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Shaping Student Teacher Expertise:
A Design to Converge Feedback, Technology,
and Social Relationships

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Abstract

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The current push to improve teacher effectiveness calls for high-quality teacher preparation programs that provides preservice teachers with impactful learning opportunities. At the heart of this teacher training is delivering high-quality feedback to the preservice teachers during their practicum experience. Employing design-based research and social network analysis methodologies, this study set out to 1) examine the support infrastructure surrounding preservice teachers at the critical time of their practicum experience, and 2) put forth new approaches, rooted in technology and social networking, in an effort to enhance support to preservice teachers. The findings sheds light on the student teachers' feedback network and suggests the study's interventions influenced the quantity and quality of the exchanged feedback.

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Chapter 1.

Influencing Student Teachers' Quality

Using Feedback in a High-Accountability Context

Education reforms demand improved student achievement, and efforts to improve teacher effectiveness perhaps hold the greatest potential in answering this call (Ball & Forzani, 2009). This assertion rests on the underlying premise that teachers play an influential role in student achievement (Ball & Forzani, 2009; Rivkin, Hanushek, & Kain, 2005). That role depends on what teachers have learned to do in their professional practice. And, if teacher and teaching quality – both individually and collectively – is improved through professional learning and development, then student achievement will likely increase (Hargreaves & Fullan, 2012).

The professional learning of teachers, stretching throughout their career, may be traced back the beginning, when they enter a teacher preparation program. Accordingly, the quality of these preparation program experiences is of central concern. Many aspects of the teacher preparation program experience are likely to contribute to the making of a teacher, but central among them is the period of time—typically several months in duration—when teacher candidates in traditional teacher preparation programs take over a class and assume the position of “student teacher” (Dexter & Riedel, 2003). Here, situated in a real classroom, the candidates start to learn how to teach by doing it, attempting new practices, receiving feedback, and reflecting (Putnam & Borko, 2000). Hopefully, this professional learning occurs within a well-constructed “infrastructure of support” for their learning.

This dissertation study addresses a central feature of that supportive infrastructure—the quality, quantity and medium for offering students teachers regular, meaningful, and useful

feedback on their emerging classroom practice. In the current context of high-stakes accountability, this dissertation study, employing design-based and social network methodologies, sheds insights on opportunities for preservice teachers to receive regular feedback on their practice, how teachers perceive and learn from feedback, and the creation of tools, systems, and cultures that make such feedback a regular part of teachers' professional work. This line of inquiry may be needed in order to truly maximize the returns on teacher quality investments and its impact on student learning.

But to understand the possibilities and constraints for providing that feedback presumes an awareness of the context in which teacher preparation occurs, to which I turn first.

A Central Challenge for Teacher Education Programs: Improving the Supportive Infrastructure for Student Teachers' Learning

A growing concern exists that teacher preparation programs may inadequately prepare preservice teachers to effectively teach, partly contributing to substandard student achievement (Bullough et al., 2002; Greenwood & Maheady, 1997; Levine, 2006). Several factors such as insufficient preparation and lack of systematic monitoring of preservice teacher quality may contribute to lower quality in teachers (Levine, 2006). Critics of the traditional university teacher preparation programs point to the finding that 80% of teacher preparation programs pass 99% of their preservice teachers (Sudzina & Knowles, 1992). This suggests that nearly all preservice teachers move through their teacher education programs, completing coursework and practicum experience to achieve a teacher certification and become in-service teachers, regardless of teaching ability. This lack of quality control is shown in surveys of alumni of the teacher preparation programs and hiring principals, reflecting the sentiment "that schools of

education do not prepare their graduates to cope with realities of today's classrooms" (Levine, 2006, p.4). Scholars have further suggested a need for colleges of education to play a role in building teachers' effectiveness in and through technological fluency, practice-centered education, and reflective practices (Dexter & Riedel, 2003; Gomez, Sherin, Griesdorn, & Finn, 2008).

The concern that teacher preparation programs may inadequately prepare preservice teachers has encouraged a medley of reform efforts. These reform efforts include increased accountability measures and accreditation standards (Sawchuk, 2013). The reform pressures are acutely felt by teacher candidates who have take on the student teaching phase of their preparation program, which adds to the stress they experience in this aspect of their preparation, but also creates an unusual opportunity for strengthening the systems of supports for their new learning.

The edTPA is one such accountability measure. This new performance-based assessment is being embraced across the country, with nearly half of the states adopting the edTPA (AACTE, 2014). This assessment requires student teachers, through written analysis and videotaping of classroom teaching, to demonstrate a certain level of competency in effective teaching. In certain states, including the state where this study took place, policy makers have made the passage of the edTPA consequential to earning a teaching certification—an essential credential to securing a teaching position in public schools.

This new assessment system and its expectations may create the conditions for a high-stakes environment for all those involved in teacher preparation. At the preservice teacher level, students may feel pressure to successfully complete the requirements of student teaching while concurrently meeting the new demands of the edTPA. At the support level, field supervisors,

carrying the responsibilities of both supporting and evaluating their student teachers, have mounting stress to have successful edTPA passage rates of their student teachers. These passage rates may indirectly or directly act as proxies for their effectiveness as field supervisors. Finally at the institutional level, leaders of accredited teacher preparation programs are accountable for publicly reporting the edTPA scores of their teacher candidates, which are compared to other (potentially competitive) teacher preparation programs, statewide and nationally.

Education reform has further put pressure on revamping teacher preparation standards. As an example, take the standards put forth by the Council for Accreditation of Educator Preparation—the newly formed, specialized accreditor for educator preparation programs (CAEP, 2013). These standards establish more accountability for teacher preparation programs by linking program quality to student achievement (Sawchuk, 2013).

The role of feedback in supporting student teachers is recognized in these latest teacher preparation standards. Providing strong student teaching practice and feedback is one of the five broad focus areas of the Council for Accreditation of Educator Preparation standards (Sawchuk, 2013), and this focus area may hold considerable potential for strengthening the link between teacher quality and student achievement.

Yet there is no guarantee that these attempts at reforms alone will actually help improve the output of teacher quality from teacher preparation programs. Making meaningful and productive changes to instructional practices require us to examine, and, in some sense, “Reprogram our past ways of doing things” (City, Elmore, Fiarman, & Teitel, 2009, p 22). Education scholars acknowledge in light of the critique of teacher preparation programs that, “Little research has been done to examine the kinds of learning experiences that help beginning

teachers acquire the knowledge and skills that underlie learner-centered and learning-centered practice” (Darling-Hammond et al., 1999, p.8).

Herein lie opportunities to develop and investigate ways to “reprogram” traditional ways of supporting preservice teachers and research novel ways to foster improved teacher learning and growth. In that spirit, research and developmental work is needed that (a) examines the support infrastructure surrounding preservice teachers at the critical time of their practicum experience—the aspects of their learning that are most directly reflected in the edTPA—and (b) develops and tests new approaches, rooted in technology and social networking, that show promise in helping teacher preparation programs enhance support they provide to preservice teachers.

At the heart of student teachers’ support infrastructures are feedback *structures, practices, and tools*—in short, all the ways that teacher preparation programs can create to help emerging teachers see what they are doing, visualize ways to improve their teaching, and learn from their ongoing efforts to engage young learners in the classroom. The feedback structures arise from the patterns of feedback interactions and practices that student teachers experience in carrying out their day-to-day teaching and learning (Wasserman & Faust, 1994). These feedback structures, embedded within the student teachers’ tasks and participant structures, may play an influential role in student teachers’ learning and growth.

In addition to the situated feedback practices and structures, the tools being utilized by student teachers (and by those the student teachers turn to for advice and development) may further shape the level and type of support available to student teachers. Putnam and Borko (2000) stress the important role technological tools may play on teacher learning and how teachers respond to reform efforts because these technologies may provide “new avenues to

access distributed expertise” (p. 11). These technological tools may make the student teachers’ support infrastructure more robust, expanding access to the expertise and feedback of others through various mediums and forms, such as email, discussions in online spaces, text-messages, and videoconferences. The extent of the tool’s usage, and, correspondingly, the amount of feedback flowing as a result of their use, is mediated by some of the following factors anchored to the student teachers’ context: availability to the tools, users’ evolving capacity to use such tools, and dispositions and attitudes towards technological tools.

Paying close attention to the student teachers’ support infrastructure, particularly the feedback sources, structures, practices and tools surrounding their classroom teaching, may be in order to better leverage the potential benefits of high-quality feedback on improving the student teachers’ practice. Feedback provides the critical information on specific practice-based performances to close practice and knowledge gaps of the preservice teacher (Hattie & Timperley, 2007; Sadler, 1989). Beyond student teachers, researchers have long acknowledged that teachers need to receive ongoing professional feedback on the effects of their efforts for sustained changes in classroom teaching and learning to occur (Eurat, 1995; Guskey, 1995; Mevarech, 1995, Hargreaves & Fullan, 2012). Yet, the following section explores how the student teachers’ support infrastructures may be insufficient in delivering the level and quality of feedback necessary to meet the student teachers’ learning and teaching needs in today’s reform context.

The Research Problem

Literature has shown that many student teachers feel they do not receive enough supervision and feedback, and feel isolated (Buck, Morsink, Griffin, Hines, & Lenk, 1992). In a

survey, student teachers reported their feelings of insufficient support and isolation may stem from “having few opportunities for collegial interaction and critique” (Buck, Morsink, Griffin, Hines, & Lenk, 1992, p. 114).

The aforementioned survey’s findings may shed light to the current constraints on the student teachers’ support infrastructure in a traditional teacher preparation program, particularly the student teachers’ limited feedback network—the people that student teachers may turn to for support. Fayne (2007) described the typical configuration, “Despite many innovative alternative models introduced over the past two decades, the typical student teacher or intern in the US is still placed in a classroom with a cooperating teacher and supervised by a college/university supervisor” (p.54). The cooperating teacher and the university field supervisor constitute the main actors in providing “feedback about specific lesson components, suggestions about new ways to think about teaching and learning, and encouragement to reflect on one’s practice” (Borko & Mayfield, 1995, p. 515).

This limited feedback network may adversely affect the quantity and quality of the feedback available to the student teacher. Following this, are illustrative examples of how student teachers, relying mainly on these two sources of feedback, at the critical time of student teaching, may present constraints to their support infrastructure and contribute to the student teachers’ feelings of isolation and not receiving insufficient support.

Within the contextual relationship between field supervisor and student teacher, challenges to delivering optimal support may arise. Suspending, for the moment, all the available means a field supervisors may provide support to student teachers, the feedback that is most salient to the student teachers’ pedagogical needs are the field observation visits. Traditionally, the field supervisor observes the student teachers’ classroom teaching, at the site

of their practicum experience, several times throughout the quarter, for the purposes of evaluating, coaching, or, a combination thereof. Each observation of the student teachers' teaching is followed-up with a de-brief session between the field supervisor and student teacher. In essence, these field visits serve as opportunities for feedback and refinement to the student teachers' instructional practice. Moreover, the field supervisors visits may be viewed as one-time snapshots of the student teachers' practice, and, hopefully, taking all these snapshots into consideration, paints a broader picture of the student teachers' growth over the academic quarter. However, the chief concern is, these visits and the feedback that flows from these field observations, are still too infrequent (Fayne, 2007), making-up a small percentage of the student teachers' total time teaching. Borko and Mayfield (1995), in their research on the "guided teaching" relationships between the student teachers and their cooperating teachers and field supervisors and their influences on student teachers' learning, described the following pattern (constraints) across their case-study participants:

Conversations between university supervisors and student teachers were frequently too rushed and based on insufficient data about the student teachers' teaching. Further, it is our impression that, in many cases, student teachers learned not to expect much out of their relationships with cooperating teachers and university supervisors. They primarily wanted the opportunity to practice and to learn by doing. They hoped for some suggestions and feedback, but they learned to be satisfied with very little. (p. 515)

While literature acknowledges the significant role cooperating teachers play in the student teachers' practicum experience (Osunde, 1996), there is scholarly debate on whether the practicum experience necessarily contributes to improving quality of the student teacher (Zeichner, 1980). The concern is, student teachers, with limited access to distributed expertise, become "enculturated into the teaching community—learning to think, talk, and act as a teacher" (Borko & Putnam, 2000, p. 7), and this "enculturation" may not align with research best-

practices in instruction, resulting in the student teacher adopting the entrenched practices that instructional reform efforts attempt to address.

Limited access to feedback may be another dimension that plays out within the student teacher and cooperating teachers arrangement. Unfortunately, in many cases, as the student teacher assumes greater teaching responsibility for the classroom, the cooperating teachers' supportive role may shift to a more passive stance, providing less direct support and feedback to the student teacher. And, in many cases, the cooperating teacher may physically remove himself or herself from the classroom, for extended periods of time, leaving the student teacher mostly alone in their teaching.

This lessening of support may contribute to the student teachers' sense of isolation, mirroring, in many aspects to, the experiences of in-service teachers. Research suggests that teachers may lack opportunities for feedback as part of their daily work because they tend to work in relative isolation and autonomously (City et al., 2009; Friedkin & Slater, 1994; Glennan & Melmed, 2000; Marzano, 2011; Spillane & Louis, 2002), teaching students by themselves, and using other times to plan curriculum, grade, complete paperwork, and individually meet with students. Various scholars have described this phenomenon in various ways. Rud (1993) categorizes this pattern as teaching in an "egg crate" (p. 71), and Little (1990) describes how the persistence of privacy permeates school culture. Consequently only small amounts of time are devoted to interacting with colleagues and (if at all) supervisors, thus, limiting professional feedback opportunities.

While it is reasonable to assert that all teachers could benefit from better, more regular feedback on their work, it is especially reasonable to suggest that, in the face of high-stakes assessments, rigorous standards, and being one step away from being an in-service teacher,

student teachers deserve superlative instructional support, specifically in the form of delivering high-quality feedback to the student teachers from various trusted sources. One could imagine various ways they might encounter this feedback, but one would hope that it would be regular, varied, constructive, and focused on the particular issues they are struggling with, as well as acknowledging those aspects of teaching practice that they are mastering.

Feedback is generally considered a strong mediator to learning and performance (Ilgen, Fisher, & Taylor, 1979; Shute, 2008), specifically in knowledge and skill acquisition (Bangert-Drowns, Kulik, Kulik, & Morgan, 1991). Research on feedback-to-teachers suggests regular, specific feedback from peers, or knowledgeable people, to student teachers on the impact of new instructional practices on student learning is crucial to sustaining instructional improvements in the classroom (Gersten, Vaughn, Deshler, & Schiller, 1997; Scheeler, McAfee, Ruhl, & Lee, 2006).

Much of the scholarly discussions of feedback's role, benefits, and, overall, importance for learning and development has been cast in terms of feedback to students and its influence on students' learning. For instance, after analyzing thousands of studies, researcher John Hattie (1992) said:

The most powerful single modification that enhances achievement is feedback.
The simplest prescription for improving education must be 'dollops of feedback'
(p.9).

More recently, Hattie's and Timperley's (2007) meta-analysis research showed the use of feedback to improve student achievement had an average effect size of .79 (in standard deviation units), which they note is quite strong compared to other educational innovations average effect sizes of .40. Understandably, the empirical evidence on the effects of feedback on students' learning is encouraging and because there are obvious parallels between feedback to students and

feedback to teachers.

Given what is known about the potential power of feedback, the intense need for it at an early, formative stage of the professional teaching practice, and the likelihood that available feedback in these contexts often fall short of what would be optimal, then a series of issues present themselves that deserve further experimentation and study. In particular, at least the following dimensions of the feedback to student teachers puzzle have yet to be fully or satisfactorily explored. First, the systems and means for providing student teachers regular access to feedback on their classroom work deserves further attention. Second, what makes feedback helpful to them—that is, what makes feedback “high-quality”—is not as well understood as it might be. Third, the possible sources and means for providing more regular, high-quality feedback to students teachers have not been as fully examined as they might be, especially when one considers what technological tools might do, and how the student teachers professional network might expand to support their learning.

In an effort to better understand the feedback to student teachers phenomena, maybe, the central task of scholars is to more fully describe the systems and means for providing student teachers with regular access to feedback on their pedagogy. One approach to undertaking this task is to put into perspective the student teachers’ professional “social network”, their feedback network in particular, and foreground the feedback activities that flow from within their network relationships (ties).

Feedback can come from various people, and, in this regard, the growing professional social network of instructors, peers, and others, may have much to offer to the student teacher. We are only just beginning to unravel the ways that these professional networks operate in the teaching profession, as a growing body of social network research emerges in education. In part,

the supportive infrastructure of teachers lends itself to gaining unique insights into the “conditions and processes that propel or inhibit change” to instructional improvements (Little, 2010, p. xi). Social network analysis offers the affordance of “potential practical utility” for “those engaged in the work of education improvement” (Little, 2010, p. xii).

While most empirical social network studies focus on mapping teachers’ networks, less research focuses on what flows through the ties within these teacher networks (Little, 2010). Feedback may flow along a continuum of informal interactions, such as a student teacher texting curriculum question to a peer, to more formal activities, where a field supervisor provides feedback on a required lesson plan of the student teacher. In short, there is room to examine, in more depth, the available feedback activities, interactions, and processes that flow within the student teacher’s professional social network.

A second major piece of the feedback to student teachers’ puzzle, that hasn’t been well addressed, is that of what makes feedback helpful to them—that is, what makes feedback “high-quality”, and how student teachers make meaning and learn from this feedback. Unfortunately, at present, education research is scant, at best, on putting forth student teachers’ perceptions of feedback quality, how they make sense of the feedback, and how the feedback influences their practice.

Conducting more empirical research on student teachers’ perceptions of quality matters because, psychology’s literature on feedback interventions tells us, that even if the learners (student teachers) received more feedback, it may not necessarily translate to positive improvements. In meta-analysis reviews on feedback interventions, feedback (for various reasons and under different conditions) may contribute to negative effects on the learner’s improvement (Kluger & Denisi, 1996; Shute, 2008). For example, if the feedback that is

received by the learner is construed as controlling or critical, then this may hamper learning improvements (Shute, 2008).

Suggestions on the practices and conditions that are crucial to delivering high-quality feedback to student teachers may be drawn from the hundreds of studies and several prominent literature reviews that have examined the construct of feedback from different perspectives: effects of feedback on learning (Hattie & Timperley, 2007), attributes and dimensions of feedback (Ilgen et al., 1979; Scheeler, Ruhl, & McAfee, 2004; Van Houten, 1980), best-practices in delivering feedback (Marzano, 2011), and conditions that foster or hinder effective feedback (Brinko, 1993). Yet, literature is weak on how teachers learn and make meaning from feedback on their practice (Putnam & Borko, 2000; Visscher & Coe, 2003). In particular, a dimension of the student teachers' making meaning of the feedback, which is worth exploring, is the teachers' *feedback capacity* – that is, the ability to receive and deliver quality professional feedback.

In summary, additional research is needed on (a) the student teachers' perceptions of high-quality feedback, as it connects to their support network, (b) the specific practices and conditions that are conducive to delivering high-quality feedback, (c) ways in which teachers make meaning and learn from the feedback, and, (d) the role that the student teachers' feedback capacity plays in making sense of the feedback.

A third critical piece of the feedback to student teachers' puzzle, yet to be satisfactorily explored, is the experimentation of ways to deliver more regular, high-quality feedback to students teachers, especially when one considers the potential of technological tools, and how the student teachers' professional network might expand to support their learning.

Positioning that feedback plays a central role to the growth of student teachers' pedagogy, the degree of growth and learning may be influenced by the *quantity* and *quality* of

the feedback a student teacher receives. Yet, the number of quality feedback opportunities which a student teacher experiences, may be encumbered by the following factors:

- The school context in which teachers lead busy professional lives (Glennan & Melmed, 2000), limiting feedback interactions of the student teacher with other teachers at their practicum site,
- Heavy workload of their field supervisor, lowering the number of classroom observations of student teachers' instruction, and, overall level of support,
- Student teachers' limited professional network,
- Low feedback capacity of feedback sources,
- Competing (additional) work demands, such as the edTPA.

Given these real constraints on actual face-to-face feedback conversations, emerging technologies designed to facilitate efficient and effective feedback exchanges may play a role in addressing these challenges. In particular, feedback technologies offer a temporal and spatial alternative to exchanging feedback (Clark & Mayer, 2008), where student teachers can engage in rapid, asynchronous "conversations" with a variety of people. This may be conducted through online discussion boards or forums, providing spaces for teachers to pose problems of practice, helping alleviate feelings of isolation, and allowing for solicitation of feedback from their professional learning network (Hewson, 2013).

One can imagine the possible benefits of technology in other ways. Technologies may increase the timeliness and frequency of feedback to student teachers, provide tools to anchor feedback to specific parts of a student teachers work (e.g. an on-text comment on a student teacher's lesson plan), and shape users' feedback capacity by designing or using feedback platforms in a way that draws out and makes the targeted feedback being sought and provided

explicit. Finally, it may be beneficial to experiment with ways in which the technology can be used to better leverage the student teachers' current feedback network, and to expand their network to actors beyond their field supervisor and cooperating teacher.

Focus of Inquiry

A critical need exists for development and research that advances our knowledge about the conceptual links between investments in teacher quality policies and improved student achievement (Plecki, 2000), and enriches educators' toolkit for making good on these investments. Teacher preparation programs represent one area where such a need is becoming clear, and where there are various possibilities for substantially strengthening the infrastructure of support for emerging teachers' initial learning about the craft of teaching. In this context, efforts to better understand and, if possible, enhance the feedback to student teachers, are a worthwhile inquiry.

To address these pressures and needs, I conjecture that preservice teacher feedback, use of technology, and teachers' social relationships, configured together, offer a promising way to shape how preservice teachers interact, learn, and grow in their practice. This dissertation constructs a case study of such an effort, employing design-based and social network methodologies, with the goal of understanding how preservice teachers perceive and make meaning of their feedback opportunities, using an innovative software tool – designed to enhance the social exchange of relevant, pedagogical feedback. The following research questions, emerging from the research problem discussed above, will guide this study:

1. From the student teachers' perspective, how, and in what ways, does the intervention design (software tool and support activities) affect opportunities to feedback, and shape their feedback structures? What is the nature of their feedback?
2. How do the student teachers perceive and describe the meaning, quality, and impact of the feedback on their practice?
3. In employing design-based methodology, what surprises, challenges, lessons, or combinations thereof, arose when adopting the software as part of the feedback workflow?

Overview of the Study as a Response to the Research Problem

Planning the study's design and overall response was crucial to answering calls for additional empirical study of the feedback to student teachers phenomenon. What resulted was a case-study design, employing design-based research and social network methodologies. And, each of the study's methodological approaches provided unique affordances in addressing the research problems and research questions. For example, in utilizing case-study methodologies, this study contributes rich descriptions of student teachers' feedback structures, practices, and tools—at the heart of their support infrastructure. This “thicker” description extends further, to how the student teachers, in grappling with classroom teaching and completing the edTPA, distinguish between low-and high-quality feedback on their practice, and to the ways where some student teachers adjusted their pedagogy based on the feedback, while others did not.

As part of the study's design, design-based research (DBR) methodologies was central to addressing the “growing need for experimentation with configurations of field experience and for the generation and study of new models to determine their effectiveness” (Bullough et al., 2002,

p. 69). And, in using DBR, this study attempted to uncover emergent ways to answer the need to “extend application of effective feedback techniques” to student teachers (Scheeler et al., 2006, p. 405). Overall, for this particular study, DBR seemed most appropriate to respond to the stated research problems, especially in the light of the Wang & Hannfin (2005) description of DBR methodology:

...A systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories (p. 7).

DBR’s “contextually-sensitive design principles and theories” guided the development of this study’s intervention design, aimed at improving the “educational practices” (Wang & Hannfin, 2005, p.7). The study’s intervention design (containing multiple components), mainly rested with TeachSpark, a web-based, feedback software which is focused on influencing how teachers exchange and learn from professional feedback. As part of the DBR methodology, TeachSpark underwent iterative cycles of improvements based on the student teachers’ and field supervisors’ feedback on the software’s attempts to improve opportunities to quality feedback. The TeachSpark development team included a software developer, a front-end web designer, a user interface designer, and myself. In short, TeachSpark was designed to offer an augmented, easy-to-use platform for teachers to seek out and receive critical pedagogical feedback (both evaluative and non-evaluative in nature) from the teachers’ social network: evaluators, peers, colleagues, family, and friends. The ease of tapping into the teachers’ extended social networks—the people whom a teacher turns to for professional help—differentiates TeachSpark from other available software tools.

This study reports to what degree, TeachSpark (and other parts of the intervention design) addressed the following major challenges facing feedback exchanges to student teachers: inadequate opportunities to professional feedback (a *quantity* perspective), and low perception of feedback meaningfulness and usefulness on the teachers' practice (a *quality* perspective). Additionally, the findings shed light on lessons learned from deploying new technology to student teachers and field supervisors, through the design-based methodology process.

In sum, this study's design and ensuing findings (a) conceptualizes a (formal and informal) feedback network where student teachers have access to feedback, (b) offers insights into the nature and perceived quality of feedback flowing through student teachers' feedback networks, and (c) provides new perspectives on how innovative technology may play a role in shaping the student teachers' networks.

Rationale for the Study

This study comes at a time of increased accountability for the effectiveness of preservice teachers, and where resources to support these preservice teachers are seemingly strained. Examining current practices of support surrounding the daily work of a student teacher, and experimenting with fresh approaches, is in order to fully maximize the access which student teachers have to high-quality feedback.

This case study employed design-based methodologies, contributing new insights into this emergent and promising research area. This analytic approach facilitates formative evaluations of the software and other intervention features, allowing for two major iteration cycles (and many more mini-iteration cycles within these) of design, enactment, and refinement

(DBRC, 2012). DBR also carries a dual commitment of theoretical and practical improvement (Sandoval, 2013), making this approach apropos to this study.

This study contributes new theoretical perspectives around the mediating factors of how teachers receive, process, and learn from feedback. More specifically, this study sketches a preliminary theoretical framework of feedback capacity, and how this feedback capacity may play a crucial role in the mediation of how teachers are able to solicit, receive, process, learn from, act upon, and provide feedback.

Additionally, this study augments the existing scholarship around teachers' professional network. There is minimal research on student teachers' networks, how the student teachers perceive the feedback being exchanged through their social ties, and in what ways these networks are used to support their instructional practices in their practicum experience. Applying social network analysis lens, I mapped the participants' network, uncovered the nature and perceived quality of the ties between student teacher and feedback sources, and discovered potential ways to strengthen and grow student teachers' network. This knowledge may be beneficial to education leaders of teacher preparation programs, who are seeking ways to better support their student teachers without shifting the additional responsibility to the already stressed field supervisors and cooperating teachers. Rather, they seek potential feedback sources from inside and outside the teachers' preparation program.

In summary, this is a case study of two groups of student teachers (n=8) during their practicum experience, and that takes place over one academic quarter. While the unit of analysis is on the two groups of student teachers, the two field supervisors played an influential role in making sense of the phenomena under study. Through analysis of documents, software analytics, and three rounds of semi-structured interviews (30 in total), I gained a firsthand

understanding of the teachers' perceptions, how they made meaning, and what they thought of teacher feedback through the use of TeachSpark and their social networks.

Establishing Common Understanding of Terminology

This study's use of terminology and concepts are referenced from various literature bases, methodologies, and from the field. In this section, to minimize ambiguity and create a common understanding of this terminology, I give definitional boundaries, starting with the kind of teacher preparation setting and phase of teacher preparation which is my focus, then noting how I treat the core phenomenon of feedback and related concepts, and, finally describing the main "cast of characters" in the feedback story.

Focal Teacher Preparation Setting and Phase

Teacher preparation program. There are numerous available routes to earn a teacher certification: traditional university programs and alternative programs. For this study, the student teachers and field supervisors are in a traditional teacher preparation program.

Undergraduates apply for admission into the college of education for their junior year, and then complete five quarters of coursework and one quarter of student teaching.

Practicum experience or student teaching. Because preservice teachers may have several field-based experiences through the course of their program, this study highlights, specifically, the practicum or student teaching experience, often viewed as the culminating, capstone experience (Sudzina & Knowles, 1992). In research and in the field, these terms are used interchangeably. It's a notable distinction, because in the final practicum, student teachers' roles traditionally shift from classroom observers to educators, taking responsibility of planning and teaching lessons, interacting with students, managing the classroom, and communicating and

collaborating with a broad base of stakeholders (cooperating teacher, teachers in the buildings, administration, students' families, etc.)

Defining The Core Phenomenon

Feedback. Feedback, taking on different forms, is important information offered to someone concerning that person's performance, thinking, or workplace setting. This information is intended to offer constructive insights into these matters, and to prompt or guide future efforts to improve the person's performance, knowledge base, awareness of their activities or surroundings, and capacity for more effective practice.

Feedback (ties) channels: These are often referred to as ties between dyadic relationships in a particular network. For this study, because the ways in which feedback flows among the ties are multi-dimensional, I prefer to use the term feedback channels to better conceptualize the various feedback activities, nature, and quality that flow through the various channels between actors. For instance, in the relationship between a field supervisor and a student teacher, there may be multiple feedback channels, each channel a conduit for a different activity, and the perceived quality of the exchanged feedback within these channels may be viewed differently.

Feedback network: The network of actors (*feedback sources*) that teachers may have access for feedback. For this study, the student teachers' network is conceptualized into two parts: *informal* and *formal*. The informal feedback network refers to the actors that do not have a direct, formalized relationship, and where feedback exchange is not a requirement as part of their relationship. The informal feedback network may comprise of family, friends, former professors, and peers. The formal feedback network consists of actors that have an institutional

expectation, obligation, or responsibility to providing feedback to the student teacher. In this study, the formal network contains two main actors: cooperating teacher and field supervisor.

Feedback structures. These structures arise out of the feedback interaction experiences from within the student teachers' day-to-day teaching and learning.

Key Participants In Feedback Exchanges

Cooperating teacher. Cooperating teachers are often referred to as the “lead teacher” or “mentor teacher” in literature. These in-service teachers (often experienced and perceived as master teachers) volunteer to have student teachers' practicum experience in their classroom and are vetted by the university teacher preparation program. Research suggests that the quality of this mentoring relationship influences the quality of the practicum experience (Bullough et al., 2002).

Field supervisor. Field supervisors in this study are faculty members in the college of education. They are charged with a host of duties pertaining to their assigned student teachers: dispensing pertinent information, conducting at least six classroom observations, giving feedback on a myriad of topics (professionalism, instruction, classroom management, etc.), evaluating teaching performance, providing encouragement, and delivering job preparedness resources and training.

Student teachers. This is a case study of a group of, mostly, undergraduate students (or often referred to as preservice teachers) during their quarter-long, culminating field-based experience. These preservice teachers, at this stage, are referred to as student teachers.

Organization of This Study Document

The first three chapters lay the foundation for this study. Chapter 1 has presented the context and research problem that this study addresses, along with a brief synopsis of the study's design and efforts to explore this problem. Chapter 2 frames the research problem and efforts to address it, by conceptualizing it more thoroughly in relevant literature, and by identifying key ideas that guide both the design-based work, and the iterative examination, that the study's design entails. Chapter 3 describes and justifies the methodology chosen for answering the research questions. Chapters 4 and 5 offer my main findings. In particular, Chapter 4 explores the opportunities to- and perceived quality of- feedback that reside within the student teachers' daily work. In Chapter 5, the focus shifts to the student teachers' professional social network, specifically examining how student teachers' networks shape their access to meaningful and useful feedback. Lastly, Chapter 6 discusses the contributions of the proposed study to existing scholarship and current practice.

Chapter 2.

Conceptual Framework: Exploring Student Teachers' Feedback Structures and Meaning-making through Professional Networks and Technology

Shute (2008) argues that feedback is critical to shaping teacher quality, as such, the construct of feedback is foregrounded in this study. In the following sections, I discuss germane theoretical frameworks, examining more in-depth what current literature tells us about the nature, sources, and temporal dimensions of professional feedback; and present a conceptual framework to illuminate how student teachers may make meaning and change practices from the feedback they receive.

The complex picture of the supportive infrastructure surrounding the work of student teachers would be incomplete without examining the student teachers' feedback network, which are potential feedback sources for improving student teachers' practice. Because the study's design puts into focus the student teachers' professional network, I draw on social networking literature for theory and methodologies.

Finally, I turn to human-computer interaction and design-based literature to inform the initial and ongoing design of the intervention tool, TeachSpark. As challenging as it might be to draw from disparate disciplines, the knowledge gleaned from these diverse literature bases formed the necessary raw materials to carry forward such an ambitious design: interweaving feedback, social networking, and emergent support technology to increase access to high-quality feedback.

Theoretical Frameworks

Theories from psychology, with behaviorist perspectives, and from the sociocultural theoretical umbrella provide insight into the role of feedback and how it is enacted in practice. Psychology theories on self-efficacy (Bandura, 1982), control (Carver & Scheier, 1982, 1990), and goal setting (Locke & Latham, 2002) are routinely referenced in literature examining feedback.

However, as an example, the goal setting theory has its constraints, namely, not taking into account that the teachers' learning from goal setting and feedback on the attainment of those goals is couched in, and influenced by, a complex, ever-changing learning environment. Hence, for the purpose of this study, drawing upon situative sociocultural theories, I highlight the idea that people develop in particular ways as they participate in communities of practice using cultural and material tools.

Situative theorists view human learning as more than autonomous acts of self-regulation, and contend that people negotiate knowledge and practice through interactions with other actors, tools, artifacts, and resources in a context (Lave & Wenger, 1991). The very nature of exchanging feedback is social and interactive. The situative perspective provides a theoretically rich lens for analyzing coordinated activities with other individuals and material (Anderson, Greeno, Reder, & Simon, 2000). This is useful in examining a learning environment, wherein professional feedback is exchanged between a mentor teacher (field supervisor or cooperating teacher) and a novice teacher (student teacher), shedding light on the situations and practices in which learning occurred and focusing on how these arrangements of activities were situated (Anderson et al., 2000; Greeno, 1998). The situative perspective emphasizes dimensions of problem spaces that emerge in activity (Greeno, 1998; Lave & Wenger, 1991), allowing a closer

examination of how student teachers understood and perceived a problem of practice and how feedback to them addressed the situation, participants, and learning goals. Thus, this analytic perspective provides a deeper understanding and richer description of the phenomena of study. Lastly, the situative perspective accentuates the interactive construction of understanding (Greeno, 1998; Lave & Wenger, 1991).

Informing Literature on Feedback to Teachers

This situative perspective provides useful theoretical context for understanding what the literature on feedback tells us. Teachers and researchers have long recognized the value of feedback in education as a generalizable instructional practice to improve student achievement (Bangert-Drowns et al., 1991; Kumar, 1991; Scheerens & Bosker, 1997), and the importance of ongoing feedback to teachers' efforts to sustain changes in classroom teaching and learning (Guskey, 1995; Hargreaves & Fullan, 2012; Mevarech, 1995). In general, educational research on feedback stretches across various literature bases, which include coaching, curriculum and instruction, educational leadership, and organizational aspects of schooling. Feedback may take multiple forms: written, oral, non-verbal, visual representations, reflections, and in the form of data. Finally, feedback can be gleaned through various modes: audio recordings, professional activities, social interactions, solo activities, software tools, video recordings, and work from within the classroom.

Because the way feedback is conceptualized and operationalized varies in educational settings and from study to study (Louis, Marks, & Kruse, 1996), one approach to distinguish feedback from one another, is by examining and describing its attributes. One useful conceptual framework is Van Houten's model (1980), in which feedback attributes are organized into three (interrelated) categories: the *nature* of feedback (what is being delivered and how it is delivered),

the temporal dimensions of feedback (what is the frequency and timing of the feedback), and the *sources* of feedback (whether it is a peer, cooperating teacher, or field supervisor). I discuss and illustrate these categories, as it might apply to feedback to student teachers.

Nature of Feedback

To a large degree, the *nature* of feedback to student teachers depends on how the student teacher perceives the intent of the feedback (evaluative or non-evaluative) from the feedback source. Also, the mode of activity the student teacher is engaged in, and the student teachers' feedback needs stemming from such an activity, shapes the nature and focus of the feedback.

The field supervisor and cooperating teacher hold dual responsibilities of coaching, and evaluating the student teacher. Sometimes these feedback sources attempt to be explicit, from the onset of delivering feedback, about the purpose of their feedback, whether it evaluative or non-evaluative. However, oftentimes, the discernment of what is evaluative and non-evaluative is solely left to the student teacher, and as the literature has probed the evaluative or non-evaluative nature of the feedback and its specific focus, attributes of, more and less, effective feedback begin to emerge.

Evaluative feedback. Evaluative feedback has long been part of the student teachers' supportive infrastructure, often materialized in and through classroom observations, and reified in college policies and accreditation standards. However, feedback perceived as evaluative may come with "baggage," potentially hindering the impact of this feedback on teacher practice. In the context of higher accountability, student teacher concerns over successfully completing their practicum experience, and the presence of differential power-bases between teacher and evaluator, play out on how teachers perceive and respond to evaluative feedback (Brinko, 1993;

Hargreaves & Fullan, 2012; Ilgen et al., 1979). For example, teachers may have difficulty in “being open” when “one person has authority over the other” (Burley & Pomphrey, 2011).

In further examining the nature of evaluative feedback that flows within the student teachers’ formal feedback networks, cooperating teachers and field supervisors (holding dual responsibilities for evaluating student teacher performance and coaching) influence *what* feedback is being delivered and *how* it is delivered. From a situative perspective, student teacher and mentor interactions are situated in complex human interactions. If participants in these complex interactions are adversarial or passive, it is unlikely that student teachers will change their teaching practice in a sustainable way. The nature of evaluative feedback from the field supervisor to a student teacher is especially susceptible to this condition. Consider the following illustrative example. In Waite’s (1993) study that employed ethnographic and conversational methods to examine teacher-supervisor conferences and their contexts, shed light on the supervisor’s role in moving meetings to a more collaborative state, compared to a more passive or adversarial state. This shift to a more collaborative stance by the supervisor begins with the traditional roles and responsibilities of the parties involved in supervisory conferences being reexamined, such as ensuring that supervisors facilitate a two-way conversation, and co-construct meaning with the teacher (Waite, 1993).

Literature, further, gives guidance on how evaluators may enhance the effects of evaluative feedback, such as emphasizing learning and growth (Piercy, 2006), connecting feedback to the established professional goals (Ilgen et al., 1979; Locke & Latham, 2002; Marzano & Simms, 2013), and delivering feedback with a laser-like focus on ways to address specific teacher and student learning needs (Kretlow, Wood, & Cooke, 2011; May & Supovitz, 2010; Myers, Simonsen, & Sugai, 2011). Eisner (1992) sums the importance of specificity this

way, “For complex forms of human action, the general advice is of limited utility. Feedback needs to be specific and focused on the actor in context” (p. 614).

Non-evaluative feedback. In foregrounding teachers’ informal feedback networks, literature describes the feedback channels teachers may have access to and interact with as non-evaluative feedback: professional learning communities (Crespo, 2006 - discusses group think; Cuddapah & Clayton, 2011 - applies Wenger's community of practice; DuFour & Eaker, 1998 - provides best practices), coaching and mentorship arrangements with “other” people in their professional network, professional development trainings, reviewing video recordings of lessons, analyzing student work, and reciprocal peer observation and feedback. Additionally, coaching literature emphasizes the value of non-evaluative feedback, and asserts that the focus of teacher feedback should be on inquiry (Joyce & Showers, 2002).

Focus of feedback. Regardless of the feedback being evaluative or non-evaluative, the nature of the feedback could be further understood by examining the *focus* of the feedback. In the interviews, participants described the feedback focus that flowed to them (and from what sources) during their practicum experience. In the course of my analysis, four common focus areas emerged: *instructional*, *curriculum*, *student relationship / classroom management*, and *informational* (“nuts & bolts”). The focus of the exchanged feedback may alter based on the student teachers’ needs, contextual influences, and engagement of the feedback sources.

Instructional feedback is of particular interest in this study because of its potentially direct influence on teaching and learning in the classroom. To provide a clear definitional boundary, the instructional feedback, taking different forms, helps student teachers’ instructional improvement efforts by providing the necessary information on specific practice-based performances, to close the gap between what is understood and what is aimed to be understood

by the teacher (Hattie & Timperley, 2007; Sadler, 1989). Said differently, instructional feedback was described as “how” content was being delivered: the instructional methods and techniques. *Curriculum feedback* was described as information given, for the purpose of improving on “what” was being taught: the subject matter or class content. *Student relationship / classroom management feedback* focused on giving pertinent information on ways to address student and classroom dynamics, class environment, and interactions among student teachers, students, content, and contexts. *Informational (often referred to as “nuts & bolts”) feedback* centered on providing student teachers with information, yet, not necessarily related directly to classroom teaching and learning. Examples of informational feedback included information related to their student teaching placement (teacher and school information), teacher preparation program (forms, evaluations, assignments), edTPA (requirements, deadlines), state requirements (background checks, finger-printing), and professional readiness (professional attire, job search). The bulk of informational feedback is derived from the field supervisors.

In sum, whether evaluative or non-evaluative in nature, or focusing on a particular aspect of the student teachers’ daily work, feedback is more effective when it contains accurate and specific data on teacher performance, is constructive in nature, and is focused on behavior rather than on the person (Brinko, 1993; City et al., 2009; Gersten et al., 1997; Ilgen et al., 1979).

Temporal Dimension of Feedback: Frequency and Timing

The second important dimension of feedback for student teachers is its frequency and timing of feedback—the temporal dimension (Ilgen et al., 1979). This dimension varies greatly by activity (infrequent field supervisor observations compared to weekly reflective writings), sources (field supervisor compared to cooperating teacher), and context (grade-level, department,

school, district, and state). In general, the effectiveness of feedback is further enhanced when these dimensions are constant and timely, with regards to the teachers' practice (Goddard, Neumerski, Goddard, Salloum, & Berebitsky, 2010). In addition, the teachers' perception of the strength of the teacher evaluation system relates, in part, to the frequency and timeliness of feedback on their pedagogy (Wise, Darling-Hammond, Mclaughlin, & Harriet, 1984).

Sources of Feedback

Perhaps, the most widely researched dimension of feedback concerns *its source*. As previously discussed, feedback to student teachers can come from a myriad of sources: field supervisors, cooperating teachers, colleagues, coaches, students, self, data and tools, etc. And where the feedback comes from has much to do with how it may be received.

Each of these sources provide unique affordances and constraints on delivering effective feedback, and contribute to the degree of teacher receptiveness to feedback. For example, empirical evidence has shown that having peers as coaches alleviated norms of isolation by providing a structured forum for teachers to share their interpretations of teaching experiences and receive feedback (Bruce & Ross, 2008). Furthermore, through "vicarious exposure" to other teachers' practices, teachers who were initially reluctant to the process began to take increased risks to change their practice (Bruce & Ross, 2008, p. 351). Another benefit of peer-delivered feedback was that, as teacher efficacy increased, the quality and importance of peer feedback also increased (Bruce & Ross, 2008).

Regardless of who is the source, teachers must perceive sources to be credible and trustworthy (Banniser, 1986; Marzano & Simms, 2013). Fostering a relationship based on mutual respect and trust was fundamental to enacting the necessary feedback, collaboration, and

risk-taking for instructional improvement (Conway, 2003; Kohler, McCullough Crilley, Shearer, & Good, 1997). This implies that the *source* is knowledgeable enough to make accurate judgments on performance and that feedback recipients trust the intentions of the source. To address the question of the validity of the feedback, teachers may utilize multiple sources of feedback, in combination, as a way to paint a clearer picture of the performance. Education researchers typically report the effect of feedback from one source, leading to difficulty in “concluding (if) feedback from one source alone is valid, reliable, and effective” (Brinko, 1993). Brinko (1993), in her analysis of studies on teaching improvement programs that incorporate feedback from multiple sources, shows that these programs have reported successful results.

Conceptualizing How Teachers Make Meaning of, and Respond to, Feedback

Even if professional feedback is present, the feedback recipient (e.g., student teacher) mediates the meaning and quality of the feedback, and fashions a response to the feedback. Consequently, the effectiveness of feedback to teachers, in part, lies in how the recipient processes feedback information (Ilgen et al., 1979). This fact takes us beyond research into the nature, timing, or source of feedback, and into the matter of how teachers make meaning of, and respond to, feedback. Therein lies the operative conceptual framework for my research, which I present and discuss in some detail in this section.

In the conceptual framework I put forth (see Figure 1), I am influenced by the work of Ilgen, Fisher, and Taylor (1979). In their model, Ilgen, Fisher, and Taylor conceptualize how feedback recipients process feedback, breaking the recipients’ processing into four stages: perception, acceptance of feedback, desire to respond, and intended response (1979). Their framework provides a worthwhile starting place, but there is a notable gap between intended

response and actual changes to instructional practice. My conceptual framework unpacks teacher processing and the critical steps that may lead to instructional changes. While the steps are presented, in the following section and figure, as a linear sequence, this lock-step progression may not hold up in various contexts with different teachers, that is—teachers may engage with the a few steps simultaneously or skip one or more steps all together.

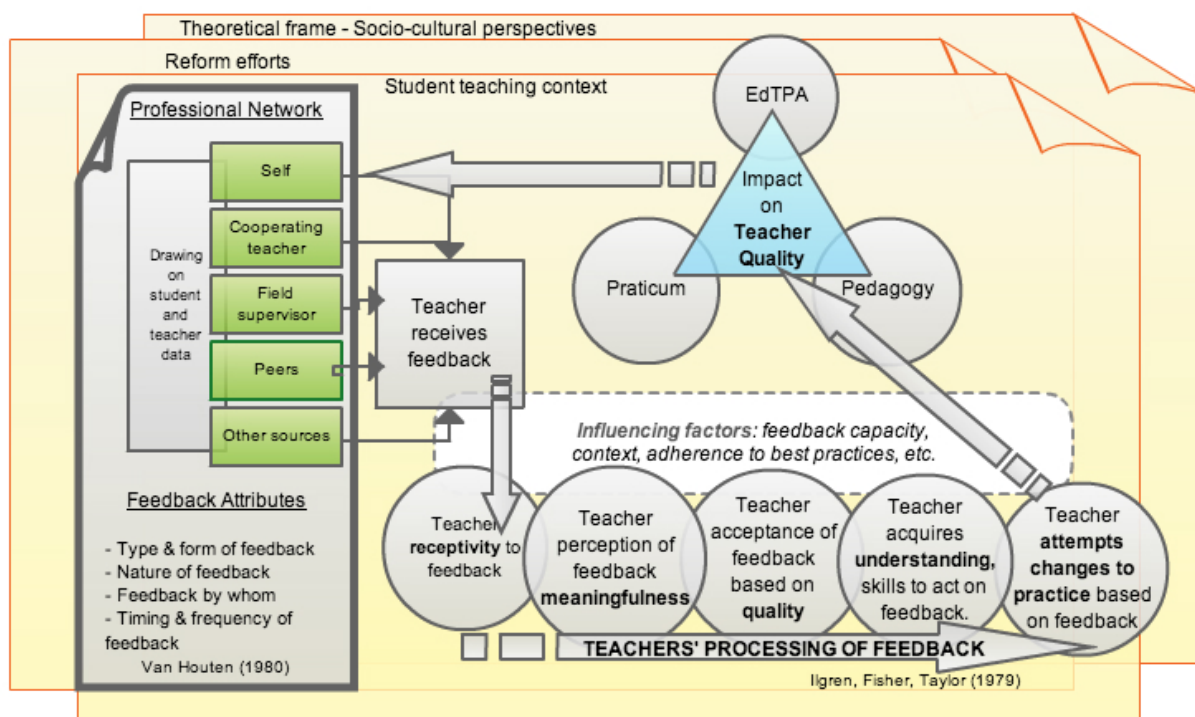


Figure 1. Conceptualizing feedback, processing, and impact on student teacher quality.

The first step in the teachers' processing feedback begins with the teacher's recognition they have received feedback, from their professional support infrastructure. On the surface, this step may seem obvious, however, conflicting views of what constitutes feedback between the feedback source and teacher may arise. This may lead to a scenario wherein a feedback provider reports sending feedback to the feedback recipient, but the feedback recipient doesn't perceive this information as feedback.

After the teacher recognizes receiving feedback, the next step deals with the teachers' receptivity to this feedback. The degree to which teachers are receptive to feedback, in large part, depends on the teachers' perception of where the feedback is coming from (the source), purpose of the feedback (evaluative or non-evaluative), and the focus of the feedback.

Additionally, a teachers' receptivity may be influenced by other factors, such as their physical and mental states. For example, a teacher that is experiencing overwhelming stress is less likely to be receptive to constructive, instructional feedback, than a teacher not in a stressful situation.

The subsequent step examines how the teacher perceives the feedback's meaningfulness. This step in the conceptual framework attempts to tease out, from the teachers' perception, the characteristics of feedback by its associative properties (e.g., "The feedback is meaningful because I trust and like the source.") and its practical properties (e.g., "The feedback will be useful to my practice because it shows me how to transition students through various activities."). For example, a teacher may be receptive to their field supervisor's evaluative feedback because the teacher respects and trusts the field supervisor as a source of feedback and may perceive this feedback as meaningful.

While the teacher may view feedback as meaningful, the teacher's *acceptance* of feedback as being particularly useful to their practice comes into view, and this acceptance of the feedback rests with the teachers' perceived quality of this feedback. The level of acceptance to feedback may stem from the teacher's belief that the feedback is an accurate portrayal of his or her performance (Ilgen et al., 1979). It is important not to conflate the "teacher perception of feedback meaningfulness" and the "teacher acceptance of feedback based on quality" steps, especially in examining how teachers make meaning and learn from feedback on their practice. Extending on the early example, while a teacher may perceive their field supervisor's feedback

as meaningful, the same teacher may not accept the feedback because it is not particularly useful or is of low-quality, for example, when it fails to reflect his or her performance.

After the teacher has perceived the feedback to be useful to their practice, the teacher may need to ascertain what skills and knowledge are necessary to appropriately respond to the feedback and achieve the feedback's instructional aims. To address this aforementioned gap between intended response and actual changes, this step reflects that even if a teacher receives feedback, specific learning or skills may be needed in order to act on the feedback. For instance, a student teacher may receive instructional feedback to improve student engagement, but may lack access to the knowledge or resources on how to implement strategies to respond.

Hopefully, the teacher acquires the necessary skills and knowledge and has a desire to respond to the feedback. The next step for the teacher is acting upon the feedback by attempting to make changes to their practice. This step of the teachers' response to feedback maps onto goal-setting theory, examining such features as positive and negative feedback signs and the degree of the goal's specificity (Ilgen et al., 1979). Moreover, upon enactment, a feedback loop, of sorts, may emerge. The teacher may receive enactment feedback (the positive and negative signs) based on the actual instructional changes on teaching and learning in the classroom (the goal).

Throughout the outlined stages of processing, many factors may influence how, and to what extent, student teachers process information. For instance, Ilgen, Fisher, and Taylor (1979) describe various influences on teachers' desire to respond to feedback: self-efficacy, intrinsic motivation, and the nature of the feedback. Feedback capacity is another major factor. Take the example of a cooperative teacher that lacks the capacity to provide constructive professional

feedback. It is reasonable to expect this *factor* would weigh greatly in how a student teacher receives, makes meaning, understands, and acts on the feedback.

Chief among the factors that influence how a teacher perceives, processes, and responds to feedback is the feedback source. The following section provides a conceptual image of the student teachers' feedback networks.

Conceptualizing Student Teachers' Feedback Networks

Stepping back from the processing of feedback, the emergence of feedback from a network of professional sources constitutes an important shaper of the processing and its outcome. All feedback, coming from a myriad of sources, has the potential to impact the student teachers' work for pedagogical improvement and constitutes a *feedback network* (the box at the left of Figure 1). As a former field supervisor and having previously conducted research on in-service teachers' feedback networks (Hougan, 2012), I conceptualized student teachers' feedback networks (ignoring for the moment the informal and formal aspects of these networks) into five groups: cooperating teacher, field supervisor, peers, others, and self, as shown in Figure 2. Across the feedback network, student and student teacher data (e.g. assessments, observational notes, student conversations, student information systems, student work, or standardized tests) were drawn on and used for feedback.

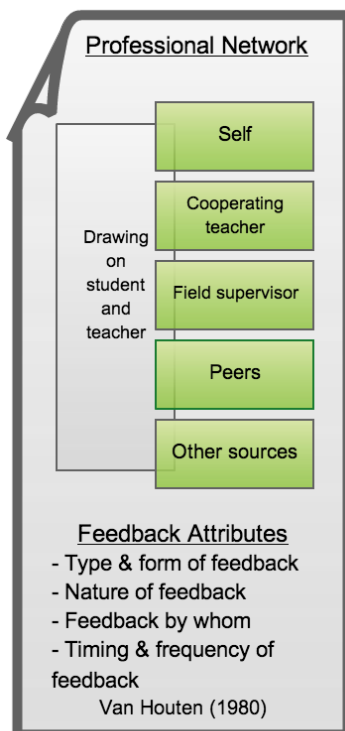


Figure 2. Student teachers' feedback network and feedback attributes.

Participants in students teachers' feedback networks. Literature is clear that the cooperating teacher plays an influential role in the quality development of student teachers by shaping student teachers' attitude development and teaching styles (Buck et al., 1992; Sudzina & Knowles, 1992; Zeichner, 1980). In this study, student teachers reported in interviews that cooperating teachers (a feedback source) often delivered more feedback and perceived it as high-quality feedback – specifically, in regards to teaching and learning in the classroom. This does not come as a surprise considering cooperating teachers have a better grasp of the classroom context—linking their extensive background knowledge and skills with classroom management, instructional best practices, and curricula to specific, timely, and frequent feedback to student teachers.

Field supervisors are another main feedback source to student teachers' practice, that may *potentially* provide feedback on lesson plans, classroom observations, written reflections, and

other various interactions. In this case, student teachers were required to provide lesson plans of planned observations 48 hours in advance of their field supervisor's arrival. In the course of the quarter, student teachers had a minimum of six classroom observations: three informal and three formal (evaluative). Immediately after each observation, student teachers received feedback on performance from their field supervisor. It wasn't unheard of that the field supervisor observed more often if the student teacher was struggling or if the student teacher requested additional feedback. Additionally, student teachers were required to submit weekly reflections to field supervisors, creating another opportunity for feedback on the student teachers' perceived progress or challenges in their practicum experience. Finally student teachers interacted with field supervisors outside of the observations and weekly reflections, through in-person meetings and telephonic and electronic communication.

Student teachers may also turn to peers (fellow student teachers) within the teacher preparation program for feedback. Research has shown the potential benefits of peer feedback on teachers attempting instructional changes (Gersten et al., 1997). Yet, scholars have characterized a long-established practice that student teachers "make their way through their [teacher education] programs on their own (Bullough et al., 2002, p. 69). In efforts to strengthen peer support, some teacher preparation programs use a cohort-model wherein a group of preservice teachers move through the program, attending most classes together (Bullough et al., 2002).

The category of "other" encompasses people that a student teacher may turn to for feedback outside their immediate cooperating teacher, field supervisor, student teacher peers, and themselves (introspectively). This category includes family members, friends, former faculty members, and in-service teachers.

Student teachers may view themselves as a feedback source when asked to whom they turn to for feedback, as was the case with many student teachers in this study. Feedback is intrinsic from the work in the classroom (Ilgen et al., 1979), especially if the student teacher is monitoring student growth and reflecting upon it. Student teachers described frequently analyzing their teaching and students' work, reflecting on what worked well, what needed improvement, and ways to enhance teaching and learning outcomes.

My purpose for conceptualizing a student teachers' feedback network is to offer scholars and practitioners a new image of professional feedback for student teachers, creating a boundary around types of feedback sources to examine the quantity, nature, and influence of the feedback flowing within the network. This is important because of the premise that feedback and its sources are situated at the heart of the supportive infrastructure of teachers' work.

Student teachers' feedback networks and the role of technology. Teachers' professional networks can provide many benefits, such as access to expertise to support learning (Coburn & Russell, 2008), but the concept of a professional network immediately begs questions about how the individual accesses the network, and, in turn, how their network interacts with him or her. Immediately, questions of technology's role within these network interactions and what the implications for technology design are come into view. Employing an analytic perspective of the student teachers' feedback network analysis provides a unique framework for technology designers and developers to rethink technology's role in expanding opportunities to meaningful and useful professional feedback by paying close attention to these networks. This perspective is derived from network theory, which is "about the consequences of network variables, such as having many ties or being centrally located" (Borgatti & Halgin, 2011, p. 1168). Social network analysis, "concerned with interpersonal transactions that constitute the social structure of a

group,” (Friedkin & Slater, 1994, p. 139) can offer fresh insights on teacher feedback through the lens of network density by examining student teachers’ advice-seeking behaviors within a network. This line of inquiry may benefit technology developers by providing them with a better understanding of where and in what ways student teachers seek out expertise and, by extension, feedback. Subsequently, designers can use this knowledge of the student teachers’ feedback structures to develop software that better leverages these relevant network actors (feedback sources) for impactful feedback to their practice.

At present, typical feedback technology is configured to facilitate evaluative feedback between evaluator and teacher. As previously discussed, feedback literature has closely examined some of the constraints of feedback delivered by evaluators, such as the field supervisor. When technology limits feedback interactions to the current configuration of student teacher and evaluator, there may be missed opportunities for student teachers, via their social networks, to receive other forms of meaningful and useful feedback on their practice from a wider variety of sources. A recent study illustrates this point by finding that formal instructional leaders (e.g., field supervisors) influenced general practices, while informal instructional leaders (e.g., cooperating teachers or colleagues) influenced teachers’ specific instructional practices (Sun, Frank, Penuel, & Kim, 2013). The authors suggest the importance of supporting both formal and informal leaders to exert influence on teachers’ practice (Sun et al., 2013).

Feedback technology may hold the potential of facilitating feedback to teachers, from both informal and formal instructional leaders inside and outside of their school setting. TeachSpark—the software tool specifically designed for this study and that was intended to enhance the reach and quality of feedback available to student teachers (or other teachers for that matter)—was designed to allow student teachers to identify and build their networks (e.g.,

lunchroom friends, grade-level or department colleagues, PLC members, and school administrators). When teachers seek feedback, they select the specific network actors best suited to provide feedback.

Applying networking theory to student teachers' feedback networks and related technologies may help address emergent and worthwhile questions. For example, I hypothesize that mapping technology to a teacher's existing network may expand opportunities for effective professional feedback. There is a dearth of literature to support this, and it raises worthwhile questions (linked to my broader research questions) to be explored in this study:

- 1) To what degree, if at all, does feedback technology linking to teachers' networks improve opportunities for feedback?
- 2) Is feedback through technology (linked to teachers' professional networks) viewed as any more (or less) meaningful and useful from the teachers' perspectives?
 - a. In what ways did network variables (e.g., ties or network density) influence (if at all) teachers' perspectives on the usefulness of the feedback?

Learning-Centered Design and Assumptions

For any technology to enhance feedback opportunities, through teachers' networks in the ways just discussed, it needs to be created with a sophisticated design that is sensitive to the nature of feedback in educational professional learning situations. This necessitates a set of ideas about technological design and the technology-human interface—which have informed the creation and design-based development of the TeachSpark software, on which this study is focused.

I turn to the human-computer interaction (HCI), particularly user-centered design on software development, because of it being a well-established literature base since the 1980s, and HCI aims to support individuals in (a) developing expertise in their profession and (b) bolstering a richer understanding of content and practices (Soloway, Guzdial, & Hay, 1994). We, as developers of TeachSpark, paid close attention to the three principles in user-centered design, to guide our design and coding for TeachSpark: “Tasks (what tasks need to be undertaken?), tools (what are the tools provided to cope with these tasks?), and interfaces (what is the interface used for those tools?)” (Soloway et al., 1994, p.40).

Anchored by HCI literature, we placed the learners’ needs at the center of our design. We took into several considerations into account in meeting learner needs. First, Soloway et al. (1994) explains the importance of *understanding is the goal*. Hence we took great strides, through communications and trainings, to inform (and ultimately support through design) what TeachSpark is: a platform for student teachers to exchange feedback.

Motivation was the basis was for the second HCI concept which we grappled with (Soloway et al., 1994), asking ourselves, how is TeachSpark compelling? And why would student teachers be motivated to use the software? Means (1994) describes teachers’ motivation to use technology this way, “Mechanical implementations of technology by teachers who do not believe that the technology will further their instructional goals are almost always fruitless” (p. 19). I attempted to get early user buy-in by (a) providing positive anecdotes, of previous (student teachers) users, describing how TeachSpark influenced their practice, and (b) explaining various ways using this software may benefit them, such as potentially providing extra support channels during their edTPA assessment.

The third learner need to be addressed is *diversity is the norm* (Soloway, et al., 1994). We designed TeachSpark with a focus on simplicity and maximizing ease-of-use, knowing that our users ranged greatly in technological abilities and skills. Yet, as described later in this section, technological capacity often serves as challenges in any software design and implementation.

The final consideration was *growth is the challenge* (Soloway, et al., 1994). Granted that the software changed over the course of the study, but, in large part, the fundamentals remained the same. This perspective speaks of the challenge of improving the knowledge and skills of the user over time, even though the software relatively remains the same. When deploying technology, there's a great need, potentially, for training and available technical assistance on how to use the technology, in order to achieve their instructional aims (Means, 1994). To address this, we deployed follow-up training, support documents, and person-to-person consultations.

Assumptions and Roadblocks

Technology offers potential benefits, specifically, as it relates to feedback technology and its impact on reshaping how teachers learn, access feedback, make meaning of feedback, and build expertise. However, technology has limitations. In the study's design, I take into consideration two major underlying assumptions about the user and the context in interacting with feedback systems and related technologies: feedback capacity and technological capacity.

Feedback capacity of users (feedback providers and recipients). A major assumption with professional networks and use of supportive technology is that, users (teachers, field supervisors, cooperating teachers, etc.) have feedback capacity, that is to say, the ability to receive and deliver useful professional feedback to influence instructional change. Technology

is unlikely to solve the problem of teachers receiving or giving substandard feedback as part of their supportive infrastructure. Because it is *through* technology that practitioners exchange feedback, giving thoughtful attention on how to best deliver effective feedback still matters. Technology may shape the *nature* of feedback, but falls short in guaranteeing that certain standards of quality are met. If the user provides feedback that does not meet what literature has outlined as best practices, such as providing specific ways for improvement, and focusing on the person rather than behaviors (Brockbank & McGill, 2006), then, teachers are less likely to perceive the feedback as useful, whether it is delivered through technology or not.

Technology capacity of users. The same logic applies to a second assumption: users have the capacity to utilize technology effectively. Level of frequency in technology use, largely depends on the practitioner (Teo, 2011). The following factors may influence as to what degree do teachers use feedback technology:

- Teachers' general attitude toward technology (Teo, 2011)
- Teachers' perception of the usefulness of the technology (Cox, Preston, & Cox, 1999)
- Adequate time to use technology (Fabry & Higgs, 1997)
- Teachers' level of support when using technology (Jones, 2004)

In summary, listening to HCI learner-centered principles, and making explicit (and planning responses to) the underlying assumptions and potential roadblocks of implementing emergent technology, sets the stage for feedback technologies to more effectively address the pressing issues surrounding the giving of high-quality feedback to teachers. The ensuing section explores the role of technology in meeting these challenges more deeply.

The Role of Feedback Technologies:

Addressing Challenges to Feedback Systems

Challenges encumber professional networks' potential to impact student teachers' work. Visually represented in Figure 3, I will discuss two major challenges facing feedback systems: inadequate opportunities for professional feedback (a *quantity* perspective), and low perception of feedback meaningfulness and usefulness to the student teachers' practice (a *quality* perspective). Many factors contribute to the quantity and quality roadblocks that confront feedback systems. I will illuminate how feedback technology, specifically TeachSpark, which was used in this study, may help address these challenges.

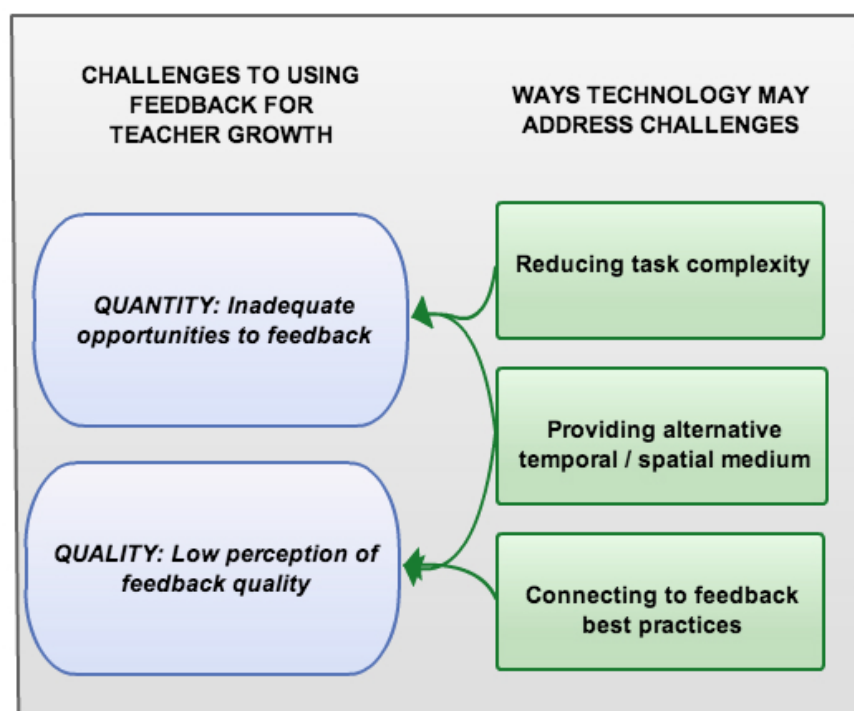


Figure 3. Feedback technology possibilities.

Quantity Perspective: How Technology can Augment the Quantity of Feedback

Because teachers lead busy professional lives (Glennan & Melmed, 2000), teachers may be less inclined to arrange or engage in feedback opportunities on their own accord, especially if the feedback activity is perceived by the teacher to be a time burden. Take the example of a student teacher requesting feedback on a lesson plan. Requesting and receiving feedback of someone in their professional network using email may involve eight or more steps (creating, saving, attaching, opening, viewing, commenting, etc.). Granted each step may take minimal time, but the inefficiency of this process—and, ultimately, the loss of time—is compounded when the quantity of feedback requests increases and further cycles of feedback are enacted. From the student teachers' and field supervisors' perspective, negatives of arranging or facilitating feedback activity (e.g., burden on time) may outweigh positives (e.g., receiving constructive feedback), thus limiting opportunities to feedback.

Feedback technologies may reduce this barrier by simplifying the logistics relating to exchanging feedback among teachers and administrators. For instance, TeachSpark may impact feedback opportunities through its lesson-sharing capabilities. Student teachers routinely share curriculum and lesson plans, and ask for feedback on these plans. TeachSpark, incorporating emergent technologies that render documents into an editable online format (HTML 5), has the capacity to allow teachers to upload their documents and share them with colleagues, which automatically generates an email (containing a link to the document) to selected colleagues. In turn, these colleagues follow the link to provide their feedback directly on the document. This nearly cuts in half the steps of the normal workflow of exchanging feedback.

Another challenge to accessing feedback is the student teachers' perception that they are isolated once they are teaching in the classroom, "Having few opportunities for collegial interaction and critique" (Buck, Morsink, Griffin, Hines, & Lenk, 1992, p. 114). This form of isolation contributes to contextual factors that may lead to unsuccessful student teaching experiences (Sudzina & Knowles, 1992). TeachSpark's platform may provide affordances to expand and access opportunities for feedback. For one, student teachers may self-reflect using TeachSpark, and choose to share these reflections with others (through a 1-step process), gathering valuable input on their teaching, providing yet another opportunity for feedback (Calandra, Brantley-Dias, Lee, & Fox, 2009). Finally, student teachers may benefit from virtual setting, among other settings, where learning to teach is "tried out, corrected, refined, and mastered" (Ball & Forzani, 2009, p. 504). TeachSpark, and similar software, can expand opportunities to feedback by offering virtual spaces to explore problems of practice, within an online learning community (sometimes referred to as a Professional Learning Network). Oftentimes, this feedback is conducted through discussions or forums. Online venues are places for teachers to post problems regarding their practice, help alleviate feelings of isolation, and solicit feedback from their professional learning network (Hewson, 2013). Most discussion boards and forums are a combination of synchronous and asynchronous communication. In short, participants of learning communities benefit by exchanging feedback when it is convenient for them, at any time, from any place.

Quality Perspective: How Technology can Enhance the Meaning or Usefulness of Feedback

As stated previously, expanding opportunities for feedback does not necessarily yield greater effects on teachers' practice if the additional feedback is perceived as not meaningful nor useful. Feedback technology has a potential role in enhancing the *nature* and *source* of feedback, both of which are key factors in the teachers' perception of the feedback's efficacy.

In alignment with best practices from feedback literature, TeachSpark is designed to improve the *nature* of the feedback in various ways. Below are a few examples of how TeachSpark may enhance the likelihood that teachers will perceive feedback as more meaningful and useful:

- *Delivering focused feedback on the teachers' needs* (Brockbank & McGill, 2006). Technologies may contribute to a more focused feedback, specifically attuned to teachers' specific learning needs, by allowing the requesting teacher to give feedback prompts, a lens of sorts, to the feedback provider. An example of this is when a teacher asks their reviewers to give feedback around specific parts of lesson plans.
- *Presenting feedback in different forms* (Brinko, 1993). Through the use of TeachSpark, feedback may manifest in multiple forms. For instance, in using this feedback software, a teacher may receive feedback from their reviewers in the form of written, on-text comments, visual markups, or through the use of discussion boards.
- *Giving timely feedback* (Goddard, Neumerski, Goddard, Salloum, & Berebitsky, 2010; Kouzes & Posner, 2006). TeachSpark enables feedback to be delivered real-time, virtually. Literature shows, that teachers acquire targeted teaching behaviors "faster and

more efficiently, when feedback was immediate” (Scheeler, McAfee, Ruhl, & Lee, 2006, p. 21).

TeachSpark and other feedback technologies encompassing online discussion boards, forums, or problem spaces, may address other teachers’ complaints: feedback tends to be a one-time event, not lending itself as a process to improve teacher quality through sustained inquiry and reflection. Private and secure online venues offer teachers the opportunity to engage in deep inquiry, a way to plug into a virtual community of educators, and a space for reflection on their growth. In short, through online learning communities, teachers can find support, experiment, reflect, and refine practice (Hewson, 2013).

Summary

The discussed literature bases, and proposed conceptual frameworks, provide the necessary foundation and lens to fruitfully engage in this design-based research. In a way, the explored literature and conceptual frameworks, set the stage for greater inquiry into- and refinement of- the study’ research questions (presented in Chapter 1). The subsequent chapter details this study’s case-study design and presents a rationale for the methodological choices, specifically geared to giving insights to this study’s refined research questions:

1. From the student teachers’ perspective, how does the intervention design (software tool and support activities) affect, and in what ways, opportunities for feedback and shape their feedback structures? What is the nature of their feedback?
 - a. From what source(s), if any, do teacher expect feedback on their teaching?
 - b. Why, and to what degree, were various feedback activities taken up in using the software (e.g., lesson plan reviews, classroom observations, discussions)?
 - c. In what ways did teachers leverage their social networks, using the software, to seek out and learn from feedback?
2. How do the student teachers perceive the meaning, quality, and impact of the feedback on their practice?

- a. To what extent, if any, did the software influence the student teachers' perception?
 - b. Taking into account the teachers' social networks, what feedback from their networks was most meaningful from the teachers' perspective?
3. In employing design-based methodology, what surprises, challenges, lessons, or combinations thereof, arose in adopting the software as part of the feedback workflow?
- a. From the student teachers' perspective, in what ways did the software deliver value to their student teaching experience, if any?

Chapter 3.

Study Design

This dissertation is part of a year-long qualitative study to better understand how using teachers' social networks and a software called TeachSpark – designed to enhance the exchange of relevant, pedagogical feedback – affects student teachers' perceptions of their feedback opportunities and, by extension, feedback quality. In the winter quarter of the 2012-13 school year I launched a small pilot study, working with a field supervisor and two student teachers. The participants were part of a traditional teacher preparation program located in the Pacific Northwest. The pilot study's goals were to field test TeachSpark, perform necessary iterations to the software, and collect preliminary data to better formulate research questions for the follow-up study.

The second study—which is the focus of this dissertation—occurred in the following fall quarter (of the 2013-14 school year). The setting was a teacher preparation program and one participant (a field supervisor) remained within the study, but because the practicum is only 1 quarter in length, the study had a new pool of student teachers. The university has multiple campuses off-site, away from their main campus. The unit of analysis for this dissertation study was the feedback interactions and responses among a *group of student teachers and their field supervisors* operating out of one of these university regional campus centers.

Research Traditions and Rationale for Them

I investigated where current literature drops off, examining how feedback processes, social networks, and technology affect student teachers' learning and practice. I was keen to

better understand how student teachers, in complex settings, interpret their experiences of feedback, and “what meaning they attribute to their experiences” (Merriam, 2009, p. 5). In an effort to bridge theory to practice, I employed a qualitative case study that utilized design-based research and social network analysis methodologies. Qualitative research was best suited to address my study’s research questions because “qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meaning people bring to them” (Denzin & Lincoln, 2005, p. 3).

Rationale for Qualitative Design-based Research

Over the past two decades, design-based research (DBR) has become broadly accepted in the education research community (Bell, 2004) as a blend of both basic and applied research (Anderson & Shattuck, 2012; Wang & Hannafin, 2005). More specifically, researchers increasingly utilize DBR in education contexts with technological innovations (Anderson & Shattuck, 2012; Edelson, 2002). DBR assumes researchers can gain valuable insights about the nature and conditions of learning by attempting and iteratively refining educational innovation in everyday settings, based on evidence derived from the interactions between the innovation, participants, and setting (Bell, 2004).

In this way, the goals of DBR set it apart from other genres of research (Bereiter, 2002), which can be descriptive, explanatory, or predictive in nature (McKenney & Reeves, 2013). In addition, DBR can be prescriptive, giving guidance for future design efforts (McKenney & Reeves, 2013).

Through DBR, I immersed myself in “the joint pursuit of practical improvement and theoretical refinement; cycles of design, enactment, analysis, and revision; and attempts to link processes of enactment to outcomes of interest” (Sandoval, 2013, p. 3-4). In my DBR research, I

actively collaborated with practitioners (Anderson & Shattuck, 2012; Wang & Hannafin, 2005) and refined the intervention (with an eye to theoretical refinement), which directly and continuously affected participants' experiences.

I further chose DBR because of its "unique attribute" of holding the simultaneous concerns of three features: (a) production of innovation, (b) knowledge about how such environments work in the settings for which they are designed, and (c) some fundamental knowledge about learning and teaching (Sandoval, 2013, p. 2).

This DBR study fulfilled each of these features. Regarding the production of innovation, I developed innovative software with the aim of expanding opportunities for useful, professional feedback for student teachers. This design of the software was a *theoretical activity* and learning environments naturally represent hypotheses about how learning happens in the context and how to support it (Cobb, Confrey, Lehrer, & Schauble, 2012). As a result, in my roles as a researcher and designer, I had the "obligation to be as explicit as possible, in advance, about what those ideas are" (Sandoval, 2013, p. 5). As discussed in Chapter 2, I applied human-centered design theory, teacher social network theory, and literature relating to teachers as technology consumers to inform the design of the software. Second, in relation to knowledge about teachers' work settings, this study drew from relevant literature, as well as my own experiences as a K-12 teacher and field supervisor, to develop a problem analysis. For instance, the software design attempted to be responsive to the problems of student teacher isolation and a heavy workload. Lastly, whereas there is a gap in our understanding about teacher learning (National Research Council, 2000), I paid attention to literature that informs what feedback teachers find high-quality and what feedback teachers tend to ignore.

McKenney and Reeves (2013) reject the claim that DBR is a *new* research methodology because DBR “uses existing quantitative and qualitative research methods and follows established norms for sampling, data collection, and data analysis” (p. 98). In this spirit, I mounted a design-based investigation that relied heavily on the kinds of qualitative insights that case study designs can produce.

A case study in the tradition of “basic” qualitative research (Merriam, 2009) “aim(s) to produce a firsthand understanding” (Yin, 2006, p. 113) of a phenomenon, which in this instance are the student teachers’ perceptions. This “firsthand understanding” included better understanding of student teachers’ perspectives on their experiences with an innovative feedback software tool, which included how they interacted with this technology, made meaning from the experience, and what they thought of teacher feedback and its impact on their pedagogy.

Using a case study offered many affordances. First, people, schools, and systems are dynamic, possessing unique characteristics and nuances that are constantly evolving, and a qualitative case study is an appropriate method for capturing these varied aspects. Second, this case study, by applying a socio-cultural theoretical framework, shed light on student teachers’ mediated perceptions and actions stemming from their interactions within their complex work culture and from using technological tools in ways that would not otherwise be captured easily in a strictly quantitative study (Stake, 2005). Third, this DBR case study may be described as *heuristic*, taking the readers beyond their original knowledge because the research shed new insights into teachers’ learning around innovative software, teachers’ social networks, and other theoretical assumptions (Gay, Mills, & Airasian, 2006). Finally, a case study is apropos because of its track record in relation to the development and use of tools, such as the TeachSpark

feedback software developed for this investigation; Merriam (2009) points out case studies have “proven particularly useful for studying educational innovations” (p. 51).

Rationale for Social Network Analysis

I drew on social network analysis terminology and methodologies, lending a useful lens to make sense of the student teachers’ networks and how their networks, in combination with the design intervention, may have influenced reform efforts and their own practices.

Certain distinctive principles shape social network perspectives (and by extension the design of this study). The first major assumption of social network analysis is the importance of relationships among the network actors. Wasserman and Faust (1994, p.4) outline other unique assumptions that underlie social network theory:

- *Actors and their actions are viewed as interdependent rather than independent, autonomous units*
- *Relational ties (linkages) between actors are channels for transfer or ‘flow’ of resources*
- *Network models focusing on individuals view the network structural environment as providing opportunities for or constrains on individual action*
- *Network models conceptualize structure as lasting patterns of relations among actors*

The type, quality, and structure of relationships, in education settings matter to a shared effort (i.e., among a group of student teachers) to improve, and “influences the process of learning and change” (Finnigan & Daly, 2012, p. 45). In large part, these improvements to learning and change are couched in the reform context facing student teachers and, by extension, their teacher preparation programs. Examining literature on teachers’ networks is important because the research has shown these relationships may influence the outcomes of reform efforts

(i.e., performance on edTPA) (Coburn, Russell, Kaufman, & Stein, 2012; Penuel, Sun, Frank, & Gallagher, 2012). More succinctly, Baker-Doyle and Yoon (2010) summarized findings from the social network analysis literature of the past decade:

The studies revealed strong influence of informal networks on teacher practice: informal networks shape teachers' attitudes toward reform, abilities to understand and implement new practices, information-sharing patterns, and commitments to ideas or practices (p. 117).

Informal networks. The student teachers' informal networks are of particular interest (and are viewed more closely in Chapter 5). The formal networks of student teachers consist mainly of their field supervisors and cooperating teachers—relationships that have been greatly studied in education literature, from different perspectives. And for good reason, in traditional teacher preparation programs (including the university in this study), the majority of the feedback given to student teachers flows from these formalized relationships. However, paying close attention to student teachers' informal networks may be worthwhile to further improve their learning and responses to reform pressures. These networks may reveal different aspects of the learning story—especially those that reflect inner experiences that student teachers are less willing to share with individuals in authority over them. As one student teacher said, the “edTPA is taking over my life.” These informal networks influence “how well and quickly change efforts take hold, diffuse, and sustain,” and for student teachers to rely strictly on their formal network, such as their field supervisors and cooperating teachers, may “leave critical practice gaps” (Daly, 2010, p. 2-3).

Finally, this study is focused on the informal networks because student teachers with dense connections generally achieve higher levels of performance than those with scant ties (Reagans & Zuckerman, 2001). By studying and augmenting the informal networks of student

teachers, this study's findings contribute to a nascent literature base on student teachers' support network.

Social network analysis approaches. I carried out a combination of a *whole network analysis* of the entire participant group, and an individual (*ego-centric*) analysis of the 8 student teachers' *feedback* networks, purposefully excluding other types of networks (such as student teachers' affective networks, wherein actors and their ties provide emotional support, not pedagogical feedback). Within these feedback networks, I was curious about the diversity (how many ties does a student teacher have, in general) and density (number of ties from within the student teacher group) of the student teachers' network and, in what ways, the design intervention influenced these ties. In the course of our interviews, I inquired about who they turned to for feedback, the nature of the feedback, timeliness, frequency, and, from their perceptions' the quality of this feedback. Furthermore, I inquired about the mode of feedback, to what extent student teachers used TeachSpark with their informal network, and, from their perspective, in what ways did the software or other design interventions affect the quantity and quality of the feedback. Finally, I captured the participants' perceptions of the interventions and sought their advice on how to improve the design for future (DBR) studies.

Sample Selection, Setting, and Timing

In this section, I describe how the student teachers and field supervisors were selected, and provide the background information of the study' context and timing.

Participant Selection

In this dissertation study I analyzed a "bounded system" (Gay et al., 2006; Merriam, 2009), consisting of *a group of student teachers, their field supervisors*, and their experiences

using innovative feedback software. I used purposeful sampling (Patton, 2003) to explore in what ways a particular group of student teachers in a traditional teacher preparation program make meaning from feedback using the software. I purposefully paid closer attention in my analysis to a few student teachers and their feedback interactions to potentially provide information-rich cases that contributed “insights and in-depth understanding” (Patton, 2003, p. 230) of teacher feedback, software, and use of teacher networks. When called for by emergent data, these participants provided a basis for comparing and contrasting the perceptions and meanings of student teachers with varying experiences and support structures.

Student teachers. While the software was made available to the entire student group (a sample frame totaling 14), I asked student teachers to consent to my research study. Twelve student teachers consented, which meant two student teachers opted-out of the interviews. Of the 12 student teachers, four declined interview requests, despite using best practices for response, such as following-up and maintaining a flexible interview schedule (Fowler, 2009). This resulted in eight student teachers in my sample to interview. Their demographics and teaching assignments breakdown are as follows:

- All eight were white.
- All but one were women.
- Ages varied from early 20s to early 40s.
- Five taught early elementary and 2 taught core subjects at the secondary-level.

Field supervisors. The group of student teachers was divided into two sub-groups, and a field supervisor oversaw each sub-group. Fran and Helen, the field supervisors, consented and actively participated throughout the study. Helen was a field supervisor that had participated in the pilot study. Both field supervisors were middle-aged, white females, and had extensive background in teaching, educational leadership, and field supervising. Collecting data from Fran

and Helen, main sources of feedback to student teachers, provided an effective way to triangulate the data and findings from student teachers.

The identities of the final sample of student teachers were not disclosed to the field supervisors—who were their immediate evaluators—to prevent threats of coercion or repercussions from their responses. Data analytics were collected on all consenting participants (including the non-responsive participants) and this was a non-intrusive process, putting no burden on the student teachers. This additional data on all participants provided a means to triangulate focus participants' data.

Setting and Timeframe

The site selected for the study was a teacher preparation program at a regional center of a land-grant state university, located in the Pacific Northwest. There were several reasons for choosing this teacher education program as the study's site. Accountability measures (e.g., edTPA), accreditation standards, and other reform efforts put pressure on teacher preparation programs to enhance preservice teachers' competencies, such as technological fluency and overall quality (Dexter & Riedel, 2003). Specifically, there is a need for colleges of education programs to play a role in building teachers' effectiveness in and through technological fluency, practice-centered education, and reflective practices (Gomez et al., 2008). This site selection offers unique perspectives and influences on the phenomena of interest. Equally important, this dissertation research was a continuation of a *pilot* DBR study conducted at the same university between January – May 2013. Furthermore, because I work as a faculty member at this university, I had insights and familiarity with the setting and the teacher preparation program that an outside person may not have access to.

Overall timing of the study. Upon proper approvals, I began recruitment, conducted initial training on the software for field supervisors and student teachers (prior to the student teachers starting their 14-15 week practicum experience in the classroom), and established a data collection window of September 1- January 15, 2014.

We, the TeachSpark development team, moved through the DBR process of planning, developing, implementing, evaluating, and refining (Edelson, 2002) in two *major* iteration cycles. Timing is especially important in conducting design work, and this started with creating a detailed plan (see Figure 3) of the two iteration cycles.

Timing of DBR iteration cycles 1 and 2. Iteration Cycle 1 started in week 2 (the first week of practicum experience) where data was collected (noted in Figure 4 as DC) and analyzed (DA) through week 5. Concurrently in week 5, software development (DEV) began and stretched through week 7 because of substantial refinement to software. This delayed the start of Iteration Cycle 2 by two weeks, resulting in a shortened three-week data collection and analysis window (compared to the planned five weeks). Fortunately, the development time in Iteration Cycle 2 was only two weeks, and less time than Cycle 1 because most of the changes in the design were not software related. This delay pushed out my final interview data collection by two weeks because I had to allow time for the participants to familiarize themselves with the refinements from Iteration Cycle 2 before measuring their perspectives.

	PRE-WEEK 1	Week 1: Before Student Teaching	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	
DBR PROCESS: ITERATION CYCLE (PLANNED)			INTERATION CYCLE 1				INTERATION CYCLE 2												
DC - DA (DATA COLLECTION)	DC - DA	DC - DA	DC - Df	DC - Df	DC - DA			DC - Df	DC - Df	DC - DA			DC - Df	DC - Df	DC - DA				
DC - I (DATA COLLECTION: PARTICIPANT INTERVIEWS)					DC - I					DC - I					DC - I				
DA - DATA ANALYSIS					DA	DA				DA	DA								
DEV - P (SOFTWARE DEVELOPMENT: PLANNING)																			
DEV - T (SOFTWARE DEVELOPMENT: TESTING)																			
DEV - I (SOFTWARE DEVELOPMENT: IMPLEMENTATION)																			
DBR PROCESS: ITERATION CYCLE (ACTUAL)			INTERATION CYCLE 1				INTERATION CYCLE 2												
DC - DA (DATA COLLECTION)	DC - DA	DC - DA	DC - Df	DC - Df	DC - DA			DC - Df	DC - Df	DC - DA			DC - Df	DC - Df	DC - DA				
DC - I (DATA COLLECTION: PARTICIPANT INTERVIEWS)					DC - I					DC - I					DC - I				DC - I
DA - DATA ANALYSIS					DA	DA				DA	DA								
DEV - P (SOFTWARE DEVELOPMENT: PLANNING)																			
DEV - T (SOFTWARE DEVELOPMENT: TESTING)																			
DEV - I (SOFTWARE DEVELOPMENT: IMPLEMENTATION)																			

Figure 4. Planned versus actual iteration cycles.

Data Collection Strategies and Procedures

Data collection consisted of 30 interviews, software analytics and artifacts (e.g., screenshots of user comments), and user surveys. I used different sources and methods to triangulate my data (Merriam, 2009; Yin, 2006), which builds trustworthiness of my analysis (Lincoln & Guba, 1985).

Interviews

In the interviews, I gathered descriptive data on participants' conceptualizations, perceptions, and how they made meaning of practice-based feedback on their pedagogy from using the software (Patton, 2003, p. 341). My design consisted of three rounds of interviews that were 30-60 minutes in length (see Table 1), allowing me to mimic a good detective by seeking out new lines of inquiry or questioning existing ones (Yin, 2006). Moreover, I framed my interview within the situative perspective, inquiring on the teachers' perspectives and thoughts on how their activities evolved within each particular situation, and how they make meaning (if at all) out of this.

Table 1. Interview rounds and focus

	Interviews: Round 1	Interviews: Round 2	Interviews: Round 3
Timing of Interview	Week 4	Week 10	Weeks 16-18
Focus of Interview	Collected data (from week 1-4) to inform Iteration Cycle 1; Data for Cycle 1 concerned refinements to the software tool.	Collected data (from week 5-10) to evaluate Iteration Cycle 1 and inform Iteration Cycle 2; Data for Cycle 2 concerned refinements to the teachers' network	Collected data (from week 5-10) to evaluate Iteration Cycle 2; Additional data collection concerned capturing summative data of user perceptions of design and research questions.

Semi-structured interview protocols were used as a means to respond flexibly to emerging ideas and new directions (Merriam, 2009). For instance, in analyzing the teachers' use of the software, new themes emerged of the teachers' reaction to the feedback or software that justified further inquiry. Furthermore, I employed cognitive interview techniques, such as role-playing. The role-playing format emphasized the interviewees' expertise, giving me a unique angle on what the participants thought about this study's topic (Patton, 2003). Another helpful technique I employed was anchoring parts of the interview on a specific artifact of the software. As an example of this, I asked participants to share an instance, from their perspective, where they received high- and low-quality feedback through TeachSpark. With both of us viewing this comment, I would inquire further about the attributes of this feedback and let them explain their thinking around the perceived quality. In the second round of interviews, particularly with the focus participants, I asked participants to log into the software during the interview (perhaps adding electronic screen-sharing if the participant was remote) and allow me to briefly observe them using the software. Gaining this user-perspective created opportunities to inquire deeper about the various research questions and, in turn, provided a space for the participants to ask their own questions about the best ways to use the software.

Because the quality of the information obtained during an interview is largely dependent on the interviewer (Patton, 2003, p. 341), the questions were tested during the pilot study. This

provided a valuable opportunity to reconfigure the questions and probes in order to elicit the participants' deeper thinking and insights around my research questions, thus improving the efficiency and effectiveness of the interview process. Interview data was mostly captured using a web-based conferencing software (called UberConference) with recording functionality. One interview was conducted in-person and, for this interview, I used a built-in recording software program on my computer. Lastly, transcripts were made available to each participant to engage in member checks – a strategy to bolster my case study's validity (Guba, 1981; Merriam, 2009).

To provide confidentiality and minimize harm, a pseudonym was assigned to each participant to prevent against disclosure, and a reference document linking pseudonyms with identifying information was kept in a separate, secure location. Student teachers were repeatedly informed that their field supervisors would not have access to data for evaluation purposes.

Data Analytics from the Software Tool

For this study, our software developers created a custom analytics tool. This served two major purposes. The first purpose was that the software analytics provided basic statistics on teachers' usage and behavior. For example, since the teachers' professional networks are a theoretical feature of my learning environment's design, then, analytics were helpful in understanding the extent to which student teachers' received feedback from their support network. The second was that these analytics served as an artifact in participant interviews, creating a way to anchor a conversation and enhance participant recollection.

Documents and Artifacts

I was purposeful in collecting data that provided a contextual basis to ground the teachers' work within the complex setting of their practicum experience (Guba, 1981), and shed insights into the teachers' perceptions of teacher feedback on their practice. The types of documents varied, from collecting and analyzing university-produced materials on the teacher preparation program to researcher-made exit slips (mini-surveys, of sorts), asking student teachers close- and open-ended questions related to the study. Collected artifacts included help-tickets, screen-shots of how users were interacting with the software, emails, researcher-produced training materials, and support blog posts.

Design and Enactment Data

Collecting data on the enactment of an innovation is also important in the DBR process (The Design-Based Research Collective, 2012), and in addressing my third research question. As the study design unfolded, I created procedures and boundaries to capture enactment process data (Collins, Joseph, & Bielaczyc, 2009). More specifically, I established temporal or thematic boundaries around the iteration cycles, which allowed me to conceptualize and gather data from a collection of influences (e.g. actors' influence, external pressures, evaluation data, conversations on design-decisions, etc.) that shaped these design cycles and their manifested influences to the learning environment. Also, the technique of creating memos was vital in collecting and, later, analyzing enactment data. This was important because this enactment data is "critical evidence to establish warrants for claims why outcomes occurred" (The Design-Based Research Collective, 2012, p. 7).

Tracking the Data and Planning the Next Iteration Cycle

I collected data on the software tool throughout the study's time frame, examining help tickets submitted by participants, reviewing participants' interviews, and viewing software analytics. Then as a development team, we prioritized design changes by participant needs and what would most likely impact the study's intended education outcomes. I wrote memos of our design meetings to capture the design decisions, and the factors leading up to these changes. We used a web-based project management tool called Trello (2014) to organize our work, coordinate jobs within the team, and to archive and retrieve completed tasks (see Figure 5). Within Trello, software tasks (refinements) were organized by iteration cycles and a simple backlog. Overall, this tool played an important role in our DBR work because Trello allowed for flexibility on task management (iterations), creating a high-level of responsiveness to improving TeachSpark to users' evolving needs.

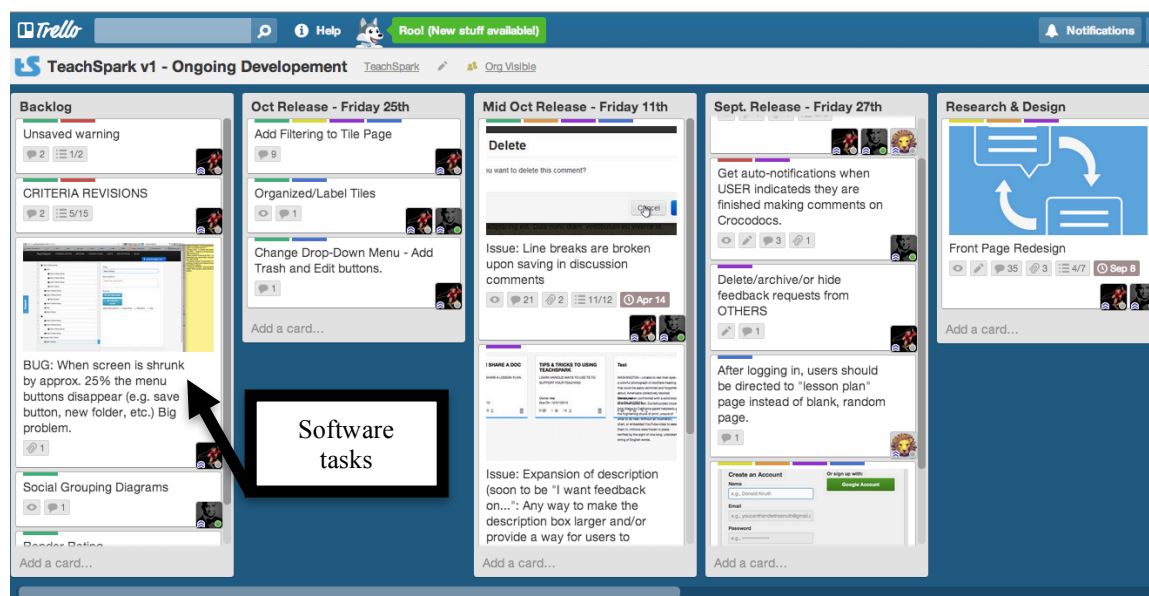


Figure 5. Screenshot of DBR planning using Trello.

Approaches to Data Analysis

A fair amount of data was collected from participants' interviews and other data sources, resulting in the need for responsive data analysis approaches (described in this section), to make sense of the data and address this study's research questions.

Making Sense of Qualitative Case Study Sources

It is typical of case studies for data to be analyzed inductively, seeking to find patterns and relations among the data (Gay et al., 2006). This dissertation study utilized a grounded theory analysis approach (Charmaz, 2001; Emerson, Fretz, & Shaw, 1995), while employing a within-case and cross-case analytic process (Miles & Huberman, 1994). Every interview was transcribed and reiteratively read in its entirety, which "encourages recognizing patterns and making comparisons" (Emerson, Fretz, & Shaw, 1995, p. 145). In doing so, I took two approaches to inductively analyze the 30 participant interviews. The first strategy was to iteratively read the interview transcripts across the interview rounds to identify emerging issues, patterns, and concepts. Next, I sequentially re-read (vertically) each case participant's three interviews to understand the evolving story of that particular participant.

I employed a hybrid of an a priori code set (reflecting my research questions) and "open" coding (capturing emerging themes). This coding approach assisted me in breaking data into analyzable units from the interviews, observations, and documentary evidence (Coffey & Atkinson, 1996). It also served as a means to conceptualize the data, raise questions, and provide preliminary linkages within and among the participants' data (Strauss, 1987). I constructed analytic categories directly from the data, which forced my attention to "study the meanings, intentions, and actions of the research participants" (Charmaz, 2001, p. 337). The data elements

were gathered and analyzed using NVivo (2014), a data analysis program for qualitative researchers.

My data analysis included data displays, which assisted me in organizing and making sense of all the complex features influencing teachers' perceptions of the feedback and software (Miles & Huberman, 1994). I reflected throughout the data analysis process by creating memos, linking the emerging evidence to my research questions and theoretical frameworks (Merriam, 2009). In the process of reviewing these memos and the analytic categories, the analysis produced emerging patterns and relationships that called for deeper discovery. Having multiple interviews with the participants afforded me the opportunity to revisit this data and gain a richer understanding of the phenomena of study from their perspective.

In summary, my goal in this study was to understand what was happening and why. I strove to make my findings impactful by connecting to the "readers' knowledge, experience, and understandings" (Gay et al., 2006, p. 426) through a rich, illuminative description of the participants' experiences and perceptions in a complex context.

Conjecture Mapping

For this DBR study, I employed Sandoval's conjecture mapping (Sandoval, 2013). In Figure 6, I sketched out my high-level conjectures and design conjectures, and detailed what was embodied in my design, mediating processes, and educational outcomes. Here, Sandoval (2013) describes conjecture mapping as:

Conjecture mapping is an effort to reify specific conjectures and how they are expected to function in interaction to promote learning. Such specification leads to empirical predictions that can be tested, and the results of such tests can lead both to refinements of a particular design as well as refinements of a theoretical perspective. (p. 3)

Conjecture mapping technique addressed a prominent challenge in DBR work: keeping the dual commitment of practical and theoretical improvement (Sandoval, 2013). It did so by serving as an anchor – a reference point – as I moved through the DBR process. Through conjecture mapping, I was explicit about the design and theoretical ideas, embodied in a learning environment, in a way that supports choices about the means for testing them (Sandoval, 2013).

Take the embodiment part of the design conjecture as an illustrative example. I learned from the pilot study the importance of being explicit about the features of the design outside of the software tool that may have a role in impacting the study's outcomes and learning environment. Beyond the *tools and resources* feature, I identified the *task structures* that were required as part of the teacher preparation program, such as six observations and the submission of weekly reflections. Working collaboratively with the field supervisors, we outlined how TeachSpark could support (or be incorporated into) these activities. It was decided that all student teachers should complete the following activities through TeachSpark: a) post weekly reflections, b) upload their lesson plans, for planned field supervisor observations, 48 hours in advance, and c) submit their parent/family welcome letter for review. This exercise of identifying assignments created clear expectations among all the participants of what was required. Yet, this was only part of the tasks that student teachers could use TeachSpark for. In our initial training, and throughout the study, I encouraged student teachers to use TeachSpark in other ways that met their professional needs, whether that may be sharing resources with school building colleagues or asking for peer feedback on the edTPA.

Putting into focus the underlying premise was to: a) encourage the student teachers to begin conceptualizing the actors/nodes in both their *informal* and *formal* professional networks, b) leverage their existing professional support network using TeachSpark, and c) expand the

participant structure (which was another key element in this study's design). As part of consenting to participate in the research, participants commit to share or exchange feedback with at least three different people outside of their *formal network*: a cooperating teacher or field supervisor. The study's findings in the proceeding chapters will shed light on how this transpired.

Conjecture Map

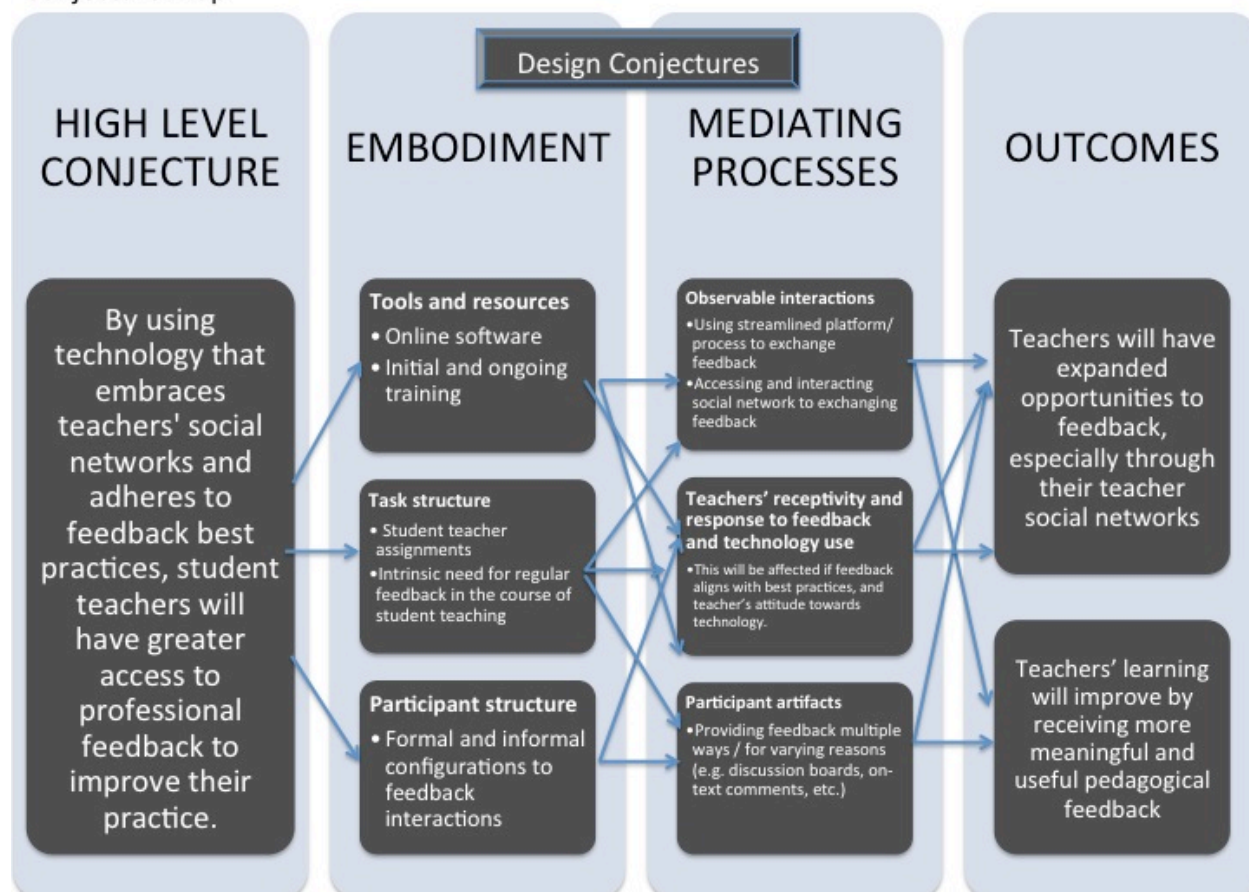


Figure 6. Conjecture map.

Limitations of the Study Design

Using qualitative case study methodologies was advantageous in foregrounding and understanding teachers' perspectives, the unfolding experiences of using feedback software in their work setting, and why and how teachers made meaning and learned from the professional

feedback. This approach allowed me to capture the rich particulars and nuances of the case, find patterns and themes, and provide a heuristic account of the case in study.

Yet, this study's design has limitations that deserve mention. First, a major concern during the study was that participants might provide overly positive responses about the software in an effort to please me, or not cause perceived discomfort during the interviews. Student teachers and field supervisors were aware that I played a major role in creating TeachSpark, and I had a previous, friendly working relationship with one of the field supervisors. I attempted to mitigate this concern through communications, and mentioning in our interviews that *we* (de-emphasizing the "I" part) are seeking negative or constructive feedback, and it is this crucial feedback that moves the design work forward. Also, within the semi-structured interviews, I structured questions to solicit their negative criticisms. For example, I would ask, "What challenges do you face in using the software?" instead of "Did you face any challenges in using the software?" Additionally, if the participants said they do not have any constructive feedback or recommendations, I would probe deeper or ask questions differently (e.g. "What are the ways in which the software can improve?"). Alternatively, if the participant was positive, I would unpack these comments, inquiring about the thinking and evidence that affects their perspective (e.g. "You said this was positive. Would you provide me an example of you mean by this?")

A second design limitation stems from the participants not having a clear-cut baseline to compare their experiences using TeachSpark (and its related activities) to the "business as usual" model for student teaching, since the student teachers only complete their final practicum once. To counter this, I turned to the field supervisors, who have experience with both TeachSpark and the "business as usual" model, to learn of their insights into the phenomena under study. Even so, student teachers had experiences with communication and collaboration software, and based

on these experiences were able to draw comparisons and inferences. For instance, in student teacher interviews I routinely asked them to describe the affordances and constraints of using TeachSpark compared to other technology tools, such as email or web-based collaboration software tools (e.g., Google Drive).

Another limitation of the study was the lack of insight from the six student teachers that didn't consent or were non-responsive and their reasons for not participating. This raised more questions than there were answers. I conjectured multiple factors might have contributed: stress of student teaching, attitude towards technology, rejection of the research activities, lack of time to commit to the interviews, etc. Their insight on why they didn't use the software would've been useful in shedding a different—but perhaps disaffirming—light on the findings.

A final aspect to consider is timing. The study was introduced to student teachers at the time they began to immerse themselves fully into student teaching. Not surprisingly, this study is not likely to be a high priority when they are “just trying to survive” as one student teacher put it. Yet, in the end, this may not have been a limitation based on some of the findings discussed in the proceeding chapters.

Chapter 4.

Understanding the Feedback Opportunities and Quality of Feedback within the Student Teachers' Work

Literature has made it clear that student teachers tend to feel isolated during their teaching experience and have indicated a desire for more supervision and feedback (Buck et al., 1992). This need is perhaps now greatest with student teachers facing increased accountability and more rigorous standards. It's reasonable to assert that increasing access to high-quality feedback for student teachers is a wise action for improving their teaching practice and influencing student achievement.

This chapter's findings tell the story of how TeachSpark and particular design interventions led to an expansion of feedback opportunities within the task structure of the student teachers' work, particularly on feedback being given on student teachers' lesson plans. And, as any good story goes, this chapter highlights the roadblocks faced by the "characters" of this feedback story and explores their perceptions of the software and its influence on the quantity and quality of feedback being exchanged.

Framing with DBR Conjecture Map: Exploring Feedback

Within the Program Task Structure

Admittedly, there were numerous ways to present the findings on the broader research questions of this study. I framed my planning, analysis and reporting utilizing Sandoval's design-based approach of conjecture mapping. By doing this, I made empirical predictions, tested in this study, of how my study's design attempted to promote student teacher learning (Sandoval, 2013). The results of this study lead to "refinements" in its design (Sandoval, 2013).

The development of this study's conjecture map was informed from preliminary data from the pilot study, conversations with the field supervisors, and my own professional experiences.

Three major design conjectures informed my study's design to increase opportunities for high-quality feedback to teachers. First, the design asserted that it was possible to expand opportunities for feedback to the student teachers within the existing work structure of the teacher preparation groups (called "task structure" in the conjecture map). The second was that in utilizing student teachers' social networks, access to feedback opportunities could increase for the student teachers (referred to as the "participant structure"). The third conjecture was that designing and implementing a software tool would enhance feedback quality flowing through the student teachers' professional network by drawing from the best practices of feedback literature and undergoing iterative design refinements.

In this chapter, the primary focus will be on ways student teachers had greater access to high-quality feedback opportunities expanded in and through their task structure and what the software's role was in this. In Chapter 5, the focus shifts to the conjecture relating to participant structures and how the software, in leveraging the participant structures, influenced student teachers' access to high-quality feedback.

Why Task Structure?

In this chapter, I present my findings (see Figure 7) on the student teachers' *task structure*, shedding light on the participants' perspective of how, and in what ways, the *intervention design* affected opportunities for feedback from a field supervisor to a student teacher. I further share findings on the nature and quality of the feedback to student teachers and its impact on teaching and learning. Understanding the *task structure* was important for a few

reasons. First, in light of mounting pressures from classroom teaching, meeting the teacher preparation program's requirements, and performing the edTPA, exploring already existing work structures seemed a worthwhile endeavor to determine if there are ways to bring efficiency to the workflow through innovative software. I posited that if efficiency occurred, the afforded time might give rise to a higher frequency of delivered feedback.

A second reason the *task structure* is of interest is the inherent relationship between the field supervisor and student teachers. The field supervisor—a mentor, of sorts—represents one of the major feedback sources in student teachers' limited feedback network. Survey data on student teachers' perceptions of their field supervisors' feedback showed that the feedback was viewed as high-quality for the most part, on par with their cooperating teacher. Of which, student teachers mainly reported receiving three of the four types of feedback focused on *instructional*, *informational*, and *student relationships*. I posited that enhancing feedback on embedded tasks, specifically delivering more *instructional feedback* from the field supervisors (viewed as high-quality *feedback sources*), might have a positive influence on student teachers' pedagogy.

In short, the software design took aim at one of the most central aspects of the teacher preparation program's overall design, and corresponded to one of the most important parts of the student teacher's experience. The design rested on the premise that in these core aspects of the program, the feedback process, content, and frequency could be substantially improved through a technology-based system.

Conjecture Map

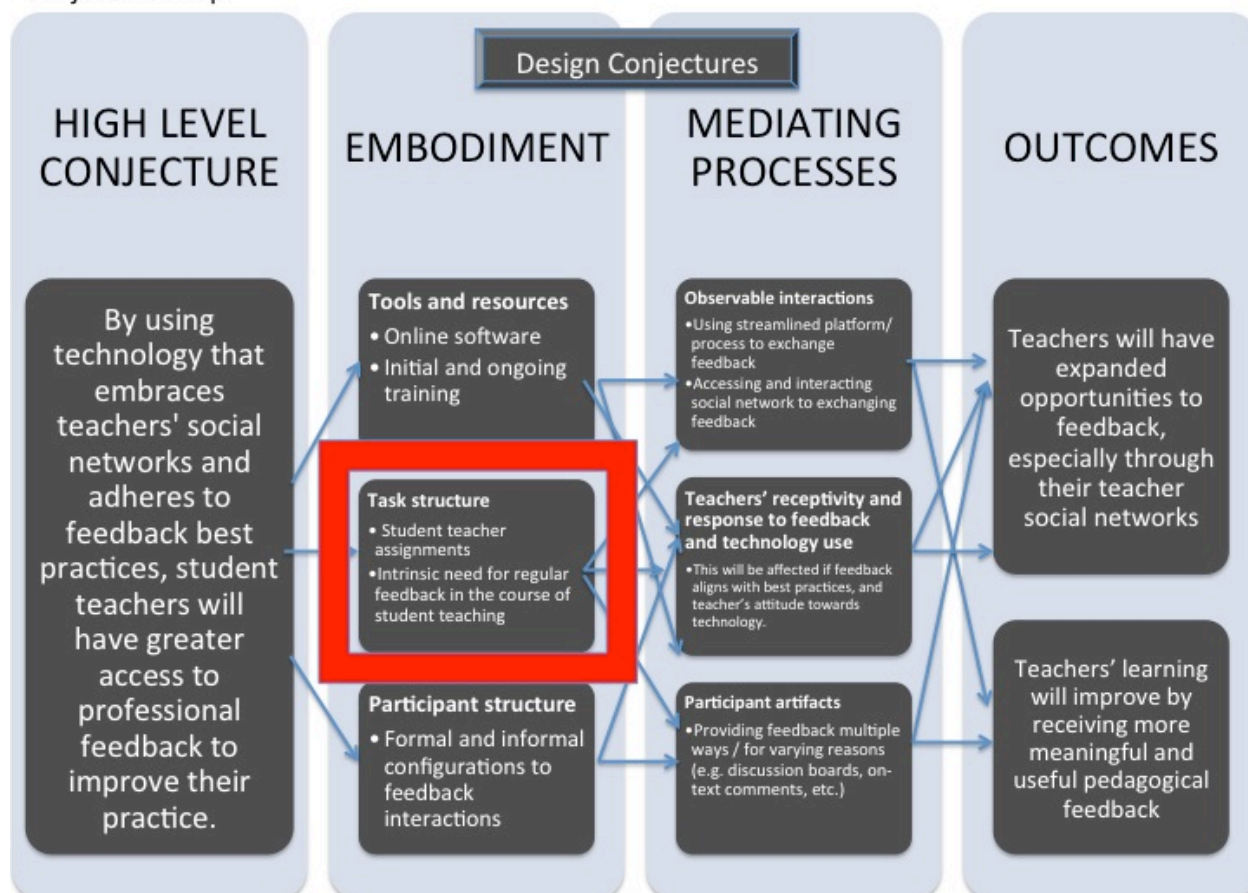


Figure 7. Conjecture map: Task structure

Focus of Task Structure

I examined certain tasks, set by the university and their field supervisor, that student teachers are required to fulfill as part of their practicum portion of their preservice education program. These required tasks constituted as the *task structure*. I collaborated with the two field supervisors to understand these tasks, inquiring to what extent feedback was provided, and if feedback was given, how it was provided and what the nature of this feedback was.

Jointly, the field supervisors and I narrowed the required tasks that the design would focus on. Student teachers were directed to post the following assignments to TeachSpark: (a) three lesson plans, 48 hours in advance, for planned field supervisor observations; (b) weekly

reflections on their student teaching experience; and (c) one parent/family welcome letter. These required tasks didn't change with the introduction of this study, rather just changing the means of accomplishing them. Prior to this study ("business as usual"), field supervisors required the student teachers to email them the lesson plans, reflections, and parent/family welcome letter. With this in mind, I was keen to find out, from the field supervisors' perspectives, what the differences between email and TeachSpark were, and if TeachSpark provided any affordances or constraints compared to email in providing greater access to feedback for student teachers.

A lesson learned from the pilot study was the importance of setting and communicating clear expectations for the student teachers at the beginning of their practicum experience about these required tasks and the role of TeachSpark in accomplishing them. Since student teachers were required to attend six seminar sessions throughout their academic quarter at the regional center, covering a broad range of topics (from edTPA information to how to interview for a teaching job), we decided this was the most appropriate place to introduce the study, the software, and required tasks. We further decided to give this information before student teachers began their practicum experience.

Knowing a tremendous amount of information was being provided to student teachers, particularly related to the edTPA, I limited my presentation to 30 minutes. In our interview, student teachers described the day as "information-packed" and "feeling over-loaded." In the 30-minute presentation I discussed the following: study overview, consent forms, study's expectations (e.g., sharing with at least 3 people), and how to opt-out of the study. I also demonstrated ways to accomplish their required tasks using TeachSpark and shared ways to receive support (pointing out the support tab in the website, sharing support email address, and providing my personal mobile phone number). I provided written documents (see Appendix E)

to complement my presentation so student teachers could later refer to it. This set the stage for the student teachers to use the software.

Understanding Differences in the Opportunities for, and Quality of, Feedback for Two Subgroups

As the study unfolded, interesting phenomena emerged around feedback and the student teachers' task structure, with intriguing differences between the two sub-groups coming into view. Therefore, for this chapter, I used a within-case analysis of the two field supervisors in this study. This approach yielded rich data and insights that helped address this chapter's focus on relating to feedback and task structure, as well as, gleaning insights to the study's broader research questions.

Helen's Group: Expanded Opportunities to Feedback

Background. Helen brings decades of experience in education to her field supervisor role. She was an elementary teacher, principal, and held central office roles. For the past decade, Helen has been a full-time field supervisor: initially working at various universities' teacher preparation programs until settling with the university in this study. Helen seemingly always carries a calm demeanor, takes her position very seriously, and indicated at several points in our conversations and interviews that she just wants to make a difference for her student teachers. It's because of that drive to do well as a field supervisor, Helen was very open to piloting TeachSpark in the winter quarter and continued to use TeachSpark for the second study in the fall. At the time of this study, Helen supervised nine student teachers of which three participated in the study.

Helen, who described herself as “not real tech-savvy,” but “not a dummy either,” was comfortable in using TeachSpark’s features and tools and was aware of its limitations. Helen’s breadth of experience as a field supervisor, coupled with her familiarity with TeachSpark, provided a unique insight on how TeachSpark compared to “business as usual” in terms of creating more opportunities of feedback and the factors that contributed to this.

New feedback channel. Helen consistently reported in her interviews that she provided more feedback using TeachSpark, specifically on the student teachers’ *lesson plans* and *reflections*, than when she used email (representing “business as usual”). Of particular interest to me was her feedback around the required *lesson plans* because this channel is directly connected to the student teachers’ teaching needs in the classroom, a key attribute to providing effective feedback (Brockbank & McGill, 2006). The feedback flowing through the lesson plan channel typically focused on *instruction* and *student relationships*.

When asked how TeachSpark has influenced opportunities to give feedback around lesson plans, Helen stated that prior to using TeachSpark she rarely provided feedback on student teachers’ lesson plans. She made this statement in her second interview:

... I really wouldn't give them any feedback on [student teachers'] lesson plans. That sounds horrible... I wouldn't actually give them feedback, it's more when we meet after they teach the lesson I want to talk to them about this and this.

By using TeachSpark, she created a new feedback channel (flow) between herself and her student teachers, where the nature of feedback was *instructional*. All of the participants in Helen’s group confirmed that they received feedback on their lesson plans before their scheduled classroom observations with Helen. This new feedback channel afforded the student teachers with opportunities to adjust their lesson plans’ instruction before their formal observation.

I was intrigued to find what specific influences or conditions led Helen to take-up providing instructional feedback on lesson plans using TeachSpark. In analyzing the transcripts of our multiple interviews, I saw a pattern where Helen attributed the change to TeachSpark –the tool. First, she said TeachSpark made it easier and quicker to provide feedback.

I think I said more, and gave more examples and things, because it was so easy to do rather than having to write and then email.

The overwhelming majority of student teacher participants, providers of feedback through TeachSpark themselves, concurred with Helen: TeachSpark provided more opportunities for feedback than if they had used email. On the surface, email has the potential to deliver unlimited feedback, but, upon closer examination, it has its constraints. Describing these constraints, participants spoke about email as being used for multiple purposes, leading to clustered inboxes and information overload, and there are a number of steps involved in sending feedback via email. Overall, participants said that TeachSpark was easier to use for the purpose of exchanging feedback. Below are two representative responses to the question whether, if at all, TeachSpark expanded feedback opportunities compared to email:

Yes. Because [other users'] information is right there. In email, you have to know their email address or whatever, and with [TeachSpark] their information was like, you can just type in their name, which was nice. It was a lot easier than sending an email. – Erin

I think, probably, it's just the ease of use. It was just so simple and all in one place, and so I would think to actually take the time to ask for feedback, and then she could give it in a very simple manner too, rather than having to download a document and give me feedback and then send it all back to me. – Tracy

Perceived quality and impact on teaching. Taking into account this new channel of feedback available to Helen's student teachers, questions arose around how her student teachers

perceived the feedback, processed it and if it (at all) shifted their instructional practice based on this feedback. Student teachers, in general, perceived the feedback as high-quality. Erin described her perception of the feedback:

[Helen has] given me a lot of good ideas within the classroom...I think all the information that she has given me has been very helpful. She doesn't just try to sugar coat anything. She's really direct and helpful. She's here to help, and everything she does is to help. I honestly believe that the things she tells me are helpful, because I have tried to implement them in the classroom, or do the things she said, and they've all worked. They worked well, and I can say she's a really good field supervisor and very helpful.

In response to the question of what student teachers did with this feedback, two student teachers reported (and shared examples of) changing practices based on the lesson plan feedback. Erin illustrated one way she changed her practice:

I'm thinking, thinking. I think getting students set up for the lessons for Helen. Helen was really big on making sure that I set the students up for what the lesson was going to be about like asking questions, 'What did we do yesterday? What do you think parallel lines are', things like that, setting them up for the lesson, and she gave me good ideas through that.

Helen provided similar accounts of seeing her lesson plan feedback enacted in practice. Not everyone agreed that the feedback directly affected his or her teaching practice. Tracy, her other student teacher, remarked, "I don't really feel like the feedback I got on TeachSpark impacted my physical teaching." In summary, the participants' examples signal, at least in a few instances, that two of the three student teachers' instructional practice was being influenced by this channel of feedback, that may not otherwise, have occurred using email.

Fran's Group: Roadblocks to Implementation

The second field supervisor, Fran, and her student teachers had contrasting experiences to Helen and her student teachers. Spotlighting these differences and the contributing factors reveal

deeper understandings of the intervention design, and how it affected feedback through the task structure for another sub-set of student teachers.

Background. Always cheerful and priding herself in creating positive relationships with her student teachers, Fran was in her fourth year as a field supervisor at this study's university setting. Her job is less permanent and predictable than Helen's. For instance, her position is contingent on certain student enrollment numbers. In an attempt to harness some semblance of job security she works with other regional teacher preparation programs.

Her current assignment included five student teachers (all of whom consented, and participated in this study). Similar to Helen, her student teacher placements were geographically scattered on the west side of the state, in varying school districts and schools. Because Fran lived in the central part of the state, she had a considerable number of driving hours, making for long days. Fran described that she was on the road so much, that she would end up spending the night at her sister's house on the west side of the state.

From the onset, Fran was supportive of the study and was willing to fully participate. She described her familiarity with technology as, "I don't know everything there is to know, but, if you show me how to do it, and I do it two or three times, then I feel competent..." Unlike Helen, Fran did not have a prior experience with TeachSpark and, therefore, did not have a working familiarity with the software in use. Yet, from the beginning of the fall quarter, Fran had been active in discussions about the study, in particular, on the discussion that established expectations for student teachers. Also, I provided Fran with training on the software prior to working with her student teachers. My field notes that indicated Fran "was very enthusiast about it" and "appeared to understand how to use it" by her affirmative responses.

Intervention needed to support design conjectures. Similar to Helen, Fran provided consistent feedback to students' weekly reflections. However, Fran differed from Helen on providing feedback on lesson plans. During the second round of interviews, across Fran's student teachers, it became apparent that Fran was not providing feedback on the required lesson plans. Kelly, her student teacher, said, "I mean... So I get discussion or whatever... I get comments back on my discussion, on my reflections, but just never on my lesson plans." Erika remarked, "Yeah. I shared two lesson plans with her already, my formal observations and stuff, then I thought that she (Fran) would comment on them, but she didn't."

The student teachers' interviews made it clear to this researcher that Fran was not fully utilizing a potential feedback channel. Since this study employs design-based methodologies, and one of the aims is expanding opportunities for *instructional* feedback for student teachers, I recognized the need to identify the contributing factors and, if possible, use available resources to refine the design intervention to address it.

Therefore, one main goal of Fran's second interview was to inquire about the lack of feedback on the lesson plans, carefully positioning the questions from a place of understanding the barriers to implementation and not from a place of judgment. To start our interview, I asked Fran to show me how she accomplishes the tasks within TeachSpark. From these observations, it became apparent that Fran was unaware of how to access the lesson plans (a separate page from the reflections) directly from within TeachSpark. After I explained how to access the lesson plans, Fran went to the page where the lesson plans reside and, on her screen, were unread student teacher feedback requests, weeks old. I could quickly identify the unread feedback requests by the visual signal which was the red "New" in the corner of the feedback request tile (see Figure 8). It was also apparent that Fran had, at some point, looked at the others. I

hypothesize that she viewed these lesson plans through email notifications (generated when a student teacher creates a feedback request) and not through TeachSpark. In the interview, upon this discovery, Fran responded,

“...I have to be honest with you and say, I didn’t ... I don’t know why ... I’m looking at this going, ‘How come I didn’t click on Documents?’ I can’t tell you right off the top of my head why I didn’t click on that other than, I guess, maybe I wasn’t thinking that lesson plans would be under there. I don’t know why.

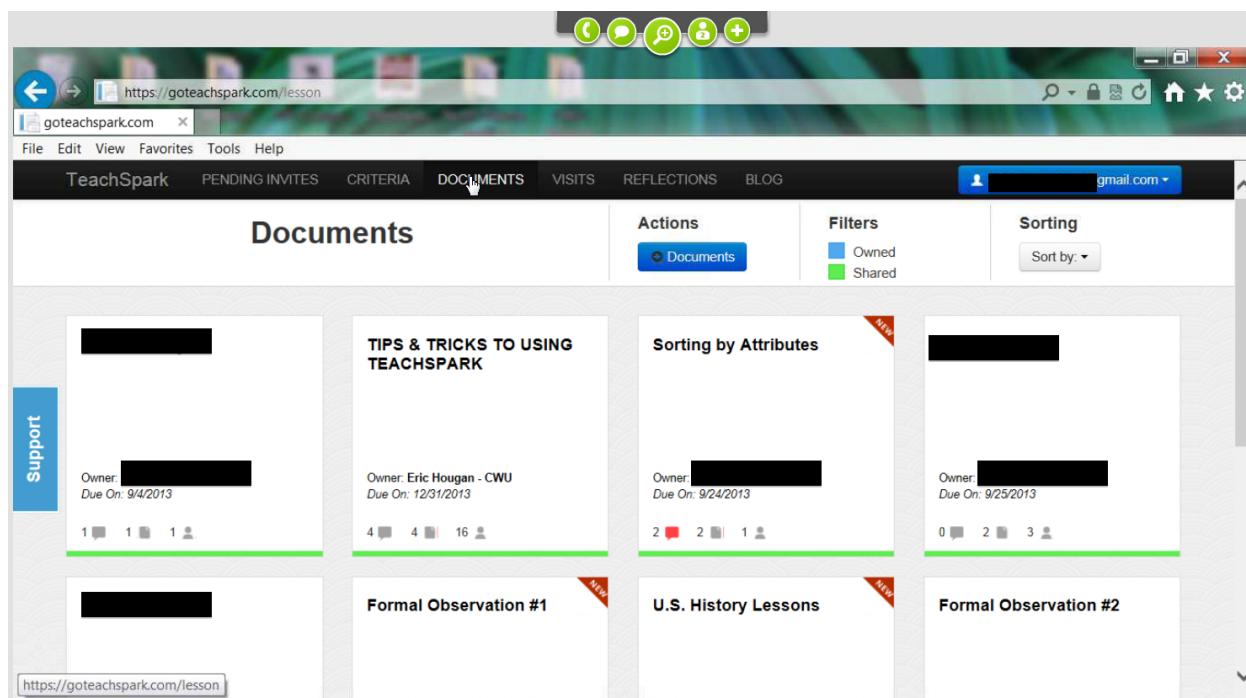


Figure 8. Fran's unread feedback requests.

I assured Fran that using TeachSpark, like any new technology, involved a learning curve and, if she wanted, she now knew how to access the lesson plans and could begin giving feedback. For the majority of our time, I answered Fran’s other questions about TeachSpark, and walked her through the new features.

Examining Fran’s situation may connect to a larger conversation regarding the complexity of the implementation of technological tools. Helen had prior experience with TeachSpark, and participants overwhelmingly felt that the tool was “intuitive.” Yet, as shown in

Fran's case, this was not sufficient enough to ensure high-fidelity implementation. For Fran, it seemed her lack of feedback stemmed not from lack of *motivation*, but, rather, from lack of awareness on how to fully use the tool. This would explain why Fran seemed upbeat about using TeachSpark when we would casually interact and discuss how TeachSpark was working. Simply put, Fran didn't know what she didn't know. Therefore she couldn't ask for specific feedback and training to remedy this. This maps to a larger and basic principle of feedback situations, and that is, the learner (feedback recipient) may not know what they don't know, and thus, don't know how to ask for their needed feedback.

Ironically, this is a challenge to the best practice, called out in feedback literature, of asking for specific feedback in an effort to link to learning goals (Locke & Latham, 2002; Marzano & Simms, 2013). This discovery foregrounds the idea that a person may need to rely on others to help one become aware of a knowledge or skill gap, and be a guide to knowing how to best address it. Helen and Fran echoed this about their own student teachers. Helen said, “[Student teachers] don't know what they need feedback on as they start out.”

This finding may refine theoretical perspectives to feedback literature, by acting as a reminder to scholars and practitioners, that within the relationship of feedback-provider and feedback-recipient, the burden to close knowledge or skills gaps may fall with both parties. If called for, the receiver may specify their needs, to which the provider has the responsibility of addressing. But, beyond addressing the specified needs of the feedback receiver, this finding suggests that the aforementioned relationship may further benefit from the feedback provider continually scan the learning environment, and monitor for *unidentified*, *unmet* learning needs of the feedback recipient.

Next, this finding suggests that certain monitoring activities of performance around an innovation are not sufficient, that perhaps, employing a sundry of monitoring strategies is needed. For instance, I routinely checked-in with participants to ensure they were not having difficulties in

using the software. This type of monitoring was met with some success. In one round of check-ins, I learned of browser compatibility issues that I easily resolved, but the issue was serious enough to hinder student teachers from uploading their required assignments. However, an important learning need, such as Fran's, was not identified. It was only after I altered the monitoring, shifting from a question-and-answer to observation format, that I could get to the root of the problem and remedy it with training.

Perceived quality and impact on teaching. Because of the initial lack of feedback on lesson plans from Fran, I wasn't able to capture the student teachers' perceptions on the quality. Yet, the student teachers gave evidence that they were still sense making: *the absence of feedback acted as feedback*. Student teachers, recognizing that Fran was not viewing their required lesson plans, in turn, began to put less effort into the task. Situative theory provides a way to make sense of how the student teachers were responding to the lack of feedback. Lave and Wenger (1991) take the stance that people negotiate knowledge and practice through interactions with other actors and tools. The evidence suggests that the student teachers' practice was negatively impacted, shifting the student teachers' motivation to putting their best work forward in the hopes of getting feedback (and perhaps recognition) to uploading a lesson plan out of simple compliance to meet the lesson plan requirement.

The second interview provided an opportunity for an impromptu intervention, furthering the "practical improvements" of DBR work (Sandoval, 2013). With the newly acquired knowledge of how to use TeachSpark, Fran committed to begin giving feedback to student teachers' lesson plans, and to "be more consistent" and "more conscientious" in doing so.

Since the second interview with Fran happened midway through the academic quarter, the third round of interviews with student teachers would reveal if student teachers began to

receive feedback on their lesson plans and, if so, capture their perceptions of the quality and impact of the feedback on their practice.

Four of the five student teachers reported to have started receiving feedback on the lesson plans. Kelly explained,

The last one that I did, I was able to see. Yes, she was able comment on it, and she didn't write too many comments, just a couple. She said my lesson was really good, but she wrote a couple of things, just common errors that I accidentally wrote. I think I wrote "10" instead of "100." It's nice that she was looking closely enough to catch that kind of stuff.

Student teachers reported the feedback quality of the lesson plans as being mixed. For instance, Zed felt Fran put in "fillers" to signal that she read the lesson plans, and her feedback on the lesson plans didn't influence his teaching. This lower perception of quality wasn't consistent with her group's overall perception of Fran's feedback quality.

Overall, aggregating all feedback Fran provided through various channels (observations, texts, emails, in-person meetings), student teachers were asked, using a Likert scale, to state their level of agreement to the statement that "Fran provided high-quality feedback". Student teachers chose from four provided choices: "strongly disagree (1)", "somewhat disagree (2)", "somewhat agree (3)", and "strongly agree (4)." Fran received an average of a 3.4 rating, with no one indicating a "disagree" with that statement.

The results from this Likert scale indicates, to a large degree, that Fran had the capacity to deliver quality feedback to student teachers, which raised the question of why Fran didn't fully exert her capacity within this particular channel. Perhaps, in the case with the feedback on the lesson plans, where the perceptions of the quality were mixed, Fran was simply overwhelmed with her external pressures and her workload. Fran made it known she was experiencing employment troubles, health issues, and stress from the demanding work schedule. If this

conjecture was true, designers of research studies such as this one may need to take into account mediating processes, such as external pressures on participants, to better respond to these circumstances. This may mean piloting their designs in multiple rounds with enough different people, to capture, more fully, the users' personal circumstances and their influences on the use of the tools, and understand what is (and what is not) within the designer's purview of responding to such external factors.

TeachSpark: View of Feedback Platform Emerged

In the course of data analysis across both student teacher groups, another exciting finding emerged that may explain why feedback expanded for student teachers through TeachSpark compared to using email. Student teachers and field supervisors said that TeachSpark's main purpose was to exchange feedback, carrying with it the expectations that any student teacher who generated a "feedback request" using TeachSpark should garner a response. A few participants captured this idea as referring to TeachSpark as a "platform" or as Fran called it a "feedback platform". All the participants shared a common understanding of the purpose of TeachSpark.

Below are a few quotes:

Because, again, email is one of those things where sometimes you just don't see it, whereas, if you're specifically going to TeachSpark, you know what your purpose is. You're not just fishing around there. You know what I mean? Not just randomly going like "Oh, I think I'll check this site." It has a specific purpose and I like that.
– Fran, 2nd interview

The ability to create a network where teachers and student teachers are able to share their work and get feedback. – Erin, 3rd interview

The goal and purpose would be to provide educators with a way of sharing and providing each other with feedback and communicating, sharing materials. – Stephanie, 3rd interview

Finding: Platform View May Mediate Behaviors

TeachSpark, viewed as a feedback platform, may have signaled to field supervisors and other feedback sources certain expectations or obligations to provide feedback, which, in turn mediated the feedback providers' behaviors to conform to these expectations. From Helen's perspective, she described student teachers' feedback requests as being on the "back-shelf" and she was motivated to respond because TeachSpark "brings it [student teacher feedback] much more forward".

While this analysis primarily focused on lesson plans as a feedback channel, TeachSpark, as a feedback platform, was used for multiple feedback activities with different actors within the student teachers' network. An example of this was of student teachers exchanging feedback with their peers on the edTPA, and, in other cases, student teachers requested family and friends to proofread and provide feedback on their classroom newsletters. Across these TeachSpark users, they had a common and shared understanding of what was expected in exchanging feedback. Erika explained it this way, "They [feedback providers] know what I'm doing on here." Kelly shared how TeachSpark influenced feedback exchanges with her peers, "I think just because Erika and Sandy, they already understood it, and you don't go through the process of explaining the whole thing." Erika's and Kelly's comments put into focus that with email, one's inbox may be filled with a sundry of messages: information, updates, requests, spam, etc. To break through this noise, one needs to write an email and clearly communicate the purpose of the email. Even so, this message may be lost in the clutter of emails. Fran elaborated on TeachSpark as a platform:

It's a platform, and this is what we're using TeachSpark for. This is what it's designed to do. If I'm going to go out of my way to put something on TeachSpark, then obviously I'm looking for a response sooner rather than later, whereas

people know with your personal email, it might be a few days. I tend not to ... Myself, I tend not to wait forever to answer emails, but there are occasions where I just don't have to look at it for a couple of days.

Interviews with the student teachers reveal their thinking about TeachSpark as a feedback platform was more nuanced. For instance, Sandy described TeachSpark as a “broad platform” where she would take different tones with the different users she was interacting with: more formal with Helen (“Helen, thank you for your comments.”), less formal with her peers (“Well, that’s cute... I did something similar kinda of thing.”).

Limitations

A few limitations affected the flow of feedback through task structures. One limitation was the users’ technical capacity. Technology use largely depends on the practitioner (Teo, 2011) and, in this study, a few users had difficulty using TeachSpark. A minor issue, but enough to halt the use of TeachSpark, was the users’ lack of awareness that their browsers’ software was outdated (by a few versions), and these outdated browsers didn’t support the latest web protocols that TeachSpark operated from. Therefore, the user didn’t experience the full functionality of the TeachSpark software, leaving the user frustrated. While a few participants submitted help tickets describing their issues of using TeachSpark, others simply resorted to “business as usual” of sending their feedback via email. In a short time, in all the cases, the users’ issues with TeachSpark were overcome by updating their browsers. In another case, a participant couldn’t locate the scroll bar because it was hidden, until one hovers the mouse cursor over the areas where the scroll bar used to be. Again, this was quickly resolved with a brief conversation. In short, the users’ varying technology capacities, and the issues that arose, created temporary barriers to the use of TeachSpark and the feedback exchanged within the software, until this researcher brought solutions forward.

Another limitation rested with the students and their efforts to fulfill their student teaching responsibilities and requirements. This meant the responsibility of expanding feedback through the *task structure* didn't solely rest with field supervisors. The students played a major role as well. Both field supervisors expressed concern that some student teachers would submit their lesson plan the night before their observation, or in rare cases, not at all. Submitting the lesson plans less than 48 hours in advance of their observation resulted in a very short window for the feedback cycle to be completed: student teacher requests feedback, field supervisor delivers feedback, and student teachers process and respond accordingly. This issue was especially problematic for Fran who was on the road all day. A few student teachers acknowledged that it was their fault for not receiving feedback because they posted their lesson plan late.

Summary

In this chapter, two of the three design conjectures, that guided the study's design, were examined: (1) it was possible to expand opportunities for feedback to the student teachers within the student teachers' task structure, and (2) that designing and implementing a software tool would enhance feedback quality flowing through the student teachers' professional network by drawing from best practices of feedback literature and undergoing iterative design refinements.

Evidence suggests TeachSpark and particular design interventions led to an expansion of feedback opportunities within the task structure of the student teachers' work. In the case of Helen, the ease of the tool and requiring the lesson plans 48 hours in advance of an observation contributed to her providing more feedback. She had this explanation in the 2nd interview:

To be very honest, I think it's made me a better supervisor because before I'd get their lesson plans rarely did I give them feedback. I collected it, looked it over before I went in, but I didn't send them much feedback because it's so hard to do.

There was no way to typewrite on the paper and get it back to them fast enough. This way I'm getting them further ahead, I have time to look them over; they have time to look over what I send hopefully. If they didn't at least they saw what I attempted to tell them even if it was after the fact.

From examining Fran's case, a finding emerged that there were roadblocks to the lesson plan channel. This shed light that, perhaps, the one way to address these types of roadblocks is by employing various, on-going monitoring strategies to uncover any issues in implementation and address them.

The third finding illuminated that participants' views of TeachSpark, as a feedback platform, may have mediated expectations and behaviors, compared to alternative ways to exchange feedback, such as email.

Finally, the quality and impact of the feedback differed between the two student teacher groups. But across both groups, student teachers considered the feedback of higher quality. What is less clear from the data is the extent of enactment (e.g. Out of the minimum three lesson plans submitted, how often did student teachers act upon the lesson plan feedback? To what degree and in what ways did the feedback shift the instruction?), and, more importantly, whether it may have negatively or positively influenced student achievement. Further study is necessary to glean greater insights to these questions.

Chapter 5.

Exploring the Feedback Opportunities and Quality within the Student Teachers' Peer Structure

As a recap, the study was shaped by the high-level conjecture that student teachers would have greater access to professional feedback to improve their practice using technology that embraces teachers' social networks and adheres to the best practices for feedback. Three design-level conjectures supported this study's high-level conjecture. The first conjecture asserted that offering the student teachers certain practical *tools and resources* would enhance the quantity of high-quality feedback flowing to them. This meant designing and developing a software by listening to what feedback literature said about receiving, processing, and delivering high-quality feedback, in addition to taking into account user input from the pilot study. Understanding that initial and ongoing support may be necessary when implementing new technology, the design team offered various support channels to the users in the forms of email updates, support blog, and direct access to the team.

The second design-level conjecture focused on mining potential opportunities for feedback within the student teachers' *task structure*: examining ways to further give feedback on assignments, from the expected sources (e.g., field supervisor), and around the responsibilities associated with being a student teacher within a traditional 4-year teacher education program. The study's overall findings reported in Chapter 4 suggest that the software (coupled with ongoing training for the feedback providers) contributed to more feedback flowing to student teachers from their respective field supervisors.

The *participant structure* represented the focus of the third essential design conjecture (see Figure 9), the focal point of this chapter and its findings. The argument here is that by

examining and augmenting student teachers' networks (specifically their informal peer network) through careful data analysis and intervention, the student teachers may have greater access to high-quality feedback.

Conjecture Map

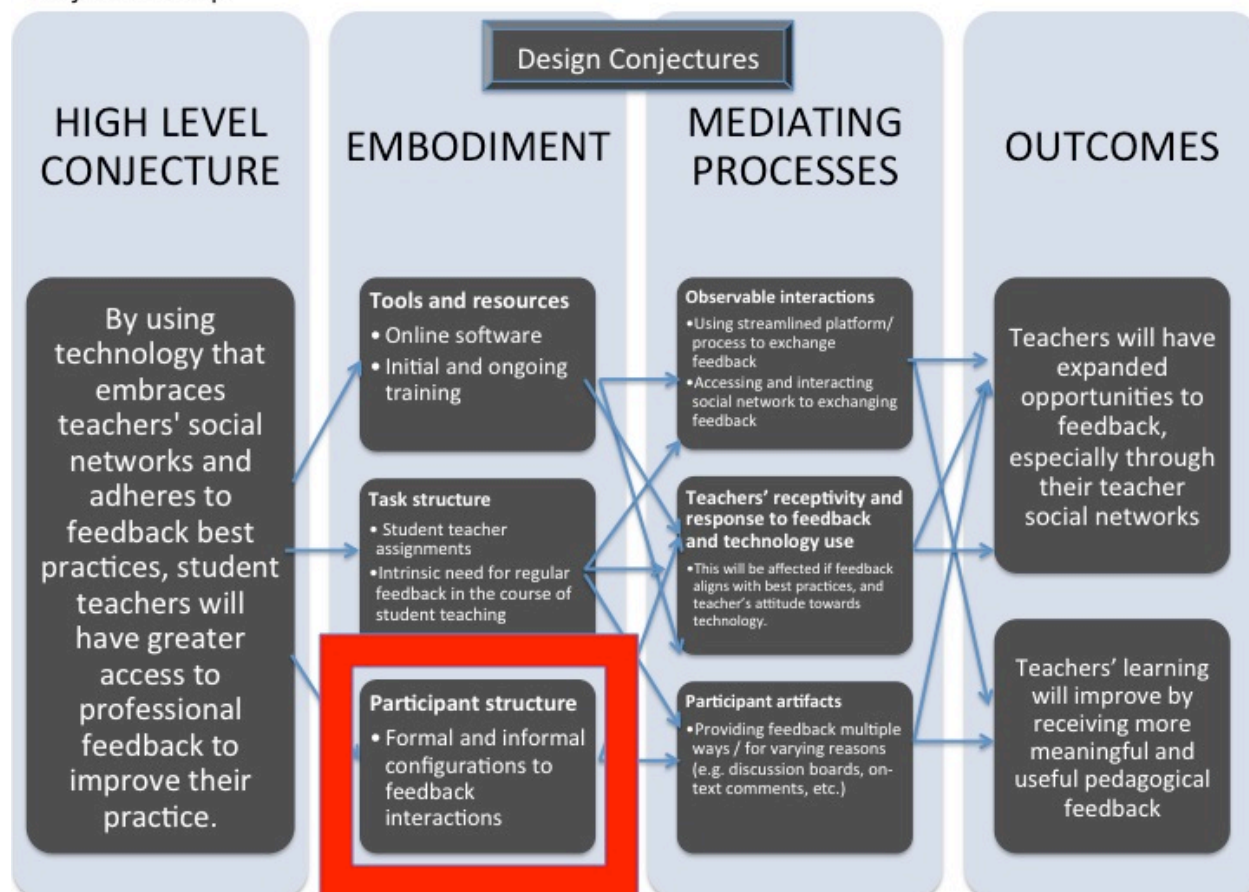


Figure 9. Conjecture map: Participant structure.

At the first informational session, when student teachers were learning about the study and its expectations, participants were asked to seek feedback from at least three different people in their informal network by sending feedback requests via TeachSpark. I viewed their informal networks as two elements: their student teacher group (comprising their peers, supervised by both field supervisors, at this particular regional center), and everyone else (excluding peers, field supervisors, or cooperating teachers).

The student teachers in the two groups (later referred to as the “peer network”) are the focus of this chapter. I initially hypothesized that student teachers would naturally solicit feedback from their immediate peers over *other* people in their informal network, since their peer student teachers had an acute awareness of the demanding work and dynamic contexts to which the work was being performed.

A First Problem of Practice: Lack of Feedback Connections

Within the Participants’ Peer Group

Up to week 11, evidence from the first two rounds of interviews, software analytics, and exit slips from follow-up training sessions showed a different pattern of behavior than what had been anticipated. Student teachers, for the most part, were not *initially* turning to their peers for feedback.

Initially Participants Made Few Feedback Connections With Peers

One social network analysis (SNA) measure that calculates actual connections out of the possible connections is called *network density*. Using the formula in Figure 10, of the 14 student teachers (includes non-participants¹) at the regional center (n=14), there were 91 *potential connections*. Arriving at the *actual connections*—when a student teacher requests feedback from a peer and the peer responds with feedback—was more complicated. Three levels of analysis were necessary to arrive at- and ensure the validity of- the actual connections within the network. For instance, the question of “How many feedback requests have you sent to your peers thus far?,” did not always equal to the number of peers whom the student teachers turned to for

¹ Non-participants’ data was included because participants still had the potential opportunity to turn to non-participants, and in a few cases, did just that.

feedback. A student teacher may have sent multiple feedback requests, but, to only one peer. Deeper analysis and triangulation from other data sources was needed to determine the actual number of peers that a student teacher sent a request to. Even here, this data did not accurately indicate if the request sent to the student teacher's peer was responded to with feedback. For example, Tracy sent feedback requests to five peers, but only two peers responded. The semi-structured interviews were essential to tease out what requests were responded to, resulting in an accurate accounting of actual connections.

<p>Potential Connections:</p> $PC = \frac{n * (n-1)}{2}$	<p>Network Density:</p> $\frac{\text{Actual Connections}}{\text{Potential Connections}}$
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Figure 10. Calculating network density.

The finding was that a total of five actual connections were made from the start of the study through week 11. That's a density of 5.5%. Four student teachers in total had sent feedback requests to their peers, one of these student teachers did not receive a response back. Of the three student teachers that made actual connections, two were from Fran's group and one was from Helen's group. In short, only three of the fourteen student teachers made feedback connections.

Lack of Relational Ties Hindered Feedback Connections

Whereas improving TeachSpark's functionality and building participant capacity were the foci of Iteration Cycle 1, the low network density became the centerpiece for Iteration Cycle 2. To start, more information was needed to inform the planning and refinement phases of the

iteration cycle. In the interviews with student teachers and field supervisors, I asked what may have contributed to the lack of feedback connections within their informal peer network (from their perspective)? Most of the participants indicated a lack of relationships with each other. There was a void of meaningful and trusting relationships—key components in fostering a safe environment for sharing and taking instructional risks (Moolenaar & Slegers, 2010).

This level of lacking relational ties was unanticipated and not planned for within the initial design because this group of student teachers were sometimes referred to as a “cohort,” signaling that they had taken classes together, mostly in-sync, and have established relationships. And while the university moved to the cohort-model, it was not in place for this study’s current student teacher group. Stephanie described her perspective on the group,

It’s like it’s not even a real cohort because I feel like cohorts you go through two years or whatever together, but the way [the university] was, we weren’t all together. Everyone was taking different classes. We didn’t just start doing real cohorts until this past year... I wouldn’t say that we’re like a real cohort. (chuckles) We’re just like a group of people that are labeled a cohort. (laughs) – Interview 2

Sammi, a student teacher in early childhood education, goes further and explained the reasons she hadn’t turned to her peers:

More than half of those people I’ve never seen before in my life (laughs). I had elementary ed, I had PE, I had high school math and no... I wouldn’t want a high school math looking at my kindergarten math lesson. – Interview 2

The practicum experience, and the participant structure within it, didn’t foster relationship building wherein trust could begin to take hold. When student teachers were together, often for the 6 scheduled seminars, they had little-to-no time to interact. In short, the embedded *participant structure* wasn’t adequate to foster the informal relationships needed for sharing among peers and delivering high-quality feedback. As a result, student teachers simply didn’t turn to each other for support and feedback.

Iteration Cycle 2: Intervening and Assessing Increase in Peer-to-Peer Feedback Opportunities

Driven by user needs, Iteration Cycle 2 focused less on refinements to TeachSpark, the software, and more on providing activities and training to bolster feedback-sharing among the student teacher group and building the capacity to request and provide feedback.

Planning and Implementing a TeachSpark Buddies Arrangement

In talking through the challenge of student teachers not sharing, Helen, the field supervisor, and myself brainstormed the idea of creating a more formalized participant arrangement (referred to as “TeachSpark Buddies”), where student teachers would be arranged in dyads or triads, grouped by similar grade-levels or subject areas. This arrangement is supported by social network analysis literature, stating, “Individuals tend to seek advice from people with whom they share demographic similarities and equal work status” (Baker-Doyle & Yoon, 2010, p. 117-118) and links to the principle of homophily—“the tendency for people to form (positive) ties with people who are like themselves on socially significant attributes” (Borgatti & Halgin, 2011, p.21). I further piloted this idea with Fran (the other field supervisor) and a few student teacher participants, and they provided positive responses to the TeachSpark Buddy idea.

Based on student teachers’ placement (grade-level or subject) and field supervisors’ input, I created five TeachSpark Buddy groups. The training that introduced this arrangement occurred in an early November session at the regional center. I turned to the professional learning community literature, because of its potential to sustain learning and improvement efforts (Stoll, Bolam, McMahon, Wallace, & Thomas, 2006), to help guide the training activities, particularly in taking steps to build cohesion and community within the TeachSpark Buddy

arrangements. These training activities (see Figure 11) incorporated elements of effective professional learning communities (albeit at a surface-level): shared values and vision, collective responsibility, and reflective professional inquiry (Stoll et al., 2006). During the trainings, I offered time for the student teachers to meet their assigned TeachSpark Buddies, share why being a “Buddy” may matter, and set feedback sharing goals.

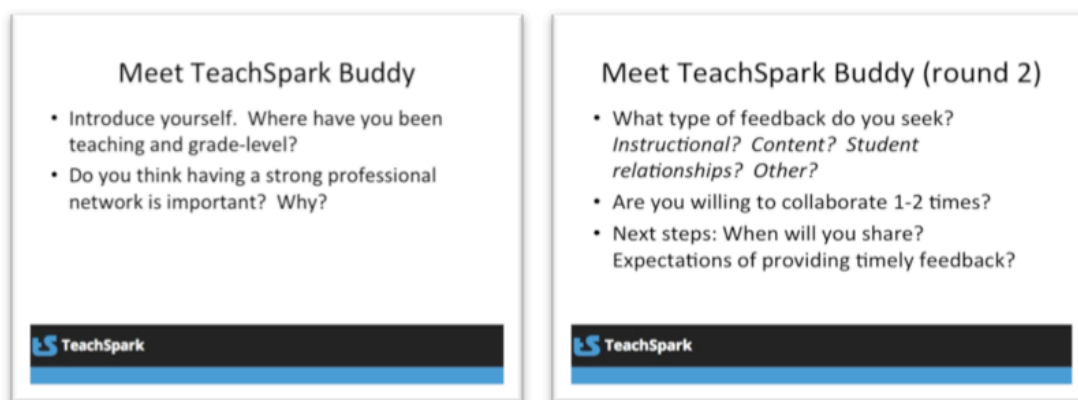


Figure 11. Presentation slides for the TeachSpark Buddy activity.

Effects of Buddy Training on Participants’ Motivation

By having all the student teachers complete an exit-slip immediately after the training, I measured student teachers’ perceptions of their future use in using TeachSpark Buddy. The results were the following:

- To the question, “After today’s session, do you plan to send a feedback request to your TeachSpark buddy/buddies?”
 - 5 – responded “No”
 - 1 – responded “Maybe”
 - 8 – responded “Yes”
- To the questions, “Moving forward, how many feedback requests do you plan to send to your fellow student teacher peers?”
 - 4 (29%) - indicated 0 future requests
 - 7 (40%) – indicated 1-2 future requests
 - 3 (21%) - indicated 3+ future requests

Most promising from this data was that, 64% of the student teachers who had not yet sent a request to their peers indicated that they were likely to send a request after this training session. This rise in planned participation may have been attributed to the simple premise, that student teachers turn to peers they know for feedback. Sammi described how TeachSpark Buddies helped, “We get past that hump of figuring out ‘Oh who do I have to share it with?’ then, we’d really be able to dive in and use the software.” In short, this preliminary data signaled a shift in the student teachers’ motivation to use their peers as part of their informal feedback network. The following section examines if these motivations translated into actual feedback exchanges among the student teachers.

Whole Network Analysis: Design Influenced Network of Peers

Analysis of interactions within the whole network revealed how the design refinements in Iteration Cycle 2, namely using TeachSpark Buddies, may have influenced the number of actual opportunities for feedback. The analysis also identifies from the student teachers’ perception, why some student teachers did not view their peers as part of their informal network, and, therefore, didn’t turn to them for feedback.

Increase in network density. Evidence suggests that the TeachSpark Buddy activity influenced the number of times in which the student teachers turned to each other for feedback. The number of actual connections increased from 5 to 12, resulting in a 13.19% network density measure (a 139% increase in 5 weeks). This number could be higher, because the 12 actual connections only represent the connections made by the participants of this study, not by non-participants.

Increase in the number of and interconnections among participants. The network density data explain *how many times* student teachers connected, out of all possible connections,

but does not explain how many student teachers turned to their peers, as part of their feedback network to receive feedback. To start addressing how many student teachers turned to their peers, I used student teachers' self-reported data (see Appendix D) from their final "exit" session of the quarter. This data revealed that, 10 of the 14 student teachers indicated that, they had sent a feedback request to, at least, 1 peer – a substantial increase. Even though it was optional, three of the six non-participants of the study decided to engage with their peers (at least through TeachSpark).

While, on the surface, this seems promising, the caveat to this data is that, it doesn't fully answer if the 10 student teachers received feedback in return. To get a clearer picture, triangulating data from interviews with the participants and software analytics was necessary. I organized the data into *adjacency matrices* and visualizations, using social network analysis software UCInet and its embedded visualization tool NetDraw (Borgatti, Everett, & Freeman, 2002).² This afforded me the benefit to "qualitatively look for patterns in the structure of the network" (Borgatti & Ofem, 2010, p. 26). I compared what the student teachers' whole network (anchored by their respective field supervisor) looked like, before and after the TeachSpark Buddy activity intervention.

² I further included measures of the quality of the ties—student teachers' perceived value of quality on a scale of 1-4, the rating of 4 being high-quality feedback (the rating of 10 means no rating was given). The quality ratings will be addressed later in the chapter.

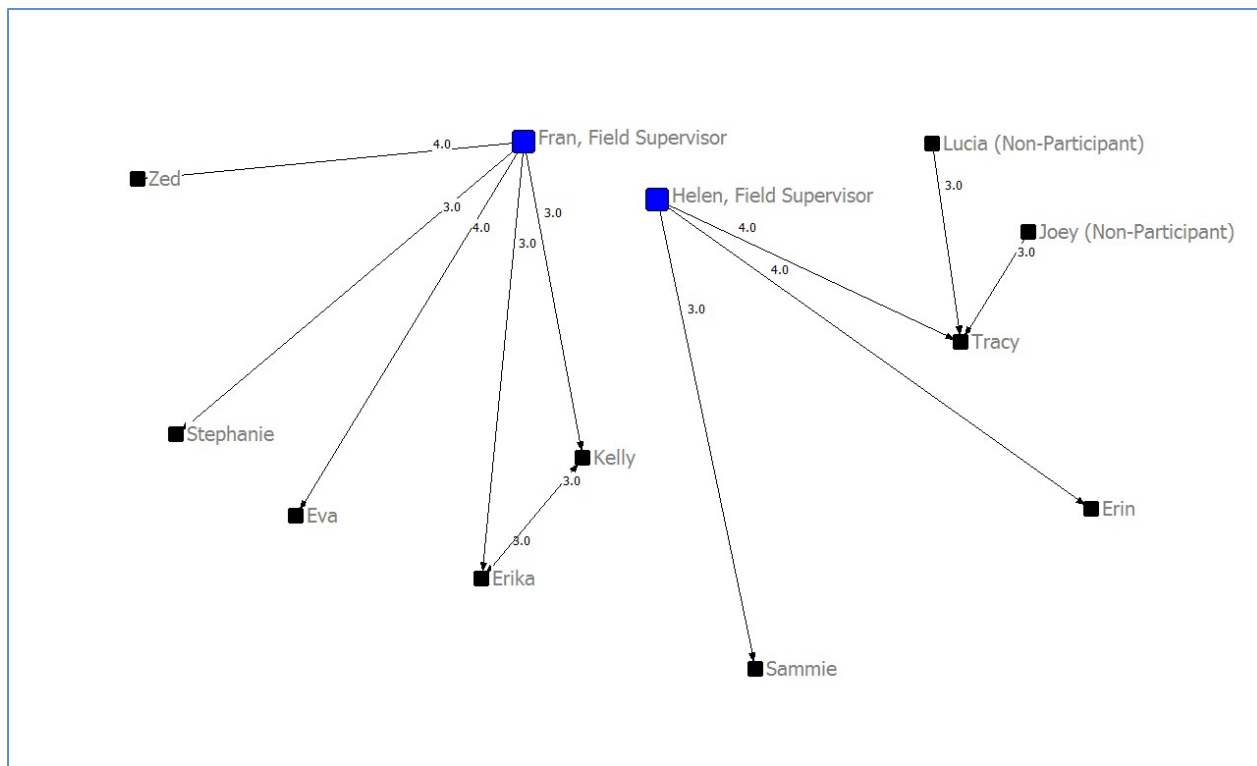


Figure 12. Whole network analysis, prior to intervention.

In examining Figure 12, a few patterns emerged. The first pattern shows that the centrality of the network mostly rested with the formal relationship of the two field supervisors (the two blue nodes), creating a *star structure*, a centralized structure (Stephen P Borgatti, Mehra, Brass, & Labianca, 2009) that has with feedback flowing outward to the student teachers. This reiterated the importance of shaping the feedback flow between field supervisors and student teachers within their task structure (Chapter 4). Alternatively, this shows how little the participants connected with their peers as part of their feedback system.

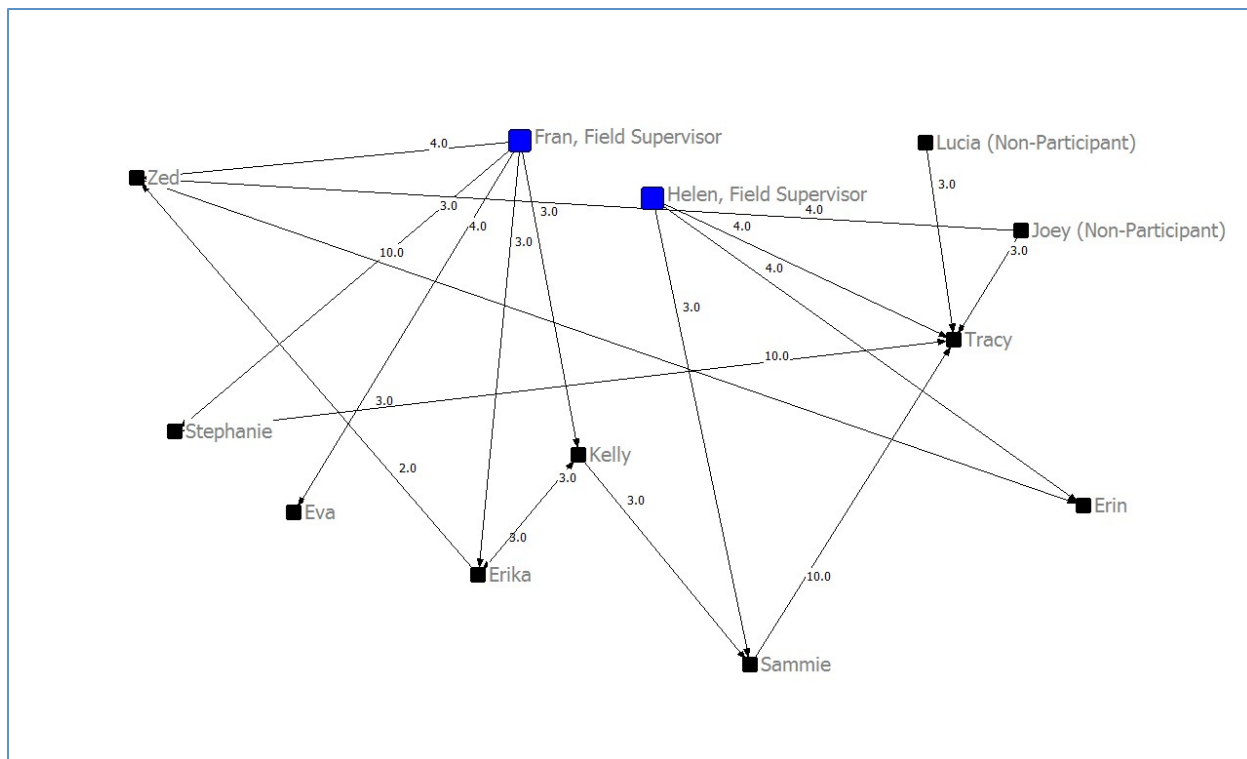


Figure 13. Whole network analysis, after intervention.

The second figure (13), paints a different picture of the student teachers' peer feedback network after the TeachSpark Buddy intervention, with the student teachers' prior interactions acting as the counterfactual. The first observation from this network analysis is when the network moved from the star structure to a more connected, web structure, creating new channels for feedback to flow. Within this new web structure, the feedback turned out to be more bi-directional (reciprocal). One reason why this structure is important is that it may influence the quality of the exchanged feedback (discussed later in this chapter). This visual representation also shows intra-group connections between Helen's and Fran's groups. Because the TeachSpark Buddy arrangements were not based on field supervisor groups, but on student teachers' grade-level or subject area, that arrangement enabled cross-connections among members of the cohort, regardless of their particular assignment within the task structure.

Finally, only one of the study's student teachers, Eva, continued to be "isolated" from the peer network, compared to the other four isolated student teachers prior to the intervention.

Potential benefits of the denser network participation. This reduction of isolation and increased network density may have positive impacts on the student teachers' learning and teaching. Zed said one major benefit of turning to his peers was, "getting more points of view" on his lesson plans. Research shows having multiple sources may be beneficial. For instance, an analysis of studies on teaching improvement programs that incorporated feedback from multiple sources (Brinko, 1993) showed that these programs have reported successful results. Others echoed the benefit of receiving different perspectives. Tracy, who initially sent feedback requests but with few responses, saw an uptick in responses. She commented:

I really liked it, just because, I think, it made other people more aware of the fact that they were responsible for responding, and so definitely, I used it more, because of the Buddies, than I think I would have otherwise, because I was starting to get discouraged from the lack of responses.

The possible limitations of late timing. Another theme emerged from the final round of interviews. I asked student teachers about their perception of the TeachSpark Buddy intervention and its influence on their practice. Student teachers saw the value in TeachSpark Buddies, but many didn't fully participate in the activity because it was too late in their student teaching practicum. Student teachers continually suggested that TeachSpark Buddies would have had more impact if implemented at the beginning of their practicum experience. Stephanie said,

I think it's worth to do it and see the value in communicating with others. I think it was helpful because maybe I initially didn't think, 'Oh yeah, I don't need to do that,' but then actually reinforced to do it.

In another response, Kelly talked about the challenges of using TeachSpark, and how it may be more beneficial to have had the Buddy activity earlier in the quarter,

I'd definitely do it maybe more at the beginning of the year or of the quarter. Talk about it. I don't know if that would be something, because I think it's a really cool idea. I think [the lack of use of TeachSpark] was just because it was at the end of our student teaching, since we were all busy. Some of us didn't have the time to do it. I think it would be beneficial maybe if you told them in the beginning of the quarter when you do your first meeting with everyone, just talk about it. Yes, I don't know. That would be my advice. I don't know if that would change anything for some people, but maybe for me, I think it would.

Limitations on participation. Eva's isolation can bring some understanding as to, why she, and, potentially, other student teachers, didn't use TeachSpark. Eva explained that not having a TeachSpark Buddy in the same grade-level as she is, is why she did not turn to her peers for feedback:

I thought it was nice to have it within the colleague group, but I also felt we were going to comment on our own. I felt like it would not be too beneficial for me to comment on somebody who's in kindergarten or second or third or fifth grade considering I don't know specifically what the developmental level her kids are at. I felt like that was kind of tricky.

The pressures of student teaching were another factor influencing the use of the TeachSpark Buddy activity. Eva said, "I think it gets to be, you are busy. TeachSpark- it's not something that you really think about something new so it's not built in as a routine." Kelly indicated the pressures of student teaching presented a challenge:

Okay, well, I'm going to be honest. I didn't really use it³, but I think it was something that would work, but I think that were all just so busy that it was at the end of student teaching. I didn't really use it, but I think it could be beneficial, but yes, I didn't really use it.

A Second Problem of Practice: Lack of Feedback Capacity and its Effect on the Quality of Feedback

³ Kelly did in fact use TeachSpark to exchange feedback with peers, but not to the full extent that she thought she should.

With student teachers receiving more opportunities for feedback, questions arose about the *quality* of this feedback from the student teachers' perspectives: How do the student teachers perceive the meaning, quality, and impact of the feedback on their practice? To what extent, if any, did the software influence the student teachers' perception?

Through careful analysis of the second interviews (prior to Iteration Cycle 2), student teachers perceived the quality of the feedback from their peers as having room for improvement. On average, student teachers said they “somewhat agreed” (equivalent to a 3.0 out of 4.0 quality rating⁴) that their peers provided high-quality feedback. This was below the ratings of the feedback quality of their field supervisors and cooperating teachers, with ratings of 3.53 and 3.63, respectively.

Two major concerns arose about the quality of the feedback. Both of these quality concerns may stem from the users' lack of *capacity*—the ability to seek and exchange high-quality feedback on a consistent basis: first, as feedback seekers, not specifying the feedback they sought to improve their practice, and second, as feedback providers, giving peers feedback that was perceived as generic and vague.

The first concern was when student teachers were requesting feedback via TeachSpark, they were not properly specifying the feedback they were seeking. I observed this behavior after software changes (from Iteration Cycle 1) added a text field in the feedback request form called “Desired Feedback” (see Figure 13). This refinement to the software was spurred by student teachers and field supervisors' requests for a way to target feedback better, offer a lens (of sorts) for the feedback provider in looking at their feedback request on their lesson plans, assessments, etc.

⁴ I asked the student teachers to indicate to what degree they agreed or disagreed (“strongly disagree”, “somewhat disagree”, “somewhat agree”, or “strongly agree”) with the following statements: My (feedback source) provided high-quality feedback.

An example of this occurred while I was observing Fran using TeachSpark. A new feedback request from a student teacher, Eva, appeared on Fran's dashboard. On the feedback request, Eva wrote, "Comment please," into the desired feedback field. Fran responded that feedback request didn't give her a frame to know what feedback the student teacher was seeking (or needed) when reviewing the student teachers' lesson plan. Another student teacher, Sammi, shared in our interview that she simply wrote, "Comments on lesson plan," in her desired feedback field.

These examples signaled to me a lack of capacity in two possible ways. First, the student may not know how or what the "Desired Feedback" field meant nor how to leave a pre-emptive comment on the document, since student teachers seemed unaware that they could do this. For instance, when I mentioned this to Erika during our interview, she said, "Wait, where do you do it?" This was in light of my efforts to communicate Iteration Cycle 1 changes by creating video tutorials and written documentation, posting them to the blog, and emailing them out.⁵

A second possible contributing factor was that the student teacher lacked the capacity to specify the feedback they desired, in general. In various ways, student teachers may not have been able to visualize for themselves where and what feedback would be helpful or needed—put another way, they didn't know what they didn't know, and therefore, had difficulty framing feedback prompts and questions. This was an interesting line of inquiry because, on one hand, student teachers consistently characterized high-quality feedback as being specific, mirroring the best practice in feedback literature on delivering feedback with a laser-like focus on ways to address specific teacher and student learning needs (Kretlow et al., 2011; May & Supovitz, 2010; Myers et al., 2011).

⁵ Student teachers, across both groups, said they did not read emails or check the blog. The often cited reason was they were too busy and overwhelmed with the pressures of the edTPA and student teaching.

With that in mind, one would presume student teachers would take efforts to specify their feedback needs. Yet, on the other hand, the student teachers didn't take actions to specify their feedback needs to their feedback sources, indicating to me that perhaps the student teachers weren't fully aware of their *role* in mediating the exchange of high-quality feedback that is specific and targeted to their learning needs. Yet, there could be other possible explanations for the student teachers' lack of action to specify their feedback needs, such as student teachers not having the know-how (especially as neophytes in the complex craft of teaching) to visualize where and what feedback would be useful on their practice.

Figure 14. Desired feedback via TeachSpark.

The aforementioned lack of feedback capacity may have contributed to the second constraint in receiving high-quality feedback: the provided feedback was often generic, short on substance and constructive advice. For example, in our interviews, Erika described turning to her peer, Kelly, because, “She’s within my own district. She knows our curriculum and stuff like that, that’s why I share it with her...” However, Erika perceived Kelly’s initial feedback as not

being high-quality: “The first time she was just like, ‘Oh I like your lessons,’ so it wasn’t really like feedback” (see Figure 15 for a screenshot of the actual feedback). Erika’s perception of Kelly’s feedback is couched in her conceptualization of high-quality feedback. She shared her view of high-quality feedback in our first interview:

I would say really just like the specifics and give example. If I was teaching a lesson and somebody was observing me and taking notes or whatever I would want them to say, ‘Oh, you did this really well; this specific thing and here’s an example of that.’ ...I would want them to do or tell me what I could improve on and what are my strengths and I can keep doing those, so just like, specific and detailed feedback I think would be quality.

Again, the generic feedback did not match the teachers’ own perceptions of high-quality feedback. In fact, seven of the eight student teacher participants described the *nature* of high-quality feedback as having the attribute of specificity. The student teachers’ perceptions and Erika’s need for specific feedback mirrors best practices in feedback literature, which emphasizes the *nature* of the feedback to be constructive and connected to the learners’ needs (Brinko, 1993; City, Elmore, Fiarman, & Teitel, 2009; Gersten, Vaughn, Deshler, & Schiller, 1997; Ilgen et al., 1979).

The screenshot shows a web browser window displaying a lesson review on TeachSpark. The URL is <https://goteachspark.com/lesson/review/>. The page title is "Review". The TeachSpark navigation bar includes "DOCUMENTS", "VISITS", "REFLECTIONS", and "BLOG". The user is logged in as "@comcast.net". The document being reviewed is "Document #4". The document content includes:

- Name: [Redacted]
- Supervisor: [Redacted]
- Cooperating Teacher: [Redacted]
- School: Rachel [Redacted]
- School District: [Redacted]
- Grade: 3rd
- Lesson Number: 3
- Subject: Mathematics
- Date: October 7, 2013 12:20-1:30

The document lists several sections:

- Lesson Title/Focus:** Adding 3-Digit Numbers (2-8)
- Chosen Language Function:** Explain
- Lesson Rationale/Input:** The purpose of this lesson is to expand student knowledge of solving 3-digit addition problems.
- Instructional Materials:**
 - Smart board
 - enVision student textbooks (23)
 - Place value block manipulatives
 - Copies of 2-6 Practice worksheet (23)
- Standards Listed by Number and Text:**
 - 3.OA.D.8: Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
- Learning Targets/Objectives:**
 - Students can add 3-digit numbers using paper-and-pencil methods and use addition to solve problems.
- Classroom Management Considerations:**
 - Have students start as a whole group on the carpet area for the introduction and the instructional part of the lesson.
 - Give clear directions before releasing students to desks and then give a signal or release by table groups to gather materials and sit down at their desks.
 - Before the lesson begins, ask that the students make sure that they are sitting next to people that they can learn by. Move students as needed throughout the lesson.
 - Use class signal TEAM/STARS for noise control and getting class attention.
- Student Characteristics and Accommodations:**
 - Students have been learning about and reviewing the concept of place value, so they should be familiar with using terms such as "ones place," "tens place," and "hundreds place."
 - Students have been learning about estimating and rounding in previous lessons during Topic Two, so problems that require these skills should be review.

A yellow sticky note is placed over the document with the following feedback:

Great lesson plan [Redacted] If I were a sub I would definitely be able to understand and carry out your lesson because of your great detail!

The right sidebar shows "Comments & Markups" with one comment: "Great lesson plan [Redacted] If I were a sub I w..." - a month ago.

Figure 15. Example of generic peer feedback.

Iteration Cycle 2: Focusing on Building Participants'

Feedback Capacity

These emergent findings and lines of inquiry shaped the planning and design of Iteration Cycle 2 in another way. In addition to intervening with the TeachSpark Buddy activity, my other intervention goal was to directly address the feedback capacity of the student teachers and to use the session training and TeachSpark (as a tool) to achieve this aim. To begin building the feedback capacities of the student teachers in the November session, I explicitly made clear their *role* in identifying their feedback needs for their feedback sources. During my presentation, I linked their role to their shared perceptions of what constitutes high-quality feedback. I also

invited the field supervisors to explain how having a lens to give feedback helps them do a better job as coaches and mentors, and this would be true for their peers as feedback providers as well.

The second portion of the capacity training was on how to use TeachSpark to receive higher-quality feedback, not only from their peers, but everyone in their feedback network. In the regional center's computer lab, I demonstrated how to specify feedback in TeachSpark, starting with the feedback request (using the desired feedback field).

Next, I demonstrated how to provide preemptive, feedback comments once a feedback request has been sent. This involved opening the document (e.g., lesson plan) in TeachSpark and placing an on-text comment, anchored to the area where the student teacher needed feedback (see Figure 16). This way, when the feedback provider reviews the document he or she immediately sees a comment asking for the desired feedback (or question) and located in the part of the document that needs attention.

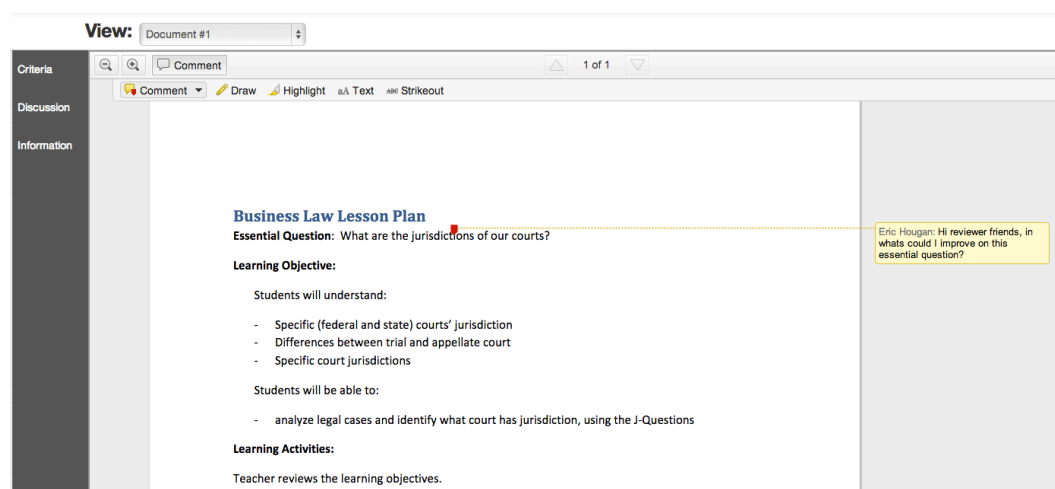


Figure 16. Example of a pre-emptive feedback prompt.

Immediate Feedback from the November Training

On the same exit slip I used to capture student teachers' attitudes and planned actions on the TeachSpark Buddy activity, I asked questions pertaining to what extent the training met its

objectives of building feedback capacity. More specifically, I asked the student teachers to indicate to what degree they agreed or disagreed (“strongly disagree,” “somewhat disagree,” “somewhat agree,” or “strongly agree”) with the following statements below:

- To the statement, “This session showed me multiple ways to seek targeted feedback using TeachSpark.”
 - 7 (50%) – responded “Somewhat agree”
 - 7 (50%)– responded “Strongly agree”
- To the statement, “In using TeachSpark, I am going to make an effort to better indicate the feedback I seek.”
 - 9 (64%) – responded “Somewhat agree”
 - 5 (36%) – responded “Strongly agree”

This preliminary data was promising because it showed the student teachers had a better understanding of how to solicit targeted feedback from peers, and others in their network, and planned to make an effort in indicating their feedback needs in the future.

Observable Changes in Capacity and Feedback Quality

I was keen on measuring (a) if student teachers began to use the different methods (desired feedback field text, and pre-emptive comments) to specify their feedback needs, and (b) if, in turn, the student teachers were exchanging more specific, constructive feedback among each other.

Data from the participants’ interviews and accompanying screenshots indicated, across all participants, student teachers’ capacity to specify feedback needs improved. Student teachers explained they began to use the desired feedback text box more effectively, or used the pre-emptive comments to anchor targeted feedback, or a combination thereof.

Tracy provided an illustrative example of how she began to take-up the practice of asking for specific feedback, whereas before she would just send the feedback request without

indicating what her feedback needs were. Below in Figure 17 is a screenshot of a feedback request Tracy generated. In this example, she is sharing a resource called Shape Journals with her TeachSpark Buddies. Tracy described the feedback she was seeking:

I put together a Shape Journal for one of my activities for a math lesson, and I was a little concerned that it was developmentally too high for kindergarten, and so I put it up on TeachSpark and was able to just say, I'm not interested in selling it or anything like that, I'd just like to know if you feel this is appropriate for that age group.

Tracy indicated that she received feedback in return about the curriculum being developmentally appropriate, and in her words the feedback “was on target.” She went further by saying, “She answered the questions I had. It was very brief. It would have been nice to have more detail, I guess, but she was right on.” This quality of interaction had not been happening before the intervention.

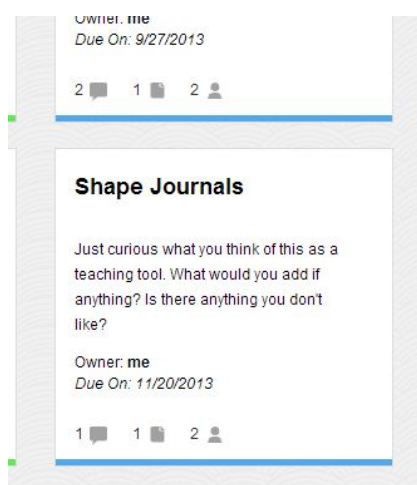


Figure 17. Example of Stephanie of specifying feedback needs.

Other student teachers found value in specifying their feedback needs using the on-text comments (the pre-emptive approach). Sammi enthusiastically said in our third interview,

I'm in love with those little track changing box things. I used them in when I sent requests for feedback. I would send little notes of 'Do I need a transition here? Would this work?'

Another example of changes in capacity was in the interactions between Erika and Kelly. Initially Erika didn't view Kelly's comments as high-quality feedback because they lacked specificity and were short on substance. However, in our third round of interviews, Erika stated, "[Kelly] gave me some pretty good feedback on my own lesson, so that was nice." Erika provided a screenshot of the feedback (see Figure 18). Comparing Kelly's feedback prior feedback in Figure 15 to her feedback, after the interventions, it is clear Kelly began to give more substantive thought to her feedback to Erika. When I asked Kelly about her improved capacity in providing feedback, she contributed it to seeing Erika modeling high-quality feedback to her and our training:

I didn't realize there were parts that I could give specific comments too. I really read (Erika's lesson plan) it a little bit deeper and was able to pick out things that were more specific. I think, yes, it had something to do with her and then just talking about quality feedback and I wanted to give her quality feedback.

The screenshot shows a web browser window displaying a lesson review on TeachSpark. The URL is <https://goteachspark.com/lesson/review/>. The page title is "Review". The navigation bar includes "TeachSpark", "DOCUMENTS", "VISITS", "REFLECTIONS", and "BLOG". The user is logged in as "@comcast.net".

The main content area is titled "View: Document #3" and includes buttons for "Add Documents" and "Add Reviewers". The page is divided into sections: "Criteria", "Discussion", "Information", and "Status". The "Criteria" section lists 10 items, with 4-8 highlighted in yellow. The "Discussion" section contains three comments from students, each in a yellow box. The "Comments & Markups" sidebar on the right shows a list of comments from other users, with the first one selected.

Criteria:

4. **Anticipatory Set/Motivator:** Have a short discussion about what point of view means. Discuss how people can have different or similar points of view on various subjects. Ask for examples of when they have had different or similar points of view from their friends.
5. **Lesson Objectives:**
 - a. Essential Question: How do people make government work?
 - b. RI.3.6: Distinguish their own point of view from that of an author of a text.
6. **Grouping of Students:** We will be working in small groups. Two groups go to two different stations on Tuesday and the other two stations on Wednesday. Each station is a half hour long.
7. **Learning Activities:**
 - a. Discuss questions listed in the Anticipatory Set section of the lesson plan.
 - b. Have students be thinking about what the point of view of the author might be for the story. Every Vote Counts.
 - c. Read the story together.
 - d. Discuss details of the story that will lead us to the author's point of view and write them in our graphic organizer.
 - e. Decide what we think the author's point of view is.
 - f. Discuss whether we agree or disagree.
 - g. Tell students to be looking for an author's point of view in their own reading to share during our 15 share time.
 - h. Switch groups and repeat.
8. **Differentiation:** The small groups are divided up by reading ability/level.
9. **Assessments:** The graphic organizer will act as an assessment of student knowledge of determining the author's point of view.
10. **Closure:** The discussion of whether we agree or disagree with the author's point of view will be the closing activity for this lesson.

Discussion:

- I like how you ask for examples based on their own experiences with their friends. That's a great way to get them involved because you are making it towards their interest!
- That's great that you guys are already learning this in third grade!
- Great way of breaking it up so that its not too much in one day
- I like that you allow them to agree or disagree so that you are giving them a choice and making it okay to have your own opinion

Comments & Markups:

Page 1

- I like how you ask for examples based on t... 24 days ago
- That's great that you guys are already lear... 24 days ago
- Great way of breaking it up so that its not t... 24 days ago

Page 2

- I like that you allow them to agree or disag... 24 days ago

Figure 18. Example of Kelly giving more robust feedback.

Triangulated Findings with Supervisors

If the changes in behavior were observable with peer-to-peer feedback, then were field supervisors experiencing similar patterns in their feedback interactions with the student teachers, within the task structures? Helen reported not seeing students use the desired feedback field, but Fran did. In the following quote, Fran described this change:

I did start seeing evidence of them. Suddenly, I started seeing, 'Oh, I submitted my lesson plan. I'd like feedback on the assessment portion or my lesson procedure.' That helped me because then I knew exactly what they were looking for. Again, I don't like guessing. I want to know. Otherwise, I'm going to go in there and look at that lesson plan and go, 'Hmm.' – Interview 3

Fran provided a screenshot (see Figure 19), showing examples of how students were using the desired feedback field. Of special note is Eva. I had earlier highlighted her (lack of) capacity when she wrote, "Comments please." From Fran's screenshot she is now asking more specific

questions of how to better engage the students. In turn, Fran provided more targeted feedback on engagement, whereas before, she may not have done that. Overall, both field supervisors reported observing students using more often the pre-emptive comments to solicit feedback.

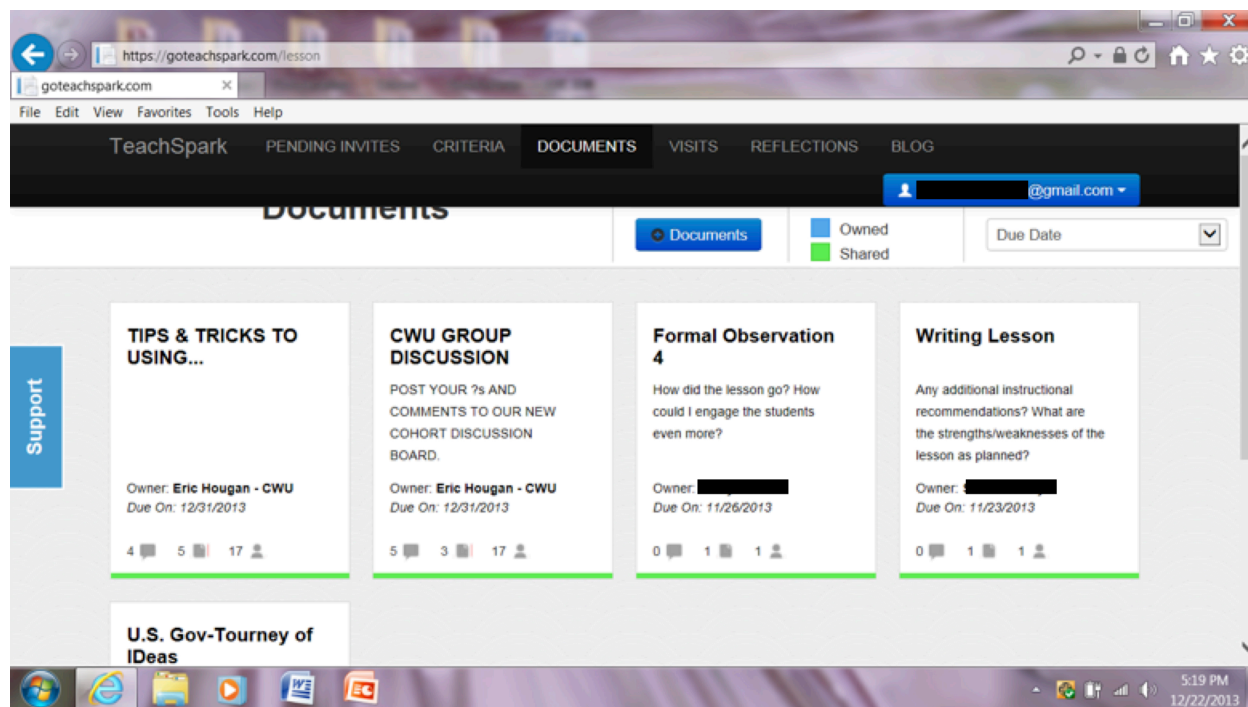


Figure 19. Examples of student teachers specifying their feedback needs.

Influences on Students Teachers' Practice

If the quantity and quality of the feedback were increasing, in what way (if at all) did this influence or impact the student teachers' practice? In the course of data analysis, two themes emerged as potential influences on the student teachers' practice. The first dealt with having the student teachers specify their feedback needs through the feedback requests and leaving pre-emptive comments. By doing this, the feedback student teachers received was more on-target and therefore had a higher probability of influencing their practice.

This pattern was further evident in the feedback delivered by field supervisors. Student teachers explained that by specifying their feedback needs, the field supervisors' feedback became less generic, and, in turn, better met the student teachers' instructional needs, questions, and concerns. Tracy explained it this way:

I think it just made it very clear what I was looking for or what someone else was looking for, so the feedback I got was always relevant to what I really wanted to know, and then when I was giving feedback, it gave me an idea of what to be looking for in a document or to answer questions.

Another fascinating theme was around the student teachers' capacity to solicit and deliver high-quality feedback. Student teachers attributed their capacity growth to practice, seeing others model best practices ("setting the bar"), the training sessions, and from the interviews. In the quote below, Erin talks about her growth,

I just uploaded and shared. I did not say, 'Hey, can you give me feedback for here.' I mean... I didn't think about it that way. I could probably help Helen out and help myself out by saying, 'Hey, can you look at this specific area of my lesson plan' although I may of thought of it in my head... So the addition to TeachSpark was very helpful. It made it so that I might've had the idea to ask Helen, you know, 'am I starting my lesson out with a good do-now or, you know, am I breaking it up enough for these students?' It kinda forced me to ask those questions, which as a student teacher I thought was great, especially for myself because I'm not a ... I'll do it myself. I'd rather try to struggle through it rather than ask those questions, and it forced me to ask them, and I liked that.

Another student teacher said filling in the desired feedback field made her stop and reflect on her needs. This suggests that the tool, in a way, acted as a mechanism to be more "intentional" (as Fran described) and reflective. Moreover, this indicates an increasing advocacy on the student teachers' part, taking a more active role in seeking the feedback they need to address any instructional gaps that may have.

Summary

These examples and the analysis reported in this chapter suggest some promising developments from this design-based research. First, peers are turning to each for instructional- and curriculum-focused feedback, utilizing an additional channel for feedback that has the potential to impact their practice. Second, the student teachers' capacity to communicate their feedback needs was improving—a vital skill for any novice professional. Third, the response rate (shown in the uptick in network density) shows peers are responding to feedback requests. Lastly, by specifying the desired feedback (in its various forms through TeachSpark) may be a major influence on the student teachers' perception they are receiving higher-quality feedback now, compared to before the intervention.

Chapter 6.

Concluding Reflections

Reform efforts—reflected in accountability measures and accreditation standards—has shone light on teacher preparation programs (Sawchuk, 2013), pressuring these programs to enhance preservice teachers' competencies, such as overall quality and technological fluency (Dexter & Riedel, 2003). These pressures are pushing colleges of education to play a more consequential role in building teachers' effectiveness in—and through—technological fluency, practice-centered education, and reflective practices (Gomez et al., 2008). These recent pressures join a longer set of concerns about the improvement of teacher preparation (Bullough et al., 2002; Greenwood & Maheady, 1997; Levine, 2006).

This context of school reform efforts and improvement aspirations makes way for new thinking and approaches that support learning to teach. A likely target for improvement is the process and nature of professional feedback, with an eye for better understanding its role and substantially enhancing the support it provides to student teachers' growth through teacher preparation programs. Examining what the literature tells us about effective feedback and identifying ways to build teacher capacity in using professional feedback to improve their practice takes us only part way toward the goal of improved preparation. A closer examination of opportunities for student teachers to receive regular feedback on their practice, how student teachers perceive and learn from this feedback, and the creation of tools, systems, and cultures, that make such feedback a regular part of teachers' professional work is in order, to truly maximize the returns on teacher quality investments and its impact on student learning.

This case investigation of two groups of student teachers (in a traditional teacher preparation program) sheds light on the feedback they receive (and seek) from the task- and

participant-structures embedded within the practicum experience. I employed design-based research (DBR) and social network analysis (SNA) methodologies, to collect empirical data and attempt to answer research questions about these students' feedback experiences and possible improvements in them. To that end, design-based research methodology allowed me to develop and test an intervention design, consisting of feedback software, support activities, and user support. Under DBR, I had two cycles of iteration in the intervention design that focused on improving student teachers' access to high-quality feedback. The social network analysis methodologies provided network density measures and visual mapping of the student teachers' feedback-related interactions, which acted as a springboard to further inquiry on the student teachers' perceptions of their feedback structure and as a basis for examining the sources, nature, and other dimensions of the feedback these students sought and/or received. In sum, case study, DBR, and SNA methodologies served different roles within the overall study design and helped to deepen our understanding of the feedback structures of student teachers, and portrayed promising ways in which particular interventions may shape this feedback structure.

Summary of Findings

The study's overarching aim was to expand student teachers' access to high-quality feedback and this goal rested on three design conjecture pillars. In brief, the first conjecture asserted that providing access to feedback software and support, that aligns to feedback best-practices, would enhance the quantity of high-quality feedback flowing to student teachers. The second conjecture contended that by examining and (if necessary) bolstering feedback on student teachers' required tasks (task structure), they may have greater access to feedback opportunities. The third conjecture argued that by examining and augmenting through careful data analysis and

intervention of student teachers' networks (specifically their informal peer network), the student teachers may have greater access to high-quality feedback.

This strategy of developing a conjecture map provided a useful framework to address this study's research questions from practical and theoretical perspectives (Sandoval, 2013). In the following sections, I highlight the main findings of this study, organized by the study's first two main research questions (which relate to the quantity and quality of feedback provided to student teachers). Lastly, I share challenges and lessons learned from carrying out the design-based research itself (research question 3).

What Can Be Learned from this Study: The Quantity Perspective

The first driving research question was, "From the student teachers' perspective, how does the design intervention (software, training, and participant activities) affect opportunities for feedback, and, in what ways? What was the nature of the feedback?" Analysis of data from the two interaction cycles revealed two main answers: (1) a new feedback channel emerged, and (2) peer-to-peer feedback interactions increased.

New feedback channel emerged. As Chapter 4 reported, the design intervention influenced student teachers' access to high-quality feedback from within their *task structure*, which comprised of the exchange of assignments between student teacher and field supervisor. Of particular interest were the lesson plans, weekly reflections, and parent/family letters that student teachers were asked to submit to their field supervisors. These tasks constituted possible feedback channels for the student teachers.

The study found that, prompted by the TeachSpark tool and related assistance, both field supervisors provided more feedback on the student teachers' tasks, compared to past quarters

(when the tool was unavailable). In the case of Helen, the ease of using the software tool and requiring the lesson plans to be submitted 48 hours in advance of an observation contributed to her providing more feedback. She had this explanation in the 2nd interview:

To be very honest, I think it's made me a better supervisor because, before I'd get their lesson plans, rarely did I give them feedback. I collected it, looked it over before I went in, but I didn't send them much feedback because it's so hard to do. There was no way to typewrite on the paper and get it back to them fast enough. This way, I'm getting them further ahead, I have time to look them over; they have time to look over what I send, hopefully. If they didn't, at least, they saw what I attempted to tell them even if it was after the fact.

What was exciting about this new channel of feedback for student teachers, was the nature of the feedback being exchanged, which was *instructional*-focused. Because student teachers conceptualized high-quality feedback as being specific and connected to their classroom's teaching and learning needs, the *lesson plan* feedback channel provided fertile ground for such high-quality feedback. This exchange of instructional feedback, perhaps, holds greater potential to directly shape student teachers' practice than other forms of feedback (e.g. informational). For instance, Helen, and (later) Fran, would anchor their feedback using the software's on-text commenting tool to specific areas within the lesson plans, leaving feedback that ranged in topics, from discussing ways to better engage students to providing more effective in-class feedback to students.

The software intervention was not sufficient, by itself. A second finding in Chapter 4 highlighted how, in Fran's case, there were potential roadblocks to efforts to expand feedback opportunities through the *lesson plan* feedback channel. This finding revealed that Fran was not initially providing feedback, offered possible explanations for this lack of feedback, and pointed to ways in which this design addressed it. To start, data from student teachers' interviews made it clear: Fran was not providing feedback to student teachers' lesson plans prior to their

scheduled observations. Students noticed this lack of feedback, and, as a result, two student teachers reported putting less effort into their lesson plans because they felt their lesson plans were being ignored.

Several factors inhibited Fran's ability to provide feedback on students' lesson plans prior to their student teaching. First, her concerns of health and job-security, as well as a grueling travel schedule may have put a strain on her ability to provide high-quality feedback on a consistent basis. Second, Fran's lack of technological know-how limited her ability or desire to provide the feedback on lesson plans using TeachSpark. While the external pressures could not be manipulated by the study design, Fran's knowledge and skills in using TeachSpark (to provide feedback on lesson plans) were addressable.

Human-computer interaction literature stresses that in learner-centered design users have varying degrees of technological skills and knowledge and that designers should take efforts to help *all* users grow in their knowledge and skills in using the software tool (Soloway, 1994). A learning from carrying out this design-based research, and attempting to address the users' diverse learning needs (in using the software), was the potential benefits of having multiple ways to measure, and continually evaluate the users' learning growth. In retrospect, I initially relied too much on interviews and casual check-in questions, to identify any performance issues in using the software. It was only when employing various, on-going monitoring strategies, such as observing Fran use the software in combination with our interviews, that I was able to uncover her learning needs and properly address them.

Peer-to-peer feedback increased. Chapter 5 focused on the student teachers' participant structure, exploring (and measuring) the student teachers' feedback network, specifically the informal feedback network of peers from within their student teacher groups and identifying

ways to bolster the feedback connections (ties) among this network. The data revealed that, by midway through the practicum experience, student teacher groups were not, to a large degree, sharing with each other, and suggested some possible reasons why this was so.

The most cited reason was that the peers didn't know each other, lacking the relational-foundation (the necessary rapport) to feel comfortable enough to exchange feedback. Even when a student teacher such as Tracy sent out numerous feedback requests to her peers, she rarely received a response back. The learning here, as part of the design-based research approach, was the importance of testing relational assumptions, making sure that the student teacher groups had strong enough network ties to foster feedback exchanges. We know from feedback literature that teachers' perception of their feedback source matters in how they receive and process feedback, and this study's case of student teachers was no exception. Teachers are more likely to listen to feedback if they perceive sources to be credible and trustworthy (Banniser, 1986; Marzano & Simms, 2013). Fostering a relationship, based on mutual respect and trust, is fundamental to enacting the necessary feedback, collaboration, and risk-taking for instructional improvement (Conway, 2003; Kohler, Mccullough Crilley, Shearer, & Good, 1997).

The analysis in Chapter 5 further demonstrated that many of the dyadic ties among student teachers were not static and could be influenced by this study's design intervention. For instance, while initially student teachers maintained weak ties among themselves in the feedback network, after the "TeachSpark Buddy intervention" (as part of Iteration Cycle 2), the state of these ties (feedback channels) changed. Analysis of SNA measurements, software analytics, software artifacts (screenshots), and student teacher interviews confirmed that, after the TeachSpark Buddy intervention, student teachers began to exchange more feedback among their peers, altering their peer-to-peer feedback structure within their overall informal network.

This finding was promising in a few ways. The improved peer-to-peer feedback structure, opened new channels to receive feedback that was pertinent to the student teachers' work, while also broadening the kinds of feedback that students received. Student teachers reported receiving additional *instructional*-and *curriculum*-focused feedback, which, for the reasons previously mentioned, may have a direct influence on the student teachers' practice. In addition, *informational* feedback flowed through the peer-to-peer channels. Most of this informational feedback pertained to the edTPA; this new feedback structure provided another dimension of support for student teachers in working through this new reform measure.

The potential benefits of the expanded peer-to-peer feedback structure can further be found in feedback literature. Each of the student teachers' feedback sources may provide unique affordances and constraints on the delivery of effective feedback and the degree of teacher receptivity to this feedback. Empirical evidence showed that having peers as coaches may alleviate norms of isolation, foster increased risk-taking to change their practice, and increase teacher efficacy (Bruce & Ross, 2008).

What Can Be Learned from this Study: The Quality Perspective

The second research question was: how do the student teachers perceive the quality of the feedback, and to what extent (if any) did the design intervention (that includes the software) influence the student teachers' perception? In short, the study found evidence that the software intervention could and often did enhance the quality of feedback, though it did so unevenly, for reasons I explore below. To introduce these findings, I first review what the data revealed about the student teachers' overall perception of quality from their task-and participant- structures.

General perceptions of feedback quality from supervisors and peers. Let's first unpack the student teachers' perception of the feedback flowing from their task structure (using TeachSpark): lesson plans, reflections, and parent/family letter. Outside of the six observations, these tasks constituted a significant portion of the feedback that student teachers received on a regular basis. Each task acted as a potential channel for feedback. The nature of the feedback that flowed from these channels varied at times. For instance, field supervisors and student teachers reported giving more *informational* feedback and supportive (encouraging) comments on the weekly reflections, whereas, within the lesson plan channel, feedback flowing to the student teacher was mostly *instructional* in nature.

Another study finding showed that field supervisors were both perceived (and rated on a quality scale) by their student teachers as having provided high-quality feedback: feedback perceived as specific, constructive, encouraging, and timely. However, differences in perceived quality emerged between the field supervisors, more so when examining the feedback flowing from the various feedback channels. For example, from Fran's student teachers, the feedback quality on lesson plans was mixed. Because Fran had not initially provided feedback until the later half of their practicum experience, student teachers discussed not putting in their full effort into the lesson plans. This may have contributed to a view that the lesson plans weren't a productive feedback channel, and this view (being too entrenched) carried through the rest of the academic quarter.

Turning to the peer-to-peer feedback network, student teachers perceived, in general, the feedback quality of their peers as lower compared to their field supervisor and cooperating teacher, only "somewhat agreeing" that the feedback was high-quality. However, the perceived feedback quality began to improve over the course of the quarter. Student teachers contributed

this increase in quality to more practice in giving feedback, understanding how to better use TeachSpark to solicit and provide targeted feedback, and viewing other peers' high-quality feedback, which, in turn, raised the bar of expectations among the student teachers. Finally, student teachers, in general, pointed to the TeachSpark Buddy intervention (and the grade-level and subject arrangements therein) to have facilitated better exchanges of feedback. A plausible explanation was that student teachers knew more of each other's teaching context and needs, such as understanding how a certain curriculum may or may not be developmentally appropriate for their peers' students.

TeachSpark may have influenced quality. In an exit survey, student teachers were asked to indicate their degree of agreement (“strongly disagree”, “somewhat disagree”, “somewhat agree”, and “strongly agree”) to the following statement: *TeachSpark improved the quality of the feedback I received (compared to not having TeachSpark and/or using emails or other alternatives)*. Fourteen student teachers voluntarily responded, and here's a breakdown of participants' responses and a sampling of the accompanying comments:

- 2 student teachers marked “somewhat disagree”;
 - *Comment:*
 - “I work best with immediate face-to-face feedback. Also, I can ask the questions without worrying about grammar.”
- 9 student teachers marked “somewhat agree”;
 - *Comments:*
 - “The quality of the feedback was stronger because it was more specific.”
 - “I could refer back to it regularly.”
 - “I was able to pinpoint the feedback I wanted.”
 - “Some feedback didn't seem too in-depth / none at all.”
- 3 student teachers marked “strongly agree”
 - *Comments:*
 - “It made the logistics of lesson plans easier for my student teachers and myself”
 - “TeachSpark gives the reviewer outlines (formats) and many ways to provide a lot of different kinds of feedback. Also, the person

asking for feedback can ask for specific feedback which increases the quality of feedback given.”

These survey results (in combination with other empirical evidence) suggest that TeachSpark affected the quality, and this effect may be attributed to the design and ongoing iterations to the software tool. Student teachers and field supervisors consistently pointed to the ability to make explicit their feedback needs, and use the tool’s on-text comments to anchor feedback to specific parts of their assignments. TeachSpark also allowed for student teachers to describe their needs in their initial feedback request. These software features are aligned with the best practice (indicated in feedback literature) of delivering focused feedback on teachers’ needs (Brockbank & McGill, 2006).

Not everything worked perfectly with TeachSpark. However, through the DBR process, I was able to identify the hindrances to high-quality feedback. The biggest concern expressed by users was over not getting timely notification when feedback is provided, and research tells us that giving timely feedback is a critical part of effective feedback (Goddard et al., 2010; Kouzes & Posner, 2006). Literature shows that, teachers acquire targeted teaching behaviors “faster and more efficiently when feedback was immediate” (Scheeler, McAfee, Ruhl, & Lee, 2006, p. 21). Based on user data, we designed and implemented an email notification and a status update system to alert student teachers when their feedback providers posted feedback. Student teachers noticed these changes and said that this resolved their issue of a lack of feedback notifications.

Feedback capacity shaped the quality of feedback. Another interesting finding came into view, around the use of TeachSpark and users’ feedback capacity—that is capacity to frame and provide useful feedback, as well as their capacity to seek out more specific forms of feedback. Evidence suggested that the more student teachers engaged in the use of TeachSpark, the more

the perceived quality improved. Sociocultural theory's notion of "becoming", and focus on cultural and material tools, provides a useful lens with which to view growing and refining feedback in the context of this software tool. Central to situative theory is the idea that humans, cultural tools, and the irrevocable tension between them have a particular past and are continually in the process of undergoing change (Wertsch, 1998). Take the example of Erika and Kelly in Chapter 5. As Erika and Kelly used TeachSpark and participated in trainings, they were able to assert their own agencies through the software, and, in using the software, they become particular kinds of people. The Zone of Proximal Development, a helpful frame to view this, refers to "The ever emergent and continuously changing distance between being and becoming" (Holzman, 2006, p. 114). The Zone of Proximal Development is best understood in this context as the means through which capacity is built.

The potential to create better outcomes with increased feedback capacity is inherently oriented toward the future. For example, by framing her feedback needs and modeling high-quality feedback to Kelly, Erika illuminated the ways in which she leveraged the tool in order to direct higher quality feedback from Kelly to her. Viewing design work through a situative lens not only allows for a focus on emergence, and is therefore particularly useful in a DBR context, but it also underlines the idea that people develop in relation to one another and the tools that they have access to. In this sense, capacity is measured by how effectively the feedback receiver, provider, and software come together.

What Can't Be Learned from this Study

As with any study, there are boundaries around what the findings do and don't tell us. In this regard, I discuss areas that the study doesn't address: the study has little to say about the

degree of enactment based on feedback (that is exactly what participants did with the feedback they received), the costs of additional feedback channels, and the possible connections to informal networks *outside* the student teacher group.

Degree and form of enactment based on feedback. In Chapters 4-6, I highlighted how this study suggests that the intervention design (TeachSpark and the various activities) improved the quality of the feedback to student teachers, particularly through their task-and participant-structures. By some accounts, student teachers and field supervisors described examples of student teachers (or themselves) using the feedback to make adjustments to their teaching. Others could not pinpoint changes to their practice based on specific feedback from their field supervisors or peers. This leaves a murky picture of the actual impact of this study's design on teaching and learning. What is even less clear from the data is the extent and actual form of enactment. This results in the following unanswered question: To what degree did the feedback, exchanged through TeachSpark, lead the student teachers' to adjust their instructional practices (and in what ways)?

To attempt to answer these questions, layers of data need to be collected and analyzed. An illustrative example of this is a field supervisor providing feedback on a lesson plan. To start the process of assessing the impact on practice, I would first need to establish the actual number of lesson plans the student teacher posted for feedback (since some student teachers neglected to post their mandatory three lesson plans), and out of these posted lesson plans, how many received feedback from the field supervisor. Next, even if the feedback was present, I would need to determine if the student teacher viewed this feedback prior to the planned observation, allowing for time to potentially adjust instruction. Next, out of the viewed feedback, what feedback (if any) did the student teacher perceive as potentially useful in impacting their

practice? Finally, did the student teacher act on this feedback, adjusting their instructional practice? And, if so, what was the perceived impact (positive or negative) on the teaching and learning?

In short, this level of data collection was outside of the purview of this study. While I collected self-reported data on the influence and impact to get a sense of what might be happening in enactment, the study's focus was more on understanding and measuring ways to broaden access to high-quality feedback.

Cost of additional feedback channels. Helen and Fran expressed concerns about the increasing pressures on their role as a field supervisor. Helen often described having a “full plate” with all her field supervisory responsibilities. She referred to the pressure of scaffolding the student teachers' learning in order for them to be successful on the edTPA. She also described feeling “buried” in paperwork. Fran echoed these concerns and expressed how she is working a lot of the time, even on the weekends.

Understanding the busy life of the field supervisor, I wondered how the use of TeachSpark either helped or added to their workload. On one hand, the field supervisors consistently reported how much easier it was to use TeachSpark to provide feedback and communicate compared to email. On the other hand, TeachSpark and its design opened new channels for feedback, specifically around the lesson plans for planned observations. While TeachSpark was more efficient than email, it did add more work in terms of viewing the lesson plans and providing feedback. In Helen's case, suppose all nine of her student teachers posted their three required lesson plans. This would result in 27 additional lesson plans that Helen would feel responsible for in giving feedback on, and this could create a sort of tension for the field supervisors.

Similarly, there may have been an issue for student teachers in terms of a “cost” for the time spent in learning TeachSpark and in using the software. Because the software was new (and constantly being improved) the students experienced a learning curve, which may have meant they spent more time using TeachSpark than other means for exchanging feedback. It’s unclear if this “time cost” from the learning curve was offset by the “time savings” from the ease-of-use once users were familiar with the software, especially considering the short time frame of using the software. While these possible costs are important considerations for future DBR work, it was not the unit of analysis for this particular dissertation study.

Learning from the map of the entire feedback network. In analyzing the student teachers’ network, data were collected on their entire network: informal and formal networks. What is not reported in this dissertation is the degree to which student teachers used TeachSpark with their informal network (outside of their peer group): family, friends, past-professors, etc. I decided to focus this dissertation study on the formal relational ties between student teacher and field supervisor and the student teachers’ informal network of peers in the two student teacher groups. The decision to bound the network to these two network structures was to allow for a deeper analysis of the nature of these ties, examine the flow of feedback within the channels, and measure student teachers’ perceptions of quality. Furthermore, within these bounded structures, I was able to better triangulate findings among the various data sources: other participants’ interviews, artifacts, survey data, and analytics.

Alternative Interpretations of Study Findings

While this study suggests that this study’s design-intervention increased opportunities for feedback to student teachers within their task structure and among their peer network, it is

plausible that there are alternative interpretations of these findings. Three alternative interpretations present themselves and are discussed when the following dimensions are taken into account: (1) the effects on the finding when comparing participants to non-participants, (2) the potential power of building participants' feedback capacity and its impact on the student teachers' access to high-quality feedback as compared to other design variables, such as the software tool, and (3) the findings reflect that of a short time frame (sufficient for only two iteration cycles), and, perhaps, a longer timeframe for this study with additional iteration cycles may have elicited greater effects.

The first alternative interpretation resides with the actual participants compared to the non-participants of the study. It's plausible that the participants who consented to this study and actively participated (by exchanging feedback with peers and conducting interviews) differed in some measureable way from the non-participants. These differences may have inflated (or influenced) this study's findings on the design-intervention's impact. In general, the participants were very accommodating and willing to take risks, such as sharing with peers, even though they were extremely busy with student teaching and completing the edTPA. This "go-getter" mentality and perhaps their capacity to balance many competing demands on their time may have shaped the participants' experiences with the study's design, which, in turn, influenced the study's findings. Alternatively, if the non-participants' perspectives were included in this study's analysis, then the study's findings may tell another story or offer different insights.

Some evidence within the study supports this view. Non-participants also had access to the TeachSpark software, yet in general they maintained lower engagement with the software and shared less with peers (shown through software analytics, exit surveys, and SNA measurements). In fact, 50% of the non-participants had not requested peer feedback using

TeachSpark by the end of the study (compared to 12.5% of the participants not requesting peer feedback). This could be read a few different ways. For one, the non-participants may have simply not engaged with their peers for feedback, ultimately not utilizing this potential feedback network. Alternatively, they may have sought feedback from others (outside of their peers or field supervisors) within their informal network. Another interpretation is they reached out to their peers for feedback without using TeachSpark, but perhaps used alternative modes (such as Facebook, text messages, or email). This however seems less likely as I would've picked up on these interactions when carrying out the ego-centric social network analysis of each of the participants. Overall, collecting additional data and, more importantly, learning of the non-participants' thinking and perspective around the design and their feedback networks would yield interesting and rich understandings.

The second alternative interpretation contends that certain variables (e.g., building feedback capacity or using the software tool) within the design may have had an outsized influence and effect on the study's outcomes, than what is presently understood. For example, it is possible that the design's effort to build feedback capacity (via training) played a greater role than the software tool itself. I observed that each student teacher, at the start of the study, was at different stage of development in their feedback capacity compared to their peers, and while they all experienced growth in their feedback capacity through training and through exposure to different feedback interactions, the student teachers' feedback capacities, evolving and varied, may have influenced the study's outcomes in different ways.

Let me illustrate how participants' feedback capacity may have influenced the study's outcomes through a quick thought-experiment. Suppose a student teacher achieved a certain level of feedback capacity—an ability to exchange high-quality feedback on a consistent basis—

where it perhaps transcends the need for feedback software, such as TeachSpark. It may be possible this particular student teacher could achieve the same results reported in this dissertation by using alternative means to exchange feedback. This same student teacher may simply substitute TeachSpark with a cloud-sharing platform, such as Google Drive (Docs).

One could go even further with this inquiry, asking if there's an inverse relationship (when feedback capacity increases, reliance on feedback software declines), or a positive correlation (when feedback capacity is increased, the feedback software is utilized more). This evidence from the study, while not conclusive, points to the latter scenario: the mutually beneficial, interdependence between the two variables. Evidence suggested that as student teachers grew in their feedback capacity, it, in turn, mediated their use of TeachSpark, employing best practices using the software's features to solicit and provide effective feedback. However, a deeper understanding of the feedback capacity of each of the student teachers could paint a richer picture to what degree the interventions influenced the study's outcomes.

Finally, the length of the study's timeframe, which only allowed for two iteration cycles, played a role in the study's outcomes. Alternatively, if the length of the study was extended, perhaps over multiple academic quarters, then this would allow for additional iteration cycles and improvement the design. In turn, these design improvements may elicit greater effects on the overall study aim of improving student teachers' access to high-quality feedback.

Unanswered Questions and Possible Future Research

As the discussion of alternative interpretations begins to suggest, this dissertation serves as fertile ground to explore additional questions and launch future research (as any iterative design-based research process is likely to do). I present two major research trajectories from this

research. One trajectory provides ways this study's line of inquiry could be expanded within the teacher preparation setting, as well as, be applied into the K-12 space. The second trajectory focuses on building upon burgeoning theoretical components that were highlighted in this study, namely, better understanding feedback capacity and its dimensions as part of the student teachers' supportive infrastructure.

The first trajectory is anchored on continuing this line of DBR work, but taking on different dimensions. One such dimension (and an obvious line of research) is to extend this same study over 1-2 years, stretching across the teacher preparation and induction process. This may prove fruitful because the study's desired outcomes may be more fully realized by engaging in more iteration cycles. Also, introducing the software earlier in the teacher preparation program might allow for the pre-service teachers' learning curve in using TeachSpark to occur at a time of lower-stakes, instead of when they are preparing for student teaching (which was how it was for this study).

Another dimension to continuing this line of inquiry deals with sustainability.

Throughout this DBR study, I pondered the following questions:

- If not under the purview of a study, would field supervisors and student teachers continue to use TeachSpark on their own?
- In what ways and to what extent would the field supervisors continue to operate within the feedback channels?
- Would the nature of the feedback provided shift in any way? And if so, how?
- Would the field supervisors return to not providing feedback on observed lesson plans, or perhaps find more efficient channels to provide feedback?

Further study would be needed to answer these questions. A DBR study could shift focus onto refining and measuring the intervention's efforts to achieve sustainability, lessening the direct involvement of this or other researchers.

A third dimension of continuing this DBR inquiry is to better understand, in a more complete picture, the student teachers' whole feedback network and ways to create and bolster feedback channels within this structure. Employing a mixed-method study may uncover what actors in the student teachers' informal network (not just peers or field supervisors) play an influential role in the student teacher receiving high-quality feedback, and from the student teachers' perspective how this feedback influenced their practice.

Another DBR study could examine the access to higher-quality feedback by scaling this to all student teachers, not housing it at the regional center. In fact, a few participants suggested that they would've benefited by having more student teachers on the TeachSpark network. They indicated that this would broaden the pool of possible feedback sources within their particular grade or subject-level.

Finally, since this study's scope of inquiry was limited to student teachers in a teacher education setting, moving beyond this limited scope of research and exploring other settings (such as the K-12 space) would be beneficial. Strikingly, student teachers and in-service teachers experience similar problems of practice. It would then be worthwhile to apply this DBR-approach within the K-12 settings, attempting to address the shared problems of practices, such as inadequate levels of feedback on their practice (Marzano, 2011), and teaching autonomously and in isolation (Buck, Morsink, Griffin, Hines, & Lenk, 1992). This type of

inquiry, in this particular setting, presents a lot of room for development in the study design and inquiry.

A second main trajectory is theoretically-grounded. This DBR study provided clues that may be a springboard to a better conceptualization of what I refer to as feedback capacity. Through iteratively listening to the 30 participant interviews (in combination with other data sources), I began to conceptualize the following possible dimensions of feedback capacity:

- *Feedback delivery dimension (feedback provider)*: degree to which one delivers feedback consistent with feedback best practice.
- *Technical dimension (feedback provider and receiver)*: degree of knowledge and skills of the user in using tools to communicate feedback.
- *Awareness dimension (feedback provider)*: awareness of background / level of expertise of feedback seeker/receiver; degree of knowledge and skills to comprehend and respond to feedback recipients' needs (or anticipated needs) and his or her feedback delivery-preferences.
- *Awareness dimension (feedback seeker/receiver)*: awareness of background / level of expertise of feedback provider; awareness of the feedback source's constraints to providing feedback.
- *Advocacy dimension (feedback receiver)*: degree of knowledge and skills to solicit targeted feedback in the asking for feedback and reaching out to a professional network.

One of the affordances of carrying out DBR work is the ability to refine theoretical perspectives. This study may act as a catalyst for inquiry and conceptualizations around the concepts of feedback capacity and its dimensions.

Contributions

This dissertation study, sitting at the intersection of various research strands, offers new insights to the scholarly field. It may also provide contributions to practitioners in teacher education settings or elsewhere.

Scholarly Contributions

This case investigation tells the story of how using design-based research methodologies may have improved the access of two groups of student teachers (in a traditional teacher preparation program) to higher-quality feedback. Several contributions emerged from this. First, this study contributed to the growing body of literature around teacher networks. More specifically, this study added value by reporting on findings that relate to the student teachers' informal (peer) network. This study revealed how interventions may have influenced the feedback structure within this network, the nature of the feedback that flowed through this peer networks' channels, and the student teachers' perceptions of this feedback. While the study demonstrated these possible effects in a fairly limited setting, the dynamics at work here may well apply in various other settings (not necessarily limited to teacher preparation programs).

This study contributed to another strand of research: feedback literature. This literature is weak on how teachers learn and make meaning from feedback on their practice (Putnam & Borko, 2000; Visscher & Coe, 2003), and becomes even more scant when examining this from the student teacher perspective. This study offers fresh perspectives on how student teachers

view high-quality feedback, and the ways their views connect to existing literature bases (especially around feedback best-practices). Finally, as part of this study, new understandings may stem from how new, innovative tools and practices may have mediated the student teachers' access to feedback, as well as shape their feedback capacity.

Finally, this study delivers new insights within the design-based research field. This study may provide heuristics for other scholars engaging in DBR work, specifically around software interventions using conjecture mapping (a new technique in the DBR field), and understanding the potential benefits of using multiple monitoring techniques during iteration cycles.

Practical Contributions

The findings in this study may be useful to practitioners in several ways. Higher education administration within the teacher preparation program and field supervisors may read this case-study to shape their own ideas about how to improve access to high-quality feedback for their preservice teachers. This may mean that administration and field supervisors will look closely at the particular task and participant support structures in place for their student teachers, and seek ways to improve student teachers' access to opportunities for high-quality feedback within these tasks and participant structures. Moreover, this study sheds light on what constitutes "high-quality" feedback from the student teachers' perspective, which may be valuable information to professionals in the role of delivering or facilitating feedback to pre-service teachers. Taking into account that this study's evidence suggests feedback technologies and related support activities positively enhanced the feedback support to student teachers and in viewing this qualitative research as a *heuristic* case-study (Merriam, 2009), administrators and

field supervisors may find it beneficial to seek feedback tools and activities that serve their students in their particular contexts.

Additionally, this study highlighted the need (for two particular groups of student teachers) for training to improve how student teachers sought and provided feedback, and later described how this training may have positively shaped feedback capacity. Based on these findings, practitioners may want to examine their own internal approaches (if any) to addressing the feedback needs within their programs.

Contributions to Larger Educational Reform Debates

High-quality feedback plays a critical role in the learning and growth of student teachers, if not practicing teachers. Carrying out student teaching is a challenge, and with the additional requirements and pressures (namely the edTPA) onto the student teacher, there is a strong need for delivering high-quality feedback to student teachers as part of their supportive infrastructure. Administrators and student teachers facing these pressures should “work smarter, not harder.” I’m reminded that making meaningful and productive changes to instructional practices require us to examine, and, in some sense, “Reprogram our past ways of doing things” (City, Elmore, Fiarman, & Teitel, 2009, p 22). This study attempted to provide evidence that it’s worthwhile to pursue innovative approaches to better serve the feedback needs of student teachers. For this study, better serving their feedback needs meant examining student teachers’ current task structures and embedded peer structures for potential new channels of feedback and support.

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Appendix A: Interview Protocols for Student Teachers

Interview protocol for 1st interview with student teachers

Topic: Student teachers' perceptions of feedback, opportunities to feedback, and in using the software.

Informant:

Interview: 1st interview

	Question / Topic	<i>Listen-fors</i>	Probe
1	<p>Thank you for agreeing to participate in this study.</p> <p>Warm-up...</p> <p>What's student teaching like so far?</p> <p>What are the biggest challenges? Nicest surprises?</p> <p>What sort of cooperating teacher do you have?</p> <p>Get background information.</p>	<p>Acquire background information on Ps</p>	<p>Grade-level? Subject?</p> <p>% of teaching v. observing?</p> <p>School / district?</p>
2	<p>As you may recall, this study is focused on feedback to student teachers. For this study, let me start by defining feedback.</p> <p><i>Professional feedback helps teachers' instructional improvement efforts by providing necessary information on specific practice-based performance. The ideas here is to close the gap between what is understood and what is aimed to be understood by the teacher.</i></p> <p>That said, I'd like to hear your thoughts about what makes high-quality feedback – feedback that helps “closer the gap” more than other types of lower quality feedback.</p> <p>Could you share an example of when you received high-quality feedback in your life?</p>	<p>Hear Ps' perception of what makes quality feedback:</p> <p>Timeliness</p> <p>Trust of provider</p> <p>Focus of feedback on instruction</p> <p>Co-constructed</p>	<p>Alternatively, what makes feedback low-quality feedback.</p>

3	<p>You've been student teaching for the past 2 to 3 weeks.</p> <p>Could you describe how you receive feedback on your practice? How often? What's the form of the feedback?</p> <p>Walk me through a couple of examples, say, in the last week. Describe who gave you feedback, about what? In what form? Was it useful? If so, how?</p> <p>Take me through another example.</p>	<p>Sources of feedback</p> <p>Frequency of feedback</p> <p>Nature of the feedback</p>	<p>Breakdown between lesson plans and observation feedback.</p>
4	<p>Who do you primarily turn to for feedback on your teaching? Why this person? What form does the feedback take?</p> <p>Who else? Why this person? What form does the feedback take?</p>	<p>Teacher centrality</p>	<p>Curious to know the % of times the P turns to cooperating teacher, peers, field supervisor, and family/friends.</p>
5	<p>So, what I've heard you say X, Y, Z are ways you get feedback on your practice.</p> <p>Can you think of other ways you could get feedback on your practice?</p>	<p>Feedback from students</p> <p>Feedback from peers</p> <p>Feedback from external orgs.</p>	
	<u>Question / Topic</u>	<u>Listen-fors</u>	<u>Probe</u>
6	<p>We are going to talk a bit about technology...</p> <p>Tell me about your general attitude to using / adopting technology</p> <p>How would you describe yourself – in general, in adopting new technology: early adopters, early majority, late majority, laggards</p>	<p>Disposition and attitude towards technology</p>	

7	<p>In the past two weeks, have you used TeachSpark? If so, how often?</p> <p>For what purpose have you used TS?</p>	<p>Reflections? Feedback request shares?</p>	<p>What feedback activities are they engaged with?</p>
8	<p>More specifically, as part of this study (and your own professional development), we've asked that you share something via TS, for a total of three times.</p> <p>Have you shared anything with your professional network (friends, peers, etc.) yet?</p> <p>Tell me about this.</p> <p>What were challenges? Surprises in requesting feedback from your network?</p>	<p>Types of feedback activities?</p> <p>Teacher social network / teacher centrality</p>	<p>Type of feedback activity? For what purpose? Who in the social network?</p>
9	<p>I'm curious about your goals around sharing via TS. Do you plan to do the minimum of three feedback requests, or go beyond this? Why?</p> <p>To whom are you going to request feedback? Why this person(s)?</p>	<p>Teacher centrality / social network + TS</p> <p>---</p> <p>Intentions/goals</p> <p>---</p> <p>Teacher agency?</p>	
10	<p>I hear you say that you've used this for [reflections, sharing education docs]...walk me through how you received feedback, if at all.</p> <p>In what ways did you receive feedback (on-text comments, discussion box)</p> <p>Do you find the feedback more or less meaningful to your practice?</p> <p>Why?</p> <p>(possible give 1 other example)</p>	<p>The quantity, nature, and of the feedback using TS</p>	
	Question / Topic	<i>Listen-fors</i>	Probe
11	We are going to shift talking about your	Teacher	Think of 2-3 words

	<p>impressions of the software itself...To start,</p> <p>What words / descriptors come to mind when you think of the feedback software?</p> <p>Why?</p>	<p>expectations, surprises, insights, impressions...</p>	<p>to describe the software.</p>
12	<p>I'd like to learn how you perceive the ease of use of TS...and will ask a series of statements. I'd like you to give a rating 1-4; 1 – strongly disagree to 4 strongly agree. I may ask follow-up questions.</p> <ol style="list-style-type: none"> 1. I thought the system was easy to use 2. I would imagine that most people would learn to use this system very quickly 3. I felt very confident using TeachSpark 	<p>TAM – PEOU – Perceived ease of use: an individual's perception that using an IT system will be free of effort.</p>	<p><i>Probe WHY on any particular uses.</i></p>
13	<p>Training / Documentation – what's worked, what hasn't worked? Why?</p>	<p>Did the tile – documentation work for you?</p>	<p>What else is needed?</p>
14	<p>What changes in the software would make the feedback more meaningful and useful for your practice?</p>	<ul style="list-style-type: none"> -Connections to goals/criteria -Notifications -Interface -Annotation functionality -Ease of use 	<p>Ways to make the feedback higher quality?</p> <p>Ways to expand access to more feedback opportunities?</p>

Interview protocol for 2nd interview with student teachers

<p>Topic: Student teachers' perceptions of feedback, opportunities to feedback, and in using the software.</p> <p>Informant:</p> <p>Interview: 2nd interview</p>			
	Question / Topic	Listen-fors	Probe
1	<p>Thank you for CONTINUING to participate in this study.</p> <p>Warm-up...</p> <p>How's student teaching going so far?</p>	<p>Acquire background information on Ps</p>	<p>% of teaching v. observing?</p>
2	<p>As part of this study, I'm looking at all the different people (sources) you get feedback.</p> <p>From our last interview, you indicated ____</p> <p>Taking this into account, is this still an accurate picture of your support network? Anyone I need to add or subtract off this list?</p> <p>Describe the feedback from each source...</p> <ul style="list-style-type: none"> • Nature of feedback? Nuts & bolts (informational); curricula; instruction; student relationships • Activities? Lesson plans, reflections, observations, grade-level teams, PLCs, etc. • Form of feedback? • Frequency? • Timeliness? • How would you rate the quality of the feedback (on a 1 – 4) <p>1 – strongly disagree to 4 strongly agree.</p>	<p>Hear Ps' perception of what constitutes their professional network?</p> <p><u>Teacher centrality:</u> To whom does the teacher turn to for support? Reasons for this. Alternatively, what would be reasons for not turning to person.</p>	<p>Why the quality rating? What could improve this rating?</p> <p>Alternatively, who do you turn to for... nuts & bolts, curricula, instruction, and student relationships.</p>
3	<p>Think back the beginning of the quarter...</p> <p>In what ways has feedback played a role in shaping your practice?</p> <p>Have you noticed any shift in the nature</p>	<p>Gather t's perception of f role, and note any shifts</p>	

	<p>and/or how feedback is given to you? Advocating for feedback?</p>		
4	<p>You've been student teaching for the past 10 weeks. How frequently do you use TS in a week?</p> <p>You had mentioned ___ used TS, who else have you used TS with – if at all?</p> <p>OR</p> <p>Thinking of your network again, to whom do you turn to for support in using TeachSpark – if at all?</p> <p>Why? Why not?</p> <p>What were challenges? Surprises in requesting feedback from your network?</p>		<p>Barriers?</p> <ul style="list-style-type: none"> • User knowledge • Tech expertise <p>DBR – What could be ways to improve the frequency of teachers sharing and collaborating on TS</p>
5	<p>More specifically, as part of this study (and your own professional development), we've asked that you share something via TS, for a total of three times.</p> <p>Do you still plan to share anything with your professional network (friends, peers, etc.) beyond what you've done so far?</p> <p>Tell me about this.</p>	<p>Types of feedback activities?</p> <p>Teacher social network / teacher centrality</p>	<p>Type of feedback activity?</p> <p>For what purpose?</p> <p>Who in the social network?</p>
6	<p>Let's dig into the feedback you are receiving via TeachSpark... I'm curious to know ... in what ways, IF AT ALL, does TeachSpark influence the quality of your feedback. Explain.</p> <p>Can you give me an example of what was high-quality feedback on TS?</p> <ul style="list-style-type: none"> • In what ways did this impact your practice? • Is there another example that where the feedback shaped your 	<p>R2 – to what extent does the software influence, if at all, the student teachers' perception of the feedback quality.</p> <p>Impact on practice?</p>	<p>Perhaps, compare TS to email exchanges (business as usual), in what ways does the quality of feedback differ, if at all?</p> <p>Are there times you prefer to use</p>

	<p>practice?</p> <p>Can you give me an example of what was low-quality feedback on TS?</p> <p>To what extent do you engage around feedback?</p> <ul style="list-style-type: none"> • Pre-emptive feedback • Reply to on-text comments • Use discussion box <p>Overall, signal to noise ratio?</p>		<p>TS over other modes of communications? If so why? If not why?</p> <p>DBR – What are ways to improve the quality of feedback exchanged on TeachSpark?</p>
	Question / Topic	<i>Listen-fors</i>	Probe
7	<p>In the past two weeks, have you used TeachSpark? If so, how often?</p> <p>For what purpose have you used TS?</p>	To see if they have used TS since the implementation of changes?	What feedback activities are they engaged with?
8	<p>On October 18th we rolled out many changes based on your and your peers’ feedback on how to improve TeachSpark?</p> <ul style="list-style-type: none"> • Change landing page to actual Docs, not blank page • Can archive • Reviewers can update status of providing feedback (with new email notification) • Requesters can view status • Fixed discussion • Added “desired feedback” box <p>As part of our new release with updates, what changes have been MOST noticeable to you?</p> <p>General impressions of the changes?</p> <p>In what ways, if at all, have they improved opportunities to feedback?</p>	<p>Awareness of changes?</p> <p>Effectiveness of communication?</p>	<p>DBR – What are ways to improve communication re: changes to TeachSpark?</p>

	In what ways, if all, have the changes improved the quality of feedback you are receiving?		
	How did you learn of these changes? <ul style="list-style-type: none"> • Tiles • Blog • User experience • Newsletter • Email • Peers 		
	Question / Topic	<i>Listen-fors</i>	Probe
9	What changes in the software would make the feedback more meaningful and useful for your practice?	<ul style="list-style-type: none"> -Connections to goals/criteria -Notifications -Interface -Annotation functionality -Ease of use 	<p>Ways to make the feedback higher quality?</p> <p>Ways to expand access to more feedback opportunities?</p>

Interview protocol for 3rd interview with student teachers

Topic: Student teachers' perceptions of feedback, opportunities to feedback, and in using the software. Informant: Interview: 3rd interview			
	Question / Topic	Listen-fors	Probe
1	Congratulations on finishing student teaching! Let's dive right in... Thinking about TeachSpark more broadly and your use of it over the last 3 months, what do you perceive as the goal / purpose of the software?	<i>Possible goals:</i> *improve understanding of XYZ *capacity growth *efficiency Trying to capture perception, tie into HCI (Soloway) +R3	To what extent did the software reach this goal? Why? Explain.
2	In your view what were the tasks that needed to be undertaken using the software?	Trying to capture perception, tie into HCI (Soloway) +R3	Talk to me further about the different tasks.
	<i>Let's shift to the tools and features within the software to help you cope (complete) these tasks.</i> Could you tell me what features and tools within the software you found <u>most helpful</u> in completing your tasks? <u>Least helpful?</u>	Trying to capture perception, tie into HCI (Soloway) +R3	Why? In what ways did the tools/features fall short? We made feature improvements throughout the quarter – are there any that stood out as particularly helpful in...? Why?
	We've talked about the tools and features... What were your impressions of the interface itself?	Trying to capture perception, tie into HCI (Soloway) +R3	Positives? Areas for improvement?
	On the subject of the software, I want to learn more about how your capacity to use the software. Did your knowledge or skills on how to use TS improve?	User capacity – skills and knowledge in using the software	If so, in what ways? Did that contribute to

	If so, please describe what new learning you had? What contributed to this growth?	-	increased feedback? Improved quality?
	<i>November 6 – we did our training.</i> What were your take-away's from that training/meeting, if any?	Curious about how that affected outcomes: using the system in general, and specifying <u>desired feedback</u> ,	<i>Our focus was on improving how you indicate the feedback you desire.</i> In what ways have you started doing this, if at all? Could you provide a screen shot of a tile indicating the feedback you desired?
	What were your impressions of the TeachBuddy approach? Did that open relationships or pave a way to connect with others?		
	Question / Topic	<i>Listen-fors</i>	Probe
	Let's go back to your professional social network (folks that you turned to for advice)... you've identified ____ is there anyone I should add/subtract from this network?	Teacher Centrality: Continuing to create an accurate map of teacher network	
	(If in Fran's group) We had talked about how you use TS with Fran on TeachSpark. She was providing feedback on the reflections, but necessarily on lesson plan. Did that change? If so, how lesson plans did you get feedback on? Talk to me about the quality of the feedback on the lesson plans?	Expanded opportunities to feedback within embodied tasks Quality of that feedback?	
	<i>I pulled some basic data analytics on your usage of the system. To be clear, I cannot see the specific feedback exchanges – your privacy is protected in that sense. I can however see how many requests you generated.</i>	R1: Triangulate data with analytics, anchor student teachers' responses to actual usages	Let's review.... Test files? Reflection? Observations? Other?

	Could you share some of your usage patterns? For instance, I notice ____	Discover usage patterns	
	Outside your interactions with Fran and keeping your professional network in mind, whom did you use TeachSpark with?	R1: Teacher centrality using TS	What was your motivation in using TS with ____? What was the nature of the feedback (or what feedback were you seeking)?
	Curious... you didn't send these requests until the end of your student teaching. What contributed / influenced /prompted you to send X requests to others outside of your field supervisor?	R1: *November 6 training? * Freeing up of time (post edTPA)? *Improving understanding of the system?	
	From the people you sent out... to whom did you hear back from? Did you provide specific target feedback? If so how did you do it?	R1: Engagement / response	
	Throughout this study we've been discussing high, low quality feedback and everything in the middle. For the feedback you sent on ____ describe the overall quality of the feedback you received?	R1: *Timely? *Co-constructed? *Tied to learning needs	Explain what you mean by ____. In what ways could it be improved?
	<i>We never envisioned TS being used with the entire network. That said, I am curious... why you chose it to use it with some, not others? What were the factors that contributed to this?</i>	R1	
	From your perspective, do you believe you had increased opportunities to feedback using TS compared to alternative ways to exchange feedback, such as email? Why or why not?	R1	
	Question / Topic	Listen-fors	Probe

	<p>In what ways, if at all, did the software and features influence the quality of the feedback you received (provided)?</p> <p>What features influenced the quality of the feedback you received?</p>		
	<p>Along those lines...(if feedback was improved) can you think of specific examples of</p>		
	<p>Would you recommend using TeachSpark with the next cohort moving forward</p>		

Appendix B: Interview Protocols for Field Supervisors

Interview protocol for 1st interview with field supervisor

<p>Topic: Field supervisors' perceptions of feedback, opportunities to feedback, and in using the software.</p> <p>Informant:</p> <p>Interview: 1st interview</p>			
	Question / Topic	<i>Listen-fors</i>	Probe
1	<p>Thank you for agreeing to participate in this study.</p> <p>Warm-up...</p> <p>How's the start of the quarter going?</p> <p>Get background information. Years as field supervisor?</p>	<p>Acquire background information on Ps</p>	<p>Number of student teachers?</p> <p>Schools?</p> <p>Grade-levels?</p> <p>Subjects?</p>
2	<p>As you may recall, this study is focused on feedback to student teachers. For this study, let me start by defining feedback.</p> <p><i>Professional feedback helps teachers' instructional improvement efforts by providing necessary information on specific practice-based performances to close the gap between what is understood and what is aimed to be understood by the teacher.</i></p> <p>That said, I'd like to hear your thoughts about what makes high-quality feedback – feedback that helps “closer the gap” more than other types of lower quality feedback.</p> <p>Could you share an example of when you received high-quality feedback in your life?</p>	<p>Hear Ps' perception of what makes quality feedback:</p> <p>Timeliness</p> <p>Trust of provider</p> <p>Focus of feedback on instruction</p> <p>Co-constructed</p>	<p>Alternatively, what makes feedback low-quality feedback.</p>
3	<p>You've been supervising student teachers for the past 2 to 3 weeks.</p>	<p>Sources of feedback</p>	<p>Breakdown between lesson</p>

	<p>Taking into account all the ways you provide feedback, Could you describe how you provide feedback on their practice? How often? What's the form of the feedback?</p> <p>Walk me through a couple of examples, say, in the last week. Describe how you gave you feedback, about what? In what form? If so, how?</p> <p>Take me through another example.</p>	<p>Frequency of feedback Nature of the feedback</p>	<p>plans and observation feedback.</p>
4	<p>Who do student teachers primarily turn to for feedback on their teaching? Why this person? What form does the feedback take?</p> <p>Who else? Why this person? What form does the feedback take?</p>	<p>Teacher centrality</p>	<p>Curious to know the % of times the P turns to cooperating teacher, peers, field supervisor, and family/friends.</p>
	<p>Question / Topic</p>	<p><i>Listen-fors</i></p>	<p>Probe</p>
5	<p>We are going to talk a bit about technology...</p> <p>Tell me about your general attitude to using / adopting technology</p> <p>How would you describe yourself – in general, in adopting new technology: early adopters, early majority, late majority, laggards</p>	<p>Disposition and attitude towards technology</p>	
6	<p>Related to TeachSpark, in the past two weeks how often do you use TeachSpark? (daily, every other day, etc.)</p> <p>Do you log in on a scheduled time, OR if you receive a notification do you immediately log-in?</p> <p>For what purpose have you used TS?</p>	<p>Reflections? Feedback request shares?</p>	<p>What feedback activities are they engaged with?</p>
7	<p>I'm curious about your goals in using TeachSpark. What sort of goals / aims do</p>	<p>Intentions/goals - - -</p>	

	you have for this quarter in working with your student teachers?	Teacher agency?	
8	I hear you say that you've used this for [reflections, sharing education docs]... walk me through how you have provided feedback, if at all. In what ways did you share feedback (on-text comments, discussion box)	The quantity, nature, and of the feedback using TS	
9	In thinking over the __ years, you've been providing feedback to student teachers – how has using TeachSpark affected, if at all, -Access to feedback opportunities -Quality of the feedback? Why?		
10	Have you received student teachers' comments via TS? Walk me through an example. (possible give 1 other example)	Curious to know how collaborative feedback is... co-constructed.	Have you noticed any changes in the exchanges between yourself and student teachers?
	Question / Topic	Listen-fors	Probe
11	We are going to shift talking about your impressions of the software itself...To start, What words / descriptors come to mind when you think of the feedback software? Why?	Teacher expectations, surprises, insights, impressions...	Think of 2-3 words to describe the software.
12	I'd like to learn how you perceive the ease of use of TS ...and will ask a series of statements. I'd like you to give a rating 1-4; 1 – strongly disagree to 4 strongly agree. I may ask follow-up questions. 1. I thought the system was easy to use 2. I would imagine that most people would	TAM – PEOU – Perceived ease of use: an individual's perception that using an IT system will be free of effort.	<i>Probe WHY on any particular uses.</i>

	learn to use this system very quickly 3. I felt very confident using TeachSpark		
	<p>I'm going to ask about what you've heard from student teachers, if anything, about TeachSpark.</p> <p>Let's start with anything they like... ... next what issues have arisen in using TS?</p> <p>Have you heard anyone using it with their social professional social network?</p> <p>Anything else?</p>		
13	What changes in the software would make the feedback more meaningful and useful for your practice?	<ul style="list-style-type: none"> -Connections to goals/criteria -Notifications -Interface -Annotation functionality -Ease of use 	<p>Ways to make the feedback higher quality?</p> <p>Ways to expand access to more feedback opportunities?</p>

Interview protocol for 2nd interview with FIELD SUPERVISORS

<p>Topic: Field supervisors' perceptions of feedback, opportunities to feedback, and in using the software.</p> <p>Informant:</p> <p>Interview: 2nd interview</p>			
	Question / Topic	<i>Listen-fors</i>	Probe
1	<p>Thank you for CONTINUING to participate in this study.</p> <p>Warm-up...</p> <p>How's field supervision going so far?</p> <p>Compared to other quarters, was there anything unique or challenging about this quarter?</p> <p>What are some the major stressors on you? On your student teachers?</p>	<p>Get information on the workload ... potential barriers to exchanging feedback</p>	<p>What are your thoughts on this current group of student teachers compared to quarters past?</p> <p>Cohesive group?</p>
2	<p>In an average week, how often do you log in to TS? Do you follow a particular routine, is it need-based (say you get an email notification), or is a combination of both.</p> <p>How many hours do spend on TS (reading and providing feedback)?</p>	<p>To get an understanding of system use.</p>	
3	<p>In those ___ hours of using TeachSpark, what purposes do you use it for?</p> <p>Where do you spend most of your time? Reflections, lesson plans, other?</p> <p>Do you have student teachers sharing (asking for feedback) beyond the weekly reflection or formal observation lesson plans?</p> <p>If so, how many student teachers? Give me some examples? Names?</p>	<p>To an insight into the use</p>	<p>Lesson plans? Reflections? Add'l feedback?</p>

4	<p>For each purpose... how do you provide feedback? On-text? Discussion? Combination?</p> <p>Why that way?</p> <p>Consistent in providing feedback?</p>		
5	<p>Describe how you provided feedback prior to TS.</p> <p>Comparing your BAU to TS, do you find you provide, provide less, the same, or more feedback to your student teachers?</p> <p>If not, why?</p> <p>If so, in what ways has TS influenced the quantity?</p>	<p>Establish a baseline of business as usual since I'm not necessarily able to do this from</p>	<p>Barriers / challenges?</p> <p>DBR – What could be ways to improve the amount/frequency of teachers sharing and collaborating on TS</p>
6	<p>Let's dig into the feedback quality you are providing via TeachSpark... I'm curious to know ... in what ways, IF AT ALL, does TeachSpark influence the quality of your feedback (say compared to BAU). Explain.</p> <p>To what extent do you engage around feedback?</p> <ul style="list-style-type: none"> • Pre-emptive feedback • Reply to on-text comments • Use discussion box 	<p>R2 – to what extent does the software influence, if at all, the student teachers' perception of the feedback quality.</p> <p>Impact on practice?</p>	<p>Perhaps, compare TS to email exchanges (business as usual), in what ways does the quality of feedback differ, if at all?</p> <p>Are there times you prefer to use TS over other modes of communications? If so why? If not why?</p> <p>DBR – What are ways to improve the quality of feedback exchanged on TeachSpark?</p>

7	<p>Fran – are you still requiring your student teachers to email their reflections and lesson plans to you in addition to using TS?</p> <p>If so, why?</p>	<p>Barriers / Challenges</p> <p>Capacity/change</p> <p>Inconsistency</p>	
8	<p>We had talked BAU... have there been challenges moving away from this?</p>	<p>Struggle with change? Taking up new technology?</p>	
9	<p>Think back the beginning of the quarter...</p> <p>Have you noticed any shift in the nature and/or how feedback is received from your student teachers? Advocating for feedback?</p>	<p>Gather t's perception of f role, and note any shifts</p>	
10	<p>On October 18th we rolled out many changes based on your and your peers' feedback on how to improve TeachSpark?</p> <ul style="list-style-type: none"> • Change landing page to actual Docs, not blank page • Can archive • Reviewers can update status of providing feedback (with new email notification) • Requesters can view status • Fixed discussion • Added "desired feedback" box <p>As part of our new release with updates, what changes have been MOST noticeable to you?</p> <p>General impressions of the changes?</p> <p>In what ways, if at all, have they improved opportunities to feedback?</p> <p>In what ways, if all, have the changes improved the quality of feedback you are receiving?</p>	<p>Awareness of changes?</p> <p>Effectiveness of communication?</p>	<p>DBR – What are ways to improve communication re: changes to TeachSpark?</p>

11	How did you learn of these changes? <ul style="list-style-type: none"> • Tiles • Blog • User experience • Newsletter • Email • Peers 		
	Question / Topic	<i>Listen-fors</i>	Probe
12	What are the positives of using TS, if any? What are the challenges of using TS, if any?	General impressions of TS	
13	What changes in the software would make the feedback more meaningful and useful for your practice?	-Connections to goals/criteria -Notifications -Interface -Annotation functionality -Ease of use	Ways to make the feedback higher quality? Ways to expand access to more feedback opportunities?
14	Moving forward... focus on 1) expanding feedback among student teachers peers, 2) improving engagement, 3) Fran - giving feedback on lesson plans Thoughts on way forward?		
15	Can I observe you using TS system / providing feedback?		

Interview protocol for 3rd interview with student teachers

Topic: Student teachers' perceptions of feedback, opportunities to feedback, and in using the software. Informant: Interview: 3rd interview			
	Question / Topic	<i>Listen-fors</i>	Probe
1	Congratulations on wrapping up another quarter! Let's dive right in... Thinking about TeachSpark more broadly and your use of it over the last 3 months, what do you perceive as the goal / purpose of the software?	<i>Possible goals:</i> *improve understanding of XYZ *capacity growth *efficiency <hr/> Trying to capture perception, tie into HCI (Soloway) +R3	To what extent did the software reach this goal? Why? Explain.
2	In your view what were the tasks that needed to be undertaken using the software?	Trying to capture perception, tie into HCI (Soloway) +R3	Talk to me further about the different tasks.
	<i>Let's shift to the tools and features within the software to help you cope (complete) these tasks.</i> Could you tell me what features and tools within the software you found <u>most helpful</u> in completing your tasks? <u>Least helpful?</u>	Trying to capture perception, tie into HCI (Soloway) +R3	Why? In what ways did the tools/features fall short? We made feature improvements throughout the quarter – are there any that stood out as particularly helpful in...? Why?
	We've talked about the tools and features... What were your impressions of the interface itself?	Trying to capture perception, tie into HCI (Soloway) +R3	Positives? Areas for improvement?
	On the subject of the software, I want to learn more about how your capacity to use the software. Did your knowledge	User capacity – skills and knowledge in using	

	<p>or skills on how to use TS improve?</p> <p>If so, please describe what new learning you had?</p> <p>What contributed to this growth?</p>	<p>the software</p> <p>-</p>	<p>If so, in what ways?</p> <p>Did that contribute to increased feedback?</p> <p>Improved quality?</p>
	<p><i>November 6 – we did our training.</i></p> <p>What were your take-away's from that training/meeting, if any?</p>	<p>Curious about how that affected outcomes: using the system in general, and specifying <u>desired feedback</u>,</p>	<p><i>Our focus was on improving how you indicate the feedback you desire.</i></p> <p>In what ways have you started doing this, if at all?</p> <p>Could you provide a screen shot of a tile indicating the feedback you desired?</p>
	<p>Could you briefly describe the overall engagement (bi-directional feedback, more conversational, co-constructed)? Was there a shift after November 6 training.</p> <p>Any particular student teacher stand out regarding this point?</p>	<p>R1:</p> <ul style="list-style-type: none"> *November 6 training? * Freeing up of time (post edTPA)? *Improving understanding of the system? 	
	<p>Many viewed their cohort not as a cohort... in your view, why is this?</p> <p>What were your impressions of the TeachSpark buddy approach? What worked? What didn't?</p>		
	Question / Topic	Listen-fors	Probe
	<p>(for Fran)</p> <p>We had talked about how you hadn't been providing feedback on lesson plans via TS for several reasons: travel, lack of knowledge using software, etc.</p> <p>From our last conversation, did that change? If so, how what contributed to this?</p>	<p>Expanded opportunities to feedback within embodied tasks</p> <p>Quality of that feedback?</p>	

	In terms of providing feedback, describe the type of feedback you provided: Nuts & bolts, instructional, curriculum, relational? Viewing this as a pie, what gets most of the attention? Are there shifts	R1: Engagement / response	
	Throughout this study we've been discussing high, low quality feedback and everything in the middle. Describe the overall quality of the feedback you provided using TS? What are ways the feedback quality could be improved? How would you compare this to the feedback you provide in your observation debriefs?	R1: *Timely? *Co-constructed? *Tied to learning needs	Explain what you mean by ___. In what ways could it be improved?
	From your perspective, in what ways did TS influence the opportunities of you providing feedback via TS compared to alternative ways to exchange feedback, such as email? Why or why not?	R1	
	Question / Topic	Listen-fors	Probe
	In what ways, if at all, did the software and features influence the quality of the feedback you received (provided)? What features influenced the quality of the feedback you received?		
	Along those lines...(if feedback was improved) can you think of specific examples of		
	Can you think of feedback that you provided via TS that you saw in enacted? Please provide an example.		

Appendix C: Exit Survey for November Training

Quick Survey

CURRENTLY HOW MANY TEACHSPARK FEEDBACK REQUESTS HAVE YOU SENT TO YOUR FELLOW STUDENT TEACHERS (includes TeachSpark Buddies)?

0 1 2 3 4+

IN THE REMAINING TIME, DO YOU PLAN TO SEND A FEEDBACK REQUEST TO YOUR FELLOW STUDENT TEACHERS?

YES NO

MOVING FORWARD, HOW MANY FEEDBACK REQUESTS DO YOU PLAN TO SEND TO YOUR FELLOW STUDENT TEACHER PEERS ("COHORT")?

0 1 2 3 4+

TO WHAT DEGREE DO YOU AGREE WITH THE FOLLOWING STATEMENTS:

**1. TeachSpark increased opportunities to feedback
(via my support network: peers, TeachSpark buddy, field supervisors, family/friends)
compared to using alternative ways to exchange feedback
(email, in-person, texts, etc.).**

STRONGLY DISAGREE SOMEWHAT DISAGREE SOMEWHAT AGREE STRONGLY
AGREE

Please explain:

**2. TeachSpark improved the quality of the feedback I received
(compared to not having TeachSpark and/or using email or other alternatives).**

STRONGLY DISAGREE SOMEWHAT DISAGREE SOMEWHAT AGREE STRONGLY
AGREE

Please explain:

ADDITIONAL COMMENTS (write on the back)

THANK YOU FOR YOUR FEEDBACK!

Appendix D: Exit Survey for End-of-Quarter

EXIT SLIP

CURRENTLY HOW MANY TEACHSPARK FEEBDACK REQUESTS HAVE YOU SENT TO YOUR FELOW STUDENT TEACHERS (WITHIN THIS "COHORT")?

0 1 2 3 4+

AFTER TODAY'S SESSION, DO YOU PLAN TO SEND A FEEDBACK REQUEST TO YOUR TEACHERSPARK BUDDY / BUDDIES?

YES NO

MOVING FORWARD, HOW MANY FEEBDACK REQUESTS DO YOU PLAN TO SEND TO YOUR FELOW STUDENT TEACHER PEERS ("COHORT")?

0 1 2 3 4+

TO WHAT DEGREE DO YOU AGREE WITH THE FOLLOWING STATEMENTS:

THIS SESSION SHOWED ME MULTIPLE WAYS TO SEEK TARGETED FEEDBACK USING TEACHSPARK.

STRONGLY DISAGREE SOMEWHAT DISAGREE SOMEWHAT AGREE STRONGLY AGREE

IN USING TEACHSPARK, I AM GOING TO MAKE AN EFFORT TO BETTER INDICIATE THE FEEDBACK I SEEK.

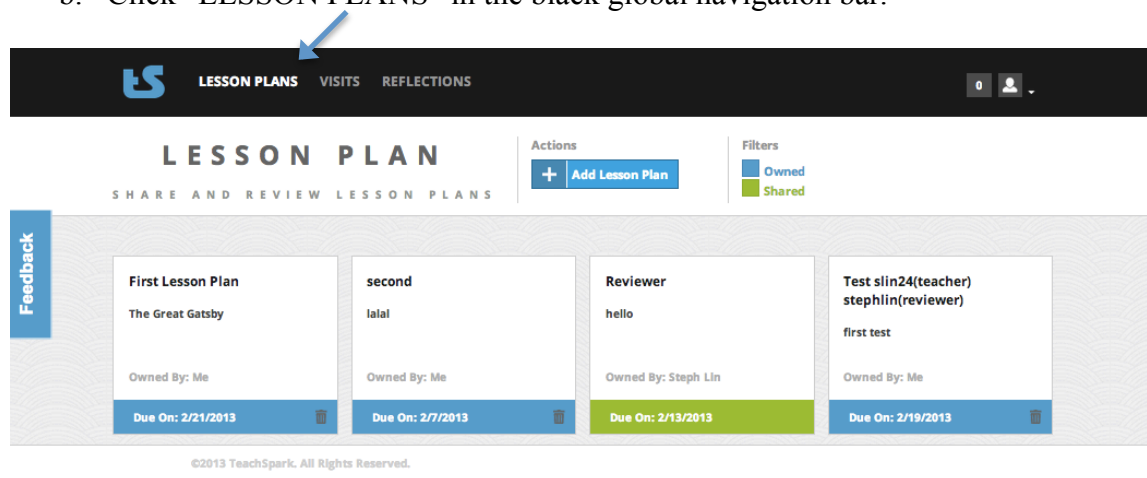
STRONGLY DISAGREE SOMEWHAT DISAGREE SOMEWHAT AGREE STRONGLY AGREE

ADDITIONAL COMMENTS:

THANK YOU FOR YOUR FEEDBACK!

Appendix E: Documentation of How to Create Feedback Requests

1. **SHARE A DOCUMENT:** To request feedback on a lesson plan or document, follow these steps:
 - a. Log into TeachSpark with your email and password
 - b. Click “LESSON PLANS” in the black global navigation bar.



Actions

+ Lesson Plans

- c. Click the blue action button
- d. Enter information into the remaining fields⁶

⁶ We know that having each field “required” is a pain. We are working quickly on making most of the fields optional.

The image shows a 'New Lesson Plan' form with the following fields and controls:

- Title**: A text input field.
- Subject**: A text input field.
- Description**: A text input field.
- Grades**: A text input field.
- Private Comments**: A checkbox with a help icon [?].
- Due Date**: A text input field.
- Buttons**: 'Close' and 'Save' buttons at the bottom right.

- e. Type your document name for the “**Title**” field
- f. Type your subject for the “**Subject**” field
- g. Give context for your document or tell your reviewer what type of feedback you want for the “**Description**” field
- h. Type the grade-level you are teaching for “**Grades**” field
- i. Enter the date that you want feedback by for the “Due Date” field.
- j. Enter _____ or _____ for “Reviewers” field. Their names should automatically appear.
- k. Click “Add Teacher”
- l. Select “Choose files to upload” to **upload your document**