportunities for leadership <i>Pedagogical transactions</i> – Exchanging information about successful teaching and leadership actions
Taking risks; challenging existing norms	<i>Social interactions</i> – experiencing a supportive community and 'safe space' to take risks <i>Intellectual deliberations</i> – assessing school culture, reflecting on the effectiveness of one's efforts, and articulating desired goals/outcomes
Developing skills for collaborating with others	<i>Social interactions</i> – engaging in discourse about teaching and leading <i>Pedagogical transactions</i> – exchanging ideas and strategies related to working effectively with peers and administrators