

AN INVESTIGATION OF ELEMENTARY SCHOOLTEACHERS' USE  
OF TWITTER FOR THEIR PROFESSIONAL LEARNING

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## ABSTRACT

### AN INVESTIGATION OF ELEMENTARY SCHOOLTEACHERS' USE OF TWITTER FOR THEIR PROFESSIONAL LEARNING

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This mixed methods study explored how elementary school teachers who use Twitter extensively use it to support their professional learning and development. Four research questions guided this study:

1. How are teachers using Twitter for their professional learning and development?
2. What do teachers report learning from their use of Twitter?
3. What do teachers say they do with the information they have learned from using Twitter?
4. What support do teachers have when they want to implement what they have learned from Twitter?

An online survey was distributed via Twitter targeting teachers of elementary grades. A total of 107 participants were included in the final sample. Interviews were conducted with a purposeful sample of 19 teachers. Document analysis of tweets from a subsample of interviewees and from a sample of tweets from the #2ndchat Twitter community served as triangulation.

The key findings from this sample illustrated several ways teachers learn from Twitter. In response to the research questions, teachers reported using Twitter as a source of motivation and support, explaining that it provided them with feedback, encouragement and peer accountability. Second, teachers reported learning about many

topics, especially technology integration techniques. Third, teachers described using the information they learned to alter some of their teaching practices and to pursue other educational opportunities. Lastly, more than half of teachers reported having administrators who supported their efforts to implement Twitter-based ideas. In addition, teachers appreciated certain affordances of Twitter including immediacy, choice, and access to other educators.

These findings have several implications for teachers, school leaders, and policymakers. Teachers reported that they believed they were getting trustworthy information from highly reputable Twitter users. However, it would be important for them to critically review the information and ensure its alignment with evidence-based teaching practices for how students learn. Further, teachers' responses seemed to indicate that they want input and control over their learning, which has important implications for traditional professional development offerings. As Twitter continues to expand and gain acceptance as a source of learning for teachers, considerations for its use as a 21<sup>st</sup> century tool must be taken into account.

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## DEDICATION

*In loving memory of Susie and Sam Nochumson*

*My mom and dad*

*To lose one's most devoted supporters along the way to a doctoral degree bestows a sense of perspective on the challenges we face in our lives. Being mindful of what this accomplishment means is a tribute that I do not take for granted. It is because of my parents' influence that I took on this challenge, and followed it to fruition.*

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T. C. N.

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## Chapter I

### INTRODUCTION

Technology is not a silver bullet. It's only as good as the teachers ... using it as one more tool to help inspire, and teach, and work through problems. (President Barack Obama, November 19, 2014)

#### **Background and Context**

##### **Overview**

In 2016, the federal government released the latest version of its National Educational Technology Plan (the “Plan”), which challenges educators to use computer technology to “collaborate far beyond the walls of their schools,” and to “design highly engaging and relevant learning experiences” for students (U.S. Department of Education, 2016, pp. 26-27). Notwithstanding the Plan’s worthy aspirations, many educators are not trained to use technology in collaborative and engaging ways. Rather, they replicate traditional teaching methods with technology. For example, some teachers use Smart Boards or interactive white boards to write on instead of chalkboards. However, this is not technology integration since the same style of teaching is being maintained with a tool that happens to be connected to a computer. In other words, “most teachers have domesticated innovative technologies by incorporating them into their existing repertoire of teacher-directed practices” (Cuban, 2013, p. 114). Likewise, one of the main purposes for integrating technology in education “is not to do what we have always done

electronically but rather to provide the kinds of learning experiences that are impossible to provide by any other means” (Means, Haertel, & Moses, 2003, p. 7).

In many cases, technology is widely used for word processing and drill and practice games that focus on repetitive skill development. In fact, 76% of public elementary school teachers had their students use technology to learn or practice basic skills (Gray, Thomas, & Lewis, 2010a). As Dede (2008) puts it, “learning involving low-level retention is typically not deeply interesting no matter what form of motivation is used; so many students quickly tire of music, animations, [and] simple games” (p. 47). Drill-and-practice games on tablets, iPads, and computers may be beneficial for some students who need extra practice with math and literacy, but they are not going to build important higher-order thinking skills. Means (2010) states that, “although many teachers certainly are using today’s technology in innovative ways, they remain the exception rather than the rule” (p. 285).

Researchers are still trying to determine how teachers learn, and how to help them “incorporate new ideas into their ongoing systems of practice” (Kennedy, 2016, p. 973). According to Kyndt, Gijbels, Grosemans, and Donche (2016), “insight into the informal learning activities teachers undertake is generally missing” (p. 1112). As a result of the lack of information about how teachers learn, it is important to frame the context of teacher learning with an overview of the following topics: (a) benefits of technology integration, (b) teachers’ experiences with technology, (c) preparing pre-service teachers to use technology, and (d) professional development for teachers.

**Benefits of technology integration.** The benefits of technology integration in the classroom include: (a) enabling students to learn abstract concepts through the use of simulations and games, (b) allowing students to collaborate with others through distance learning opportunities, and (c) providing students with the ability to direct their own learning at their own pace (Bransford, Brown, & Cocking, 2000; Darling-Hammond, Banks, Zumwalt, Gomez, Sherin, Griesdorn, & Finn, 2005; Liu & Szabo, 2009). In



particular, Darling-Hammond et al. (2005) stress the use of video tools as a way for students and teachers to reflect on their own performances. Technology also allows students to “set their own learning goals” and to “express their own views of their strengths, weaknesses, and achievements” (U.S. Department of Education, 2010, p. 38). Likewise, Beetham and Sharpe (2013) argue that students “must become digitally literate, judging for themselves which tools and services support their learning goals” (p. 38), thereby leading them to become active participants in their own learning.

In order for students to know how to use digital tools, they need knowledgeable teachers who can guide them toward the appropriate tools and help them learn to make decisions for when to use them. Using technology at school can be highly motivating, especially for students who may view school as being irrelevant to their lives. Bransford et al. (2000) express that, “because many new technologies are interactive, it is now easier to create environments in which students learn by doing” (p. 207). As a result, new opportunities for learning are available and teachers need to know how and when to use appropriate technology with their students.

According to Arnold and Moshchenko (2009), “it is important to infuse the curriculum with technology early in a child’s formal learning experiences in order to provide robust learning events that become second nature” (p. 1). A formal introduction to computer technology usually begins in the elementary grades. In a recent survey, just over 50% of students in grades K-3 reported that they were enrolled in a computer class (Lee & Spires, 2009). However, a national survey conducted by Project Tomorrow (2009) through their Speak Up initiative found that:

Students, regardless of community demographics, socio-economic backgrounds, gender and grade, tell us year after year that the lack of sophisticated use of emerging technology tools in school, is in fact, holding back their education and in many ways, disengaging them from learning.  
(p. 1)

Many students may encounter a disconnect between the way they experience technology outside of school and what their schools are offering them with computer technology. For example, some schools block access to social networking sites claiming that it makes students unproductive. However, social networking is one of the main outlets in which students communicate with others. With proper training on how to use social networks in innovative ways, teachers may actually be able to foster a more meaningful class environment in which students can participate both inside and outside of the classroom.

Project Tomorrow (2009) also found that 25% of teachers have expressed interest in using social networking sites to teach. Social networking builds relationships and can be a valuable way to foster trust between students and their teachers. For example, Schroeder, Minocha, and Schneider (2010) found that “by accessing each other’s blogs and social networking profiles, students were able to overcome relational barriers, which in turn contributed to the development of a community spirit” (p. 164). Furthermore, 86% of teens reported that having access to the Internet helps them “do better” in school (Hitlin & Rainie, 2005). Today’s teens are so engrossed in using technology that it makes sense that teachers learn how to incorporate it in ways that are meaningful to their students.

**Teachers’ experiences with technology.** Some teachers may view new technology as threatening. Therefore, these types of teachers may not adopt technology in their classrooms at all. These teachers may feel that their current teaching styles have been successful during their careers and they do not need to alter their teaching by incorporating technology. Yet, with technology becoming more prevalent in most schools, it would be difficult to be one of the few teachers holding out. Solomon, Allen, and Resta (2003) found that, in particular, teachers’ experiences played a role in whether or not they used technology with their students. In many cases, teachers “teach as they were taught; if technology was not in the picture when they were in school, it is difficult

for some teachers to appreciate its value as a critical element for enhancing student learning” (p. 19).

It is hard for some teachers to imagine what a 21<sup>st</sup> century classroom should look like, let alone facilitate one themselves, if they have never been exposed to hands-on learning activities with technology. The Pew Report (Levin & Arafeh, 2002) confirms that in individual schools:

Teachers are the ones who choose whether to make assignments that require the use of the Internet by their students, allow the use of the Internet (often as a supplement to other sources and tools), or even forbid its use. There are often wide variances in teacher attitudes about and uses of the Internet from classroom to classroom. (p. 7)

However, there are ways to improve teachers’ willingness to integrate technology into their teaching. Marcinkiewicz (1993) states, “For teachers who do not appreciably demonstrate self-competence or innovativeness, intervention through staff development might address these variables directly or indirectly” (p. 220).

Kmitta and Davis (2004) also found that educators’ pedagogical philosophies had “some bearing on how the computer is used, as well as how often the computer is used in the classroom” (p. 338). Educators with a constructivist, hands-on approach to teaching are more likely to engage their students in higher-order thinking tasks compared with educators who preferred traditional teaching methods who mainly focused on remedial, drill and practice types of learning (Kmitta & Davis, 2004). These same educators also use “technology as a reward” (Palak & Walls, 2009, p. 436). Palak and Walls found that “teachers may be unable to integrate technology to support student-centered practices because they lack models of technology to facilitate this type of learning” (p. 437). Furthermore, Riel and Becker (2000) argue that teachers who are not able to adapt to using technology in their teaching do not have “a high commitment to continual learning” (p. 412) that is required in the field of education.

**Preparing pre-service teachers to use technology.** The most recent version of the National Educational Technology Plan insists that schools should be able to rely upon the preparation of teachers during their graduate education to develop “a solid understanding of how to use technology to support learning” (U.S. Department of Education, 2016, p. 32). Despite the fact that teachers should be very well prepared before they begin their teaching careers, research has found that in many instances, the preparation is not sufficient. For example, only 25% of future teachers reported learning specific Web 2.0 tools such as blogs, wikis, and media production in their teacher preparation programs (Project Tomorrow, 2009).

Solmon and Chirra (2006) place further fault with education courses since they primarily “teach *about* technology rather than teaching students how to use technology as a tool in the classroom” (p. 77). Brown and Warschauer (2006) also found that education courses overemphasized the “mastery of hardware and software functions rather than on training the participants to integrate technology into classroom teaching” (p. 607). Furthermore, only ten states in the United States require educators to undergo technology training or professional development in technology in order to retain their teaching certification (Gray et al., 2010a).

Further evidence for the lack of teacher preparation with technology integration during their graduate programs comes from the National Center for Education Statistics where it was found that only 49% of teachers responded that their graduate education programs prepared them to use educational technology for instruction (Gray et al., 2010a). However, it is unclear whether this preparation is to instruct teachers how to use technology in innovative ways, or as Solmon and Chirra (2006) stated, to learn *about* different technology tools. Regardless, the data reveal that a number of educators are not equipped with the skills to integrate technology into their curricula.

**Professional development for teachers.** Many school districts invest heavily in professional development opportunities for their teachers on an annual basis. In fact, one

research study estimated that nearly \$8 billion was spent on professional development opportunities in the largest 50 school districts combined (The New Teacher Project, 2015). Despite this investment, most teachers do not improve their teaching practices (TNTP, 2015). Gaytan and McEwen (2006) found that “schools also struggle with the establishment of high quality professional development plans geared towards the effective integration of technology into teaching practices” (p. 78).

Researchers have found that “U.S. investments in teacher learning appear to be increasingly focused on the least effective models of professional development—short-term workshops that research suggests are unlikely to influence teaching practice and student outcomes” (Wei, Darling-Hammond, & Adamson, 2010, p. 1). In fact, three of the most common complaints with professional development are that:

- It is usually disconnected from the everyday practice of teaching.
- It is too generic and unrelated to the curriculum or to the specific instructional problems teachers face.
- It is infrequent and implemented as a one-shot event or led by an outside consultant who drops in to conduct a workshop and never returns to the school or district (DeMonte, 2013; Guskey, 2000).

With regard to professional development workshops for technology training, teachers need opportunities to experience what their students would potentially experience through long-term, hands-on workshops that model how integrated technology activities can occur in the classroom. When professional development workshops are offered to teachers, they are usually done in “short, fragmented, and episodic workshops that offer little opportunity to integrate learning into practice” (U.S. Department of Education, 2010, p. 65). In too many cases, “professional development has taken a ‘training’ approach, with a short term focus” usually “around a particular software” (Mueller, Wood, Willoughby, Ross, & Specht, 2008, p. 1524). Miranda and Russell (2011) suggest that school districts should “promote professional development

opportunities that focus on the benefits rather than the mechanics of using instructional technology, and highlight instructional technology strategies used by teachers who use technology innovatively and successfully” (p. 319). Yet, it appears that many teachers are not having these types of experiences when they receive professional development.

Guskey and Yoon (2009) found that what educators really need is “just-in-time, job embedded assistance as they struggle to adapt new curricula and new instructional practices to their unique classroom contexts” (p. 497). This type of training should be available on a regular basis so that teachers do not need to wait until the next conference, workshop or professional development day to have their questions answered. Just-in-time training is especially important when using technology since teachers may be in the middle of a lesson when computers stop working properly and immediate assistance is needed. Or, teachers may also have new ideas that they would like to implement but need some quick guidance to get started. According to Plair (2008), “teachers crave a constant support person” (p. 70) when they begin projects that may be out of their comfort zone. Follow-up support and mentoring are key components that help build confidence in teachers as they embark on the implementation of new technology projects.

One area of concern with professional development and technology integration is the potential for catering to the newest technological trends. Guskey (2003) claims that there is a “long-standing criticism of professional development that focuses on fads and bandwagon movements rather than on solid evidence of what works with students” (p. 749). In the field of education, Maddux and Cummings (2004) claim that fads are a problem for many reasons. Some of the reasons include a lack of adherence to educational theories, especially those related to technology. As Maddux and Cummings state, “the short history of this new field has been plagued by fad and fashion since its inception in the mid- to late- eighties” (p. 514). Among the list of technological innovations that were once hailed as triumphs in schools were 16 millimeter film, educational television, and other audio and visual aids, Webquests, and Logo

programming (Maddux & Cummings, 2004). Hence, it is necessary to proceed with caution when designing professional development for teachers. Rather than focus on specific hardware and software that may not exist in the future, teachers should be skilled in adapting to rapid changes in technology and viewing the use of newer technologies in teaching through a critical lens.

In general, research has found that professional development programs for teachers are not designed with the teachers in mind. A 2009 National Center for Education Statistics survey found that only 36% of teachers agreed that professional development in educational technology met their goals and needs (Gray et al., 2010a). Bransford et al. (2000) found that “rather than ask teachers where they need help, they are simply expected to attend prearranged workshops” (p. 27). This type of workshop experience is problematic for educators who may not feel any personal or professional connections to the topics being presented. In addition, Bransford et al. claim that, “in order for teachers to change their practices, they need opportunities to try things out in their classrooms and then receive feedback” (p. 27).

Despite the need for teachers to try out what they have learned, Birman et al. (2007) found that “less than one-quarter of teachers reported that they participated in professional development that often provided opportunities to practice what they had learned, lead discussions, or conduct demonstrations” (p. 76). Since many professional development opportunities may be held outside of teachers’ own schools at conferences, other schools, and universities, teachers are unlikely to get prompt feedback and support as they try to adopt new initiatives in their classrooms. Kennedy (2016) also cites this problem with professional development, “because PD programs typically meet with teachers *outside* of their classrooms to talk about teaching, yet they expect their words to alter teachers’ behaviors *inside* the classroom” (p. 947). Therefore, teachers may have learned new ideas, but they continue to embrace their habitual ways of teaching.

Current online efforts to train teachers to use technology such as webinars are generally geared toward how to use specific products such as interactive white boards and teachers do not necessarily gain ideas for innovative technology integration from online webinars. However, there may be promising ways for teachers to continue their professional learning through online social networks such as Twitter. This research study explored how elementary school teachers reported using Twitter to support their professional learning and development. As will be seen in the concluding chapter, there are many implications to consider when using any online social media, including Twitter, to learn.

### **Problem Statement**

An exponential increase in the use of technology in schools has coincided with a call for teachers to integrate technology into their teaching practices. School districts invest heavily in the purchase of technology and professional development. However, the literature has revealed that, in many cases, professional development is inadequate. Therefore, given the importance of technology in this digital age, research needed to be undertaken to explore another possible resource, Twitter, an online social media website, that many teachers have reported using as a means to support their learning and professional growth.

### **Purpose and Research Questions**

The purpose of this research study was to explore how elementary school teachers use the social networking website, Twitter, to support their professional learning and development. To carry out this purpose, the following research questions were addressed:



1. How are teachers using Twitter for their professional learning and development?
2. What do teachers report learning from their use of Twitter?
3. What do teachers say they do with the information they have learned from using Twitter?
4. What support do teachers have when they want to implement what they have learned from Twitter?

### **Approach**

A two-phase mixed methods approach was used for this study. It was designed to explore how a sample of elementary school teachers used Twitter to support their professional learning. The first phase included an online survey with 45 items. These items included both closed-ended and open-ended questions, along with two 5-point Likert rating scales. The first Likert scale checked for frequencies of teachers' Twitter use for various purposes, and the second Likert scale asked teachers to indicate the extent to which Twitter helped them incorporate different teaching strategies in their classrooms.

The second phase of this study included interviews with a purposeful sample of survey respondents who met criteria targeting frequent Twitter users. Document analysis of tweets from two different groups served as triangulation. The first group of tweets was collected from a smaller, purposeful sample of interview participants. The second group of tweets was collected from a moderated chat of second grade teachers, #2ndchat, to establish a sense of the context within which teachers use moderated chats. Cross-tabs analysis was performed on all quantitative data, while qualitative data was coded and analyzed for themes.

Initially, this project began with the intent to understand how elementary school teachers were learning to use technology, in general, in their teaching practices. The background and context presented at the beginning of this chapter described how teaching practices could be enhanced by integrating technology and the expectations for teachers to learn how to use technology to benefit their students. Professional development, in a general sense, and specifically, professional development related to technology integration, was described to explain that many teachers may not have access to high quality professional development that meets their needs. Given the emerging literature on teachers' use of Twitter to support their professional learning, this dissertation research began with an emphasis on how teachers used Twitter to learn to integrate technology and evolved to include a broader exploration of teachers' use of Twitter for learning in general.

### **Assumptions of This Study**

This researcher held the following assumptions:

1. Teachers see the value of technology and are willing to embrace its implementation as a way to transform their traditional teaching methods.
2. With adequate training, teachers are capable of integrating technology into their teaching.
3. Collaboration through online social networking with other teachers and experts may enhance teacher effectiveness in the classroom.
4. Some teachers may not want to learn how to use technology in their teaching.
5. Many administrators may not understand how to improve technology integration in their schools.

## **Rationale and Significance**

Visser, Evering, and Barrett (2014) made two recommendations for future research as a result of their study on teachers using Twitter for professional development. Their first recommendation was based on their finding that teachers use Twitter for professional development and, as a result, their teaching practices have improved according to teachers' self-reports. Thus, they argued for more empirical evidence that Twitter is having an impact on improving classroom teaching. The second recommendation put forth by Visser et al. was to further investigate the teachers who are using Twitter for professional development. For example, they found that most of the respondents to their Twitter-based survey described themselves as "above-average" (p. 410) in their technology abilities, and more experienced teachers were better represented than newer teachers.

Partially as a result of these two recommendations, this research study attempted to find further evidence to support the facts that: (a) there are changes taking place in classrooms as a result of teachers undertaking their own professional and development with Twitter, and (b) teachers rely on Twitter to support their own learning needs.

Lawless and Pellegrino (2007) argue that there needs to be a more "systematic study of how technology integration occurs within schools" (p. 575). Teachers are on the front lines when it comes to applying technology to education. School districts are purchasing and distributing technology devices to students and teachers. As a result, teachers need to be properly prepared to use the technology devices. Teachers may assume that their students are more familiar with technology because they are growing up with it in their everyday lives. Yet, it is precisely this reason why it is important for teachers to know what to do with technology in their teaching in order to appeal to the ways in which their students expect to learn. Beetham and Sharpe (2013) would agree that it is essential for teachers to know how to integrate technology as they state, "Our

digital native students may be able to use technologies, but that does not mean they can learn from them” (p. xvii). Moreover, teachers should learn how to use technology in ways that change their traditional teaching styles into ones that encourage the development of higher-order thinking skills in students.

This study holds particular value for administrators, teachers, policymakers, and students since they are all impacted by how well technology is utilized in classrooms as well as how teachers learn. Developing a shared vision amongst the teachers within a school is crucial if technology integration is to become part of the school’s culture. As one administrator exclaimed, “Administrators must have a vision of technology use, model this vision in the professional practice, and develop teacher leaders who take a lead role in implementing said technology vision” (Schrum, Galizio, & Ledesma, 2011, p. 252). Sergiovanni (2001) also suggests that in order to improve schools, the focus should be “on people first, build them up, increase their commitment, link them to purposes, help them to be self-managing” (p. 59). Unless teachers become part of the change initiative, they will likely view the changes as being imposed upon them when in actuality, they should be part of the solution.

Lawless and Pellegrino (2007) also state, “Much of the activity under way on multiple levels of the educational system is driven by a very strong perceived need for action, but it is often not guided by any substantial knowledgebase” (p. 576). This activity is evident in the numerous school districts that are urgently purchasing thousands of devices to give to students and teachers. Miranda and Russell (2011) point out that “evidence suggests that investments in instructional technology may not have translated into widespread use in schools” (p. 301) due to a lack of planning for long-term teacher training that goes beyond episodic workshops.

Most current and future school leaders are not equipped “in leading schools to encourage technology and preparing 21<sup>st</sup> century learners” (Schrum et al., 2011, p. 257). Moreover, Lawless and Pellegrino (2007) acknowledge that “the paucity of empirical

research examining the area of technology professional development for teachers is astonishing” (p. 584). Therefore, the intent of this research study was to explore how an alternative digital resource, Twitter, may play a role in professional learning and development opportunities for all teachers.

### **Researcher Perspectives**

The researcher is an experienced elementary school teacher and technology specialist. Throughout her career, the types of technologies available to educators have increased and changed the potential for student learning in all classrooms. As part of the technology specialist role, the researcher conducted numerous professional development workshops for primary and secondary school teachers demonstrating effective ways to integrate technology into curricula.

One of the activities the researcher found her elementary students loved the most involved using Skype to connect globally with other elementary school classes to guess their geographic locations. This simple activity utilizes technology in an innovative way to build students’ higher-order thinking skills as they learned about geography concepts. By following the #mysterySkype hashtag on Twitter, the researcher connected with many teachers who were also interested in collaborating. The fourth grade students inquired each day if they would be participating in a #mysterySkype. Anecdotally, the following year, teachers of the fifth graders said they were impressed with the geographic knowledge students had obtained in third and fourth grades (mostly as a result of playing #mysterySkype).

In working with other teachers, the researcher learned that many of them were unsure what to do with laptops, iPads and computers available in their classrooms. In many cases, teachers discovered the easiest solution was to engage students in drill and practice websites such as IXL math in which students repetitively answer math problems

and earn points for each problem answered correctly. Although students need to know their basic math facts, this sole use of computer technology was not going to develop higher-order thinking skills. Therefore, the researcher found that it was challenging to introduce teachers to new ways of thinking that meant abandoning previous approaches and adopting methods that would lead students to be more critical thinkers.

Overall, the researcher's experience with learning to integrate technology into her teaching has been her own undertaking. She has attended numerous technology conferences and workshops in which presenters share new ideas that she envisioned her colleagues incorporating into their lessons. Yet, the culture of many schools does not always allow for experimentation with technology integration because curricular material needed to be covered in a given amount of time. In fact, 68% of teachers agree that the "use of educational technology is adversely affected by competing priorities in the classroom" (Gray, Thomas & Lewis, 2010b).

Collins and Halverson (2010) claim that "deeply embedded in the culture of schooling is the notion that students should learn a large body of facts, concepts, procedures, theories, and works of art and science that have accumulated over time" (p. 20). To maintain this culture of schooling, some teachers teach entirely to the textbooks, filling students' heads with information for exams, leaving little time for them to interact or engage in active learning. From a personal example, an AP biology teacher discussed only showing PowerPoint slides with information during each lesson while students took copious notes. This teacher admitted that she and her students are "bored" with this arrangement, but there is pressure for the students to do well on the exams, thus this teacher felt she had to sacrifice more interactive, hands-on learning opportunities to make sure the students have the requisite information for their exams.

Maddux and Cummings (2004) suggest that "teacher educators themselves should serve as models of scientific thinking by conducting their own research, by writing and publishing theoretical papers, and by sharing these scholarly activities with students"

(p. 529). As a teacher educator, this researcher looks forward to being able to use the research presented in this study to influence the field of educational technology and teacher professional development.

### **Definitions**

*Educational Technologies*: digitally delivered products designed to help students and teachers; examples include desktop computers, laptops, tablets, apps, communication programs such as Skype; websites; peripherals such as interactive white boards and document cameras.

*Higher-order thinking skills*: skills that require greater cognitive demand.

*Innovative technology use*: using technology in ways that transform traditional teaching styles to build higher-order thinking skills.

*Non-traditional teaching methods*: online assignments; virtual games; online announcements; instructional websites; continuous evaluation; interdisciplinary lessons; inquiry-based learning; activity-based learning; collaboration; differentiated instruction; flipped classroom; problem-based learning; live interactions with experts; autonomy for students; authentic learning activities.

*Professional Development/Learning*: learning experiences designed to help educators expand their understanding of how to improve student achievement.

*Technology integration*: using technology tools to support curricular goals.

*Traditional teaching methods*: include rote learning and memorization; teacher-directed instruction where knowledge is imparted by teachers to students, namely, through lectures.

## Chapter II

### LITERATURE REVIEW

#### **Purpose**

The purpose of this research study was to explore how elementary school teachers use the social networking website, Twitter, to support their professional learning and development. To carry out this study, it was necessary to complete a critical review of current literature. This review was ongoing throughout the data collection, data analysis and synthesis phases of the study.

This critical review explored the traditional types of learning environments that prepare future and current teachers for their profession. It also explored recent literature surrounding, Twitter, a social networking service that many teachers are using to support their professional learning. In light of the fact that many teachers have taken to Twitter to help them learn, three major areas of literature are reviewed: (a) the use of technology to transform pedagogy, (b) current methods of teacher preparation and professional development, and (c) adult learning theory.

The chapter begins with an introduction to, and rationale for, the areas covered in this literature review. Next, Section I begins with an historical overview of schooling in the United States to establish the context for understanding how the roles of teachers have evolved. Section II discusses the use of technology to transform pedagogy. This section examines the role of technology in education, and how teachers may or may not be



learning how to adapt their teaching practices to meet the changing learning needs of students due to the impact technology is having on their lives.

In Section III, a review of the literature on current methods of teacher preparation and professional development provides an understanding of the context in which teachers learn the pedagogical requirements of their profession.

Lastly, Section IV reviews adult learning theory to provide a framework for understanding the knowledge, skills, attitudes, and beliefs that play a role in ensuring teachers' abilities to learn.

To conduct this selected literature review, multiple sources of information were used including books, dissertations, online resources and journals. These sources were accessed through ERIC, ProQuest, Digital Dissertations, Google Scholar, eduCAT, and CLIO.

## **Introduction**

This chapter is divided into four sections: Section I begins with an historical perspective of traditional classroom teaching to help explain the structure of schools and how, due to this structure, the nature of traditional schooling is difficult to change. Section II reviews the literature regarding how technology is being used to transform pedagogy to meet the needs of students in this digital age. In addition, this topic examines the impact technology is having on today's classrooms and how the roles of teachers as well as the classroom environment are not necessarily changing to meet the needs of students within the 21<sup>st</sup> century digital world.

Section III reviews the literature pertaining to current methods of teacher preparation and professional development. The two subsections discussed are: (a) the preparation of pre-service teachers in the area of technology, and (b) professional development for in-service teachers related to technology. Despite the best efforts of

numerous stakeholders in professional learning for teachers, this literature review reveals that pre-service education may not be meeting the needs of future teachers, and that many current methods of professional development may not be helping teachers learn to incorporate technology appropriately in their teaching.

Section IV examines adult learning theories with a specific interest in how these theories play a pivotal role in teachers' learning to use technology and the transformation of their pedagogical approaches. This topic explores the following areas: (a) formal and informal learning, (b) social learning, (c) the transfer of learning, (d) self-directed learning, and (e) teacher beliefs. It also includes a discussion of recent literature describing the role of Twitter as a tool for teacher learning.

This chapter concludes with a summary, followed by a description of the conceptual framework used for this dissertation. The conceptual framework was developed and informed by the literature previously mentioned, and by this study's four research questions:

1. How are teachers using Twitter for their professional learning and development?
2. What do teachers report learning from their use of Twitter?
3. What do teachers say they do with the information they have learned from using Twitter?
4. What support do teachers have when they want to implement what they have learned from Twitter?

### **Rationale for Topics**

Today's schools are faced with the challenge of competing for students' attention as more and more students are constantly connected to digital devices. These devices provide students with instantaneous communication with others, as well as immediate

access to information. According to data from the National Center for Educational Statistics, 97% of teachers had one or more computers in their classrooms on a daily basis, and 54% of teachers were able to bring sets of computers into their classrooms for all students to use (Gray et al., 2010b). Additionally, 77% of school districts also meet minimum standards for high-speed broadband (*Every Student Succeeds Act*, 2015). As a result of an overwhelming majority of teachers having access to technology in their schools as evidenced by these statistics, it was necessary to investigate how teachers are learning to use technology in ways that provide benefits to student learning that traditional methods of teaching do not. Culp, Honey, and Mandinach (2005) argue that “only with adequate professional development will all teachers be able to put technology to use in ways that will truly enhance student learning” (p. 293).

While there is a good deal of research regarding barriers to teachers’ adoption of technology including their beliefs (Ertmer, 2005; Kim, Kim, Lee, Spector, & DeMeester, 2013; Liu & Szabo, 2009; Mumtaz, 2000), lack of leadership, lack of time and resources (Mumtaz, 2000; Wright & Wilson, 2006), and insufficient teacher preparation (Ertmer, Ottenbreit-Leftwich, & York, 2007; Franklin, 2007; Riel & Becker, 2000), there is less research describing how teachers learn to use technology in ways that challenge their traditional teaching methods (Visser et al., 2014). Furthermore, much of the research that has been done in this area has shown limited evidence of a transformative impact on traditional teaching methods (Cuban, 2013; John, 2005; Means, 2010). However, in the areas in which technology did transform traditional teaching methods, technology was used for creative purposes and it was highly aligned with the subject matter to be taught (John, 2005).

An historical overview of teaching in the United States provides an understanding of the complexity involved when trying to make significant changes within a school system. This overview begins with the one-room schoolhouses of the industrial ages and continues with an examination of current classrooms of today. It also takes into

consideration what a 21<sup>st</sup> century classrooms should look like. In 21<sup>st</sup> century classrooms, some teachers understand the implications that technology is having on their teaching practices. These teachers tend to utilize online social networks to propel their own professional learning and to stay current with changing digital technologies. Meanwhile, many other teachers have yet to begin exploring how to incorporate digital technologies into their teaching practices. Consequently, this literature review discusses adult learning perspectives as they might apply to teacher learning.

### **Section I: Historical Overview of Traditional Classroom Teaching**

The role of the current classroom teacher remains, in many ways, very similar to the roles of teachers during the 19<sup>th</sup> century. In the 19<sup>th</sup> century, schooling mainly involved didactic instruction taught by “poorly trained individuals who relied on textbooks as the primary means of instruction and recitation as the main check on student progress” (Reese, 2013, p. 323). Students were often bored and not engaged in learning (Reese, 2013). Classrooms were teacher-centered with teachers standing in front of the students and lecturing for hours (Reese, 2013). Teachers did not collaborate with others and they taught the same lessons to different groups of students year after year, without much modification (Wagner, 2008).

A turning point came in the 19<sup>th</sup> century as new ideas about shifting schooling toward child-centered instruction were promoted by Johann Heinrich Pestalozzi (Reese, 2013). However, because classrooms had more than 50 students and one teacher, individualized attention was limited, resulting in uniformity for all students who passively received instruction (Reese, 2013). John Dewey, in critiquing the traditional form of teaching students, claimed that children were being forced to “memorize material they frequently did not understand” and “knowledge was abstract and removed from their experiences” (as cited in Reese, 2013, p. 327). For example, in Dewey’s Laboratory

school which experimented with new ways of teaching, students gained hands-on experience with clay modeling which helped them construct buildings in which they learned math and physics concepts (Reese, 2013). Even though many educators praised child-centered education, implementing it throughout the majority of schools was, and still remains, a challenge (Reese, 2013). In fact, throughout the 20<sup>th</sup> century, research found that 90% of all students were enrolled in teacher-centered and textbook focused classrooms (Reese, 2013).

Though minor reforms occurred to focus more on the needs of the child, traditional teaching practices are still the driving force within schools in the 21<sup>st</sup> century. According to Reese (2013), this is due to the fact that the public was more comfortable with schools that ensured that students had the basic reading, writing and math skills that could easily be measured by report cards. As traditional teaching methods took hold, they not only influenced local schools, but entire systems that were formed around them. In fact, schools were described as factory-like whereby they could easily produce educated children more efficiently than the one room schoolhouse (Cuban, 2008). These factory-like school systems were “organized around age-grading, traditional curricular sequencing, accepted professional accreditation and long-standing funding models” which have also led to schools struggling with “adapting to new, learner-directed technologies” (Collins & Halverson, 2010, p. 18).

Traditional teaching methods rarely provide opportunities for student initiated inquiry and flexibility. In many of today’s classrooms, direct instruction, where the teacher does most of the explaining, occurs on a regular basis, and in some cases, almost exclusively. In fact, because of the rigidity of traditional teaching methods, John Dewey argued that “American schools prematurely stifled childhood curiosity and, therefore, students were not prepared properly for life’s challenges” (as cited in Day & Harbour, 2013, p. 111). Herrington and Kervin (2007) describe a traditional model of education as

one in which “students are seated in rows at their desks facing the teacher at the front and they are taught in a largely didactic and decontextualized manner” (p. 2).

Wagner (2008) found that the teaching that actually goes on in classrooms varies widely despite uniform policies that aim to make teaching more even throughout different school districts in each state. As an example of a lesson being applied uniformly, a school board member described her experience observing a writing lesson: “All you have to do is go in and watch some of our teachers teach writing. And it would make your hair curl. Very formulaic and incredibly repetitive so as to drum any glint of creativity from a child’s heart” (p. 123). This statement provides evidence of the existence of heavily didactic teaching methods developed in the past in that all students are expected to learn at the same pace with rules that govern exactly how students are supposed to write. To help mitigate situations such as these from happening in today’s classrooms, teachers should be able to recognize that each student has different creative potential and that there are technology resources available to help individualize instruction for each student.

### **Direct Instruction**

Magliaro, Lockee, and Burton (2005) claim that “direct instruction is the strategy of choice when the learning objective requires that the learners have direct practice in what must be done, or said, or written” (p. 43). The teacher-student interaction is the key to direct instruction and teachers can guide individual students through learning new material. Teachers can give “a clear analysis of the task, constant assessment of understanding and provision of support when and as needed” (p. 51). However, in the traditional style of teaching, teachers mainly lecture or give information to students. Thus, there are fewer opportunities for student contributions and discussions (Brewer, 2015).

Following direct instruction, students are usually given opportunities to practice the information they have received from their teachers. With technology, there are an

exhaustive number of drill and practice games available for students on computers, tablets, and iPads that reflect this most basic type of teaching method. Students can login to computers and begin practicing math or literacy skills on any of the numerous websites and apps. For example, the National Geographic website is widely recognized as a reputable learning outlet for students to learn about geography. In its attempt to engage students, the National Geographic website uses many drill and practice quiz games for students to test their knowledge. Many of the games are strictly fact based as the example question in Figure 1 below shows.



Figure 1: Sample question from National Geographic website

The question asks students to recall an exact date in history when Hillary and Norgay reached the summit of Mt. Everest. Although the significance of the achievement and its date may be important, the factual data is information that students can easily look up on their own with the Internet. A more challenging question for students would be to consider the implications of having achieved such a feat to future mountaineers and explorers.

### **Learner-centered Environments**

In contrast to direct instruction, many researchers advocate instruction with technology that builds students' higher-order thinking skills and focuses on the needs of individual learners (Bransford et al., 2000; Mishra & Koehler, 2006; Polly, 2011).

Higher-order thinking skills are more likely to lead to higher-level thought processing and a deeper understanding of curricular material and they are not as easy to develop as rote skills that develop through memorization and repeated drills. Additionally, the needs of individual learners can be addressed with technology through the creation of learner-centered environments. Bransford et al. (2000) define learner-centered environments as those that “pay careful attention to the knowledge, skills, attitudes, and beliefs that learners bring to the educational setting” (p. 133). Teachers can use this information from their students as a diagnostic tool to verify what they know or whether they have misconceptions in their knowledge. Some researchers have found digital technology tools that are effective when conducting formative evaluations of students’ knowledge (Thissen-Roe, Hunt, & Minstrell, 2004).

## **Section II: The Use of Technology to Transform Pedagogy**

Technology has a role in changing teachers’ pedagogical approaches. In today’s schools of the 21<sup>st</sup> century, where technology is becoming ever-present, some teachers “do not even recognize that their students have an increasingly new set of needs and expectations for learning that are based on using the Internet” (Levin & Arafah, 2002, p. 17). Research has shown that the ways students learn is changing and “the sanctity and tradition of the four walls of the classroom quite literally is melting away” (p. 45). Furthermore, Tadros (2011) states that the next generations of students “cannot cope with traditional methods” of teaching because these students are “born and raised in the information overload age where data is ubiquitous and information no farther than a click of the mouse, they have developed characteristics and habits that are profoundly different from the traditional student of old times” (p. 87).



This section explores some of the areas in which technology can be used to transform pedagogy including by enabling student-centered learning and altering the ways in which students are assessed.

### **Enabling Student-centered Learning**

Teachers are increasingly being tasked with integrating technology to create student-centered learning environments. To this end, the International Society for Technology in Education (ISTE) has agreed upon standards for the use of technology in education. ISTE is the official organization responsible for recommending guidelines for accreditation to another organization, NCATE (National Council for Accreditation of Teacher Education), for programs that prepare future educators to use technology (Koehler & Mishra, 2005). As an example of how the ISTE standards pertain to individual teachers, one of the standards specifies that teachers should be able to develop technology-enriched learning environments that enable all students to pursue their individual curiosities and become active participants in setting their own educational goals, managing their own learning, and assessing their own progress (ISTE, 2015).

If school districts adhere to the recommended technology standards such as this example states, then teachers within those districts must ensure that their students are actively engaged in their own learning processes and outcomes. Students would no longer be expected to remain passive when it comes to their learning, quite the contrary. Students would be engaged in meaningful learning experiences, bearing some responsibility for how they learn (Liu & Szabo, 2009). Some researchers argue that despite the lofty standards for technology integration that ISTE supplies, there is little information regarding how teachers should learn to implement them (Koehler & Mishra, 2005).

In a qualitative study, researchers investigated how technology met the needs of students by interviewing teachers (Ottenbreit-Leftwich, Glazewski, Newby, & Ertmer,

2010). They discovered that technology facilitated student engagement. In many of the interviews, teachers expressed their excitement as students worked together, stating that “this was a teachers’ dream” (p. 1325) to witness students collaborating and using technology as a means of communication. These researchers also found that while some teachers realized that they could have done certain lessons with pencil and paper, students benefited from using technology. For example, one teacher found that by incorporating content into web-based programs such as Inspiration, a concept mapping program, students not only learned more of the content, they also gained computer skills as they manipulated the information in the program (Ottenbreit-Leftwich et al., 2010).

In a report for the National Assessment of Educational Progress (NAEP), performance standards for technology and engineering are presented for students as they reach grades four, eight, and 12 (U.S. Department of Education, Institute of Education Sciences, 2014). In the fourth grade, one of the performance standards states that students: Should be aware of a number of digital and network tools that can be used for finding information, and they should be able to use these tools to collect, organize, and display data in response to specific questions and to help solve problems (U.S. Department of Education, Institute of Education Sciences, 2014). This standard, which requires technology to be used in a way that differs from what many elementary school teachers may be familiar with, represents a teaching approach using technology in ways that traditional teaching methods are unable to do.

Fourth grade students should also be able to identify types of technologies in their world, design and test a simple model, explain how technologies can result in positive and negative effects, and use common technologies to achieve goals in school and in everyday life (U.S. Department of Education, Institute of Education Sciences, 2014). These standards require students to contribute to their own understanding of how models work, using technology in the process. As Scardamalia and Bereiter (2006) point out, these activities are examples of students taking control of their own learning rather than

waiting for their teachers to dictate information to them. Furthermore, Wiggins and McTighe (2005) argue that without opportunities for student-centered learning experiences, students are subjected to interpretations that have already been made for them, disregarding their need to uncover information on their own.

### **Problem-based Learning**

Technology reshapes how students learn and can be a valuable resource in problem-based learning. In problem-based learning, small groups of students are given complex problems to solve. The problems may be open-ended, without a single correct answer. The learning process involves students following a specific cycle in which they identify facts, generate hypotheses, identify their knowledge deficiencies, and apply new knowledge (Hmelo-Silver, 2004). Classrooms in which students are given the freedom to explore their learning environments allow them to discover and solve problems on their own (Liu & Szabo, 2009). The benefits of problem-based learning for students include the ability to motivate students, allowing them to feel as though they are a part of the solution (Hmelo-Silver, 2004). Throughout this process, the teacher is there to monitor and assist students as they work through problems.

Technology can facilitate problem-based learning environments as students use digital tools to communicate their ideas with one another, as well as with experts who may be contacted through communication applications such as Skype and Google Hangout. Likewise, students can use social networking to expand their search for information to solve their problems. According to Hmelo-Silver (2004), “research suggests that the small group discussions and debate in problem-based learning sessions enhances problem solving and higher-order thinking and promotes shared knowledge construction” (p. 246). Thus, teachers should know how to use digital technologies for communication in support of the development of these skills in their students.

One potential barrier to the creation of problem-based learning environments is “the constraints of classroom organization” where teachers have to plan carefully to fit these types of learning experiences into 40- or 50-minute blocks of time (Hmelo-Silver, 2004, p. 260). However, despite the potential difficulty in altering traditional school day schedules, the benefits to students would outweigh such concerns. Students would be engaging in authentic learning experiences, whereby they are the ones to create meaning through their experiences and interactions, which are precisely the types of experiences John Dewey aspired to establish in his Laboratory school (Ertmer & Newby, 1993).

Although problem-based learning seems like an ideal learning experience for students, it may not be enough for all students involved. Hmelo-Silver (2004) points out that “there may be a place for direct instruction once students have developed the need to know, particularly with less uniformly skilled learners” (p. 253). With a seemingly wide-open challenge for students to solve problems, some learners may have difficulties with the lack of structure in the problem solving scenarios, and some learners may have special learning needs that may require other forms of instruction.

### **Knowledge-building Communities**

Scardamalia and Bereiter (1999) have argued for a transformation of schools from service providers to collaborative knowledge- building communities. In collaborative knowledge building communities, the learning shifts from concrete pieces of information that teachers give to students, to environments in which students are actively constructing knowledge that is new to them (Scardamalia & Bereiter, 1999). This shift is challenging for many educators to envision and adopt, according to Scardamalia and Bereiter, due to the fact that “people tend to think of knowledge exclusively as content residing in people’s minds” (p. 276). These researchers believe that “ordinary schooling provides hardly any opportunity [for students to construct knowledge], and so students graduate into the work world with little sense of how to function in it” (p. 289). Thus, they argue

for more practical work in students' school days that reflects what students will eventually experience in the real world.

Ertmer and Newby (1993) affirm that before embarking on higher-level thinking tasks, students need a sufficient amount of prior knowledge before learning can take place. Therefore, it is necessary, in some cases, to teach students basic skills through direct instruction (Scardamalia, 2001). However, the more students become familiar with those skills, the types of learning activities should shift to ones in which students contribute to new knowledge building. Knowledge building also happens as students learn from each other (Bransford et al., 2000). Numerous technological tools exist to facilitate student-to-student communication, as well as student-to-teacher, and student to a wider, global audience. Henry Jenkins (2009) refers to this type of learning as a participatory culture.

### **Participatory Culture**

Participatory culture, as defined by Jenkins (2009), "is one in which members believe their contributions matter, and feel some degree of social connection with one another" (p. 3). Some elementary school classrooms use blogging as a way for students to engage with each other as well as a global audience. In Twitter, a hashtag, #comments4kids, is sometimes used to gain feedback from computer users all around the world. When classmates and other users comment on students' blogging, those students are actively participating and reading their classmates' work, while at the same time, they anticipate feedback from their peers on their own work. Furthermore, creating a participatory culture in schools can help shift the traditional learning approaches from teacher-directed learning to student-centered learning (Jenkins, 2009).

According to Keefe (2007), "today's schools must increasingly produce adaptable individuals who are lifelong learners and able to keep pace with the era of rapid change in which we will continue to live" (p. 217). With this tall order, teachers are the ones

charged with the “production” of these individuals. Yet, there is much evidence in the literature that many schools still resemble the same ones that schooled the masses beginning in the Industrial Age (Bransford et al., 2000; Cuban, 2013; Resnick, 2010). In fact, Cuban (2013) states that even with the numerous reforms that schools have undertaken since the Industrial Age, little has changed in the ways teachers teach including “textbook-driven lessons, more teacher talk than student talk, mostly whole group instruction with occasional small group-work, seatwork for students, periodic quizzes, and tests” (p. 111). With technology such as laptops in many classrooms, there is now a hybrid in which newer technology has been adapted to fit with more traditional styles of teaching.

### **Altering Traditional Assessments**

In 2001, the *No Child Left Behind* act (NCLB) required rigorous testing of students in grades 3-8 every year and again in high school with penalties for schools whose students did not make certain gains (Korthagen, Kim, & Greene, 2012). Currently, in many K-12 schools, students are being prepared with the goal of getting into college. During these years in elementary, middle and high school, teachers are given allotted amounts of time with which to cover curricular material that is deemed necessary for students to know. Much of the curricular material is based on the material that students will see when they take standardized assessments in every grade, beginning in grade three. One of the problems that Wagner (2008) attributes to the frequent multiple choice tests that students in the United States are given is that they are unable to “apply what they have learned to a new problem or context they haven’t seen before” (p. 95). In other words, students have practiced finding one right answer to the question that they have not learned how to answer more open-ended, higher-order thinking questions.

The focus on covering material within specified time frames poses a dilemma for teachers who must cover all the material and keep students engaged. In many cases,

covering material can be done quickly in traditional fashion through lectures, note taking, textbook following, and frequent quizzes and tests. Furthermore, Prensky (2006) states:

If educators want to have relevance in this century, it is crucial that we find ways to engage students in school. Because common sense tells us that we will never have enough truly great teachers to engage these students in the old ways—through compelling lectures from those rare, charismatic teachers, for example—we must engage them in the 21st century way: electronically. (p. 2)

McDonald and Danino (2015) illustrate an example in which students had access to a “rare and exceptional” (p. 66) learning experience when astronaut Commander Chris Hadfield communicated from aboard the international space station. Commander Hadfield provided real-time interviews and pictures and other online interactions with students who increased their appreciation and awareness of science and engineering.

There are ways in which students can still learn necessary material while at the same time using technology as a resource. John (2005) found that teachers used computer technology for extended periods if the learning experiences for students were enhanced in ways that would not be possible without it. However, some of the teachers in John’s study expressed concern that simulations and games in science would actually undermine the content, whereby students would more engaged in the gaming aspects and less involved in exploring the scientific principles. Yet, the understanding that all learning occurs from textbooks or within the classroom is something that is beginning to change, albeit slowly, for some teachers. However, there is a divide between the ways in which students use technology outside of school and how their teachers may or may not be using it to teach them. Farmer (2008) shares this outlook about the divide in students’ lives about their use of technology outside school and inside school and argues that schools may be in trouble:

If the outside world is a major driving force for educational adaptation, and yet education does not respond, [students] might well question one or the other entity and school may lose out. Already, students separate school from real life. (p. 63)

It is imperative to rethink other possibilities for educating students who are no longer confined to learning within classrooms, with individual teachers. Tadros (2011) would agree as she argues that “traditional methods should be revised and educators need to reconfigure relationships with students and with the technology they use” (p. 91).

With digital technologies, it is entirely possible to create individual learning opportunities in which students study material that they are interested in, at their own pace and with assessments, such as portfolios, that truly show what they have learned. Resnick (2010) asserts that in many school districts, students begin preparing for high stakes tests early in the school year, and at the expense of other curricular subjects, where the main goal is repeated practice of items that will appear on the tests.

Recently, the *Every Student Succeeds Act* (ESSA, 2015) was signed into law, repealing the *No Child Left Behind* act. This new law supports states’ efforts to assess students in multiple ways. In addition, under this new law, the federal government will support states that want to consider using innovative assessments for their students. Therefore, it is entirely possible to consider using technology to establish new ways of assessing student learning with technology.

Teachers commonly prepare students for high stakes tests through repetitive drills that “tend to deaden students’ genuine interest in learning” (Popham, 2001, p. 21) and make them “want to give up on school” (p. 22). Since students will still have to take high stakes tests, finding better solutions for how students are prepared for these tests is crucial to keep students enrolled in, and interested in school. Hannafin and Foshay (2006) explored how the use of computer-based instruction (CBI) could be used to improve math scores for students in the 10<sup>th</sup> grade. The computer-based instruction in this study involved factors that provided: (a) immediate feedback for students, (b) interactive instructional sequences, (c) students working at their own pace, and (d) a focus on mastering certain modules before proceeding to the next ones.



Although Hannafin and Foshay (2006) acknowledge that their primary goal was to “help struggling students pass the MCAS exam” (p. 151), it appeared that students were being helped to stay motivated with CBI as they learned the material. Students were not being forced to learn through didactic teaching or coverage of material in which they would have been given “easily forgotten facts, definitions, and formulas to plug into rigid questions” (Wiggins & McTighe, 2005, p. 45). Instead, this learning approach involved technology that transformed the learning environment into one that was student-centered and allowed students to take control of their own learning.

One of the problems with current standardized testing is that results are not immediately available for teachers to make adjustments to help students during the year in which the tests are taken (Thissen-Roe, Hunt, & Minstrell, 2004). Thissen-Roe and colleagues explored the role of technology in transforming student assessment. With their DIAGNOSER program, a web-based tool that provides formative assessment as well as immediate feedback for students and teachers, the ways in which student learning is assessed were altered. Not only did the DIAGNOSER assessment tool provide immediate feedback, it also gave teachers activities to do with students based on common misconceptions that ensued during the assessment. They found that “teachers overestimate the frequency of rare misconceptions, while underestimating the frequency of common ones” (p. 239). With the DIAGNOSER assessment tool, student misconceptions were made visible to teachers, who could then modify their teaching before continuing on to more advanced material.

In similar fashion, Clarke-Midura and Dede (2010) also looked at transforming student assessment with virtual worlds. They claimed that much of what students learn in schools is a result of what appears on high-stakes tests, and includes little assessment of students’ higher-level critical thinking skills. Using an innovative technology solution, Midura and Dede ventured to find out if immersing student assessments in virtual learning could potentially assess student performance in more meaningful ways. Their

work is still ongoing as they tackle issues of generalizability of these new types of assessments. Many teachers may assume they have successfully taught lessons because they covered the topics and received correct answers from their students (Wiggins & McTighe, 2005). However, immersing students in real world, albeit virtual learning scenarios, may provide the ultimate test of what they do and do not know.

Despite all the apparent benefits of the technology described in this section, including creating more student-centered learning opportunities and altering the ways in which students are assessed, technology may, in fact, detract from student learning (Lei, 2010). Therefore, there still remains much to learn about the role technology should have in schools.

### **Section III: Current Methods of Teacher Preparation and Professional Development**

This section presents current literature on the preparation of teachers who are learning to become teachers (pre-service) and those teachers who are already established (in-service). Guskey (2000) defines professional development as “an ongoing, job-embedded process” (p. 19) that can be accomplished through different methods such as training, observation/assessment, and involvement in an improvement process, study groups, inquiry/action research, individually guided activities, and mentoring. In-service teachers generally receive professional development during the course of their teaching careers.

The literature to date tells us that, in fact, there are limitations to what professional development can do to support teacher learning. In order to further understand how teachers are prepared for teaching before professional development becomes available to them, this section presents an overview of pre-service education for teachers. Pre-service education is where teachers encounter their first experiences in classroom settings. A

common criticism with pre-service education is the expectation of some professors that future teachers use technology to complete assignments, without actually modeling the ways technology can be used in classroom settings (Pierson & Cozart, 2005).

### **The Preparation of Pre-service Teachers**

Historically, beginning in the 1980s, colleges of education were unprepared to teach teachers how to use emerging technologies of the time (Schifter & Stewart, 2010). In fact, “there was no computer faculty in colleges of education” at all (p. 8). Therefore, teachers at that time were not receiving any instruction in technology education with regard to “how to use computers in pedagogically appropriate ways” (p. 8). Within the past 25 years, most teacher preparation programs began to shift their focus and include technology integration (Schifter & Stewart, 2010; Stobaugh & Tassell, 2011).

According to Stobaugh and Tassell (2011), 79% of teacher education programs expose pre-service teachers to technology integration during their student-teaching fieldwork. However, despite this focus, the literature on pre-service education reveals that when there are opportunities for new teachers to learn to integrate technology into their teaching, they are not learning methods that encourage the use of greater cognitive processing (Nadolny, 2011; Solmon & Chirra, 2006). Further, only 17% of pre-service teachers were taught how technology could be used to support individualized instruction (Stobaugh & Tassell, 2011).

Warschauer and Matuchniak (2010) found that when teachers do integrate technology, the integration might result in more “shallow” learning, such as creating a newsletter or searching for information on the Internet (p. 199). These types of activities are geared toward the production of basic computer skills as opposed to higher-level critical thinking skills that students need to develop in order to compete in today’s global society. King, Goodson, and Rohani (1998) define higher-level thinking skills as “critical, logical, reflective, metacognitive, and creative thinking” and “they are activated

when individuals encounter unfamiliar problems, uncertainties, questions, or dilemmas” (p. 2). Without engaging in activities that promote these skills, new teachers may be unable to model learning of a higher quality in their own teaching practices.

**A vision for technology in education.** An important development in the history of education has been the release of National Education Technology plans beginning in 1996. These plans set forth visions for technology literacy for students and teachers. The current National Education Technology Plan (U.S. Department of Education, 2016) asserts that all teachers, upon completion of their teacher preparation programs (pre-service), should know how to use technology in meaningful ways. They should not need remedial training once they are hired by a school district. Further, new teachers should have exposure to technology integration, modeled by their professors throughout their coursework (Brown & Warschauer, 2006; Edwards & Mosley, 2011; Koehler & Mishra, 2005; U.S. Department of Education, 2016). Edwards and Mosley (2011) attest that teacher educators at the university level:

must model the use of various technologies for the K-12 and higher education classrooms, explain and demonstrate how these technologies are linked to and affect learning outcomes, and assist in the decision-making process of identifying those technologies that contribute toward meaningful learning. (p. 209)

Fleming, Motamedi, and May (2007) found modeling technology use for new teachers to be a key factor in their later use. In fact, they discovered that "the more extensively pre-service teachers observe computer technology being used and the more they use computer technology in and out of the student teaching classroom, the more likely pre-service teachers were to report competence in their computer technology skills" (p. 207). Stobaugh and Tassell (2011) suggest another option to encourage faculty to model technology integration for pre-service students: Assess pre-service teachers on their abilities to integrate technology with higher-level thinking strategies as the goal.

Unfortunately, Pierson and Cozart (2005) found that although pre-service teachers were expected to use technology for their assignments, there was little exposure for them to “significant instructional use of technology in their coursework” (p. 61). Another troubling finding from a study involving pre-service teachers enrolled in a technology integration class was that the teachers were expected to learn how to use the hardware and software without learning how to integrate technology to impact student learning (Brown & Warschauer, 2006). Furthermore, Wright and Wilson (2006) found that pre-service teachers “were more likely to emulate what they were taught than to apply individual creative technology integration plans” (p. 49), therefore making it even more important for teacher educators to model the best practices for successful technology integration and to encourage creative uses for technology beyond what they have learned in their pre-service education programs.

**Pre-service teachers: Are they learning to integrate technology?** Pre-service education programs for teachers are tasked with “think[ing] of their responsibilities as including the production of technically literate teaching professionals who have a set of ideas about how their students should be able to use technology within particular disciplines” (Darling-Hammond et al., 2005, p. 199). In a report from the American Association of Colleges for Teacher Education (AACTE, 2013), “some 98% of teacher preparation programs prepare their students to use technology to deliver instruction” (p. 10). Although this percentage sounds like most colleges of education are successful in preparing future teachers to integrate technology, the terminology “deliver instruction” implies that these future educators are primarily learning how to use presentation tools such as multimedia slideshows, projectors or other types of technology that do not transform traditional learning in which students are passive recipients of information.

The Council for the Accreditation of Educator Preparation (CAEP) states that schools of education are to “ensure that candidates model and apply technology standards as they design, implement and assess learning experiences to engage students and

improve learning; and enrich professional practice” (www.caepnet.org). With a clear message to schools of education from an accreditation organization to prepare their teachers to “apply technology standards” in their profession, many questions remain: Namely, how are these educators being prepared, and to what extent will they be knowledgeable in effectively using technology? Despite the statistics indicating a large number of teachers are being prepared during pre-service education, they may not necessarily be equipped to maximize the impact technology could have on student learning.

In one particularly unique study, Nadolny (2011) investigated the use of a technology website designed to connect current classroom teachers with prospective teachers enrolled in teacher education programs. The prospective teachers in this study had “no formal student teaching experience and relied on their own experiences in education as a model for technology integration” (p. 177). The current classroom teachers would request lesson plans that integrated technology, and in response, the prospective teachers would create two-minute video lesson plans on YouTube reflecting what they had been learning in an educational technology course in their teacher preparation program. The prospective teachers assessed the technology skill levels of the requesting teachers before creating YouTube video lesson plans. As a result of her study, Nadolny found that the project met its goal of connecting prospective teachers to the realities of the classroom and infusing technology into curricular projects. Moreover, this type of learning situation provided future teachers with a hands-on experience using real world scenarios that may be encountered as they transition to in-service teachers.

**The TPACK framework.** Another example that demonstrates how teachers learn to integrate technology into their teaching comes from Koehler and Mishra (2006), who developed a framework for technology integration targeted at teachers enrolled in teacher education programs. Their approach is built upon Shulman’s (1986) Pedagogical Content Knowledge framework in which teachers need both subject matter knowledge and

pedagogical strategies simultaneously. Before Shulman integrated these two qualities together, teacher education focused on either building teachers' content knowledge or enhancing pedagogical skills (Mishra & Koehler, 2006). At the time in which Shulman developed his framework, both content knowledge and pedagogical strategies were thought of as separate entities to be learned whereas, today, in many cases, knowledge of technology is also perceived as separate from content and pedagogy (Mishra & Koehler, 2006). These researchers argued that teachers “need to know not just the subject matter they teach but also the manner in which the subject matter can be changed by the application of technology” (p. 1028).

As a result of this need, Mishra and Koehler (2006) developed the Technological Pedagogical and Content Knowledge (TPACK) framework. This framework emphasizes the cohesive relationship between technology, pedagogy, and content knowledge, all of which are necessary for good teaching. These researchers further argued that the best way for teachers to learn to integrate technology is through learning by design in which teachers actively participate in groups to solve authentic problems with the use of technology such that they begin to build a repertoire of practices to use in their own teaching.

### **Professional Development for In-service Teachers**

Professional development is believed to lead to improvements in teaching. Guskey (2000) defines professional development as “those processes and activities designed to enhance the professional knowledge, skills, and attitudes of educators so that they might, in turn, improve the learning of students” (p. 16). A further definition of professional development by Yoon, Duncan, Lee, Scarloss, and Shaply (2007) includes core components of professional development, that is, they are “characterized by coherence, active learning, sufficient duration, collective participation, a focus on content knowledge, and a reform rather than traditional approach” (p. 1).

Almost all teachers are required to participate in professional development every year (Kennedy, 2016). In a 2009 statistic, 55% of elementary school teachers spent between 1-8 hours of time in professional development activities for educational technology (Gray et al., 2010a). In addition, 90% of elementary school teachers agreed that the professional development activities “supported the goals and standards of my state, district, and school” (Gray et al., 2010a).

Research into the length of time for professional development to have an impact varies. According to one study, teachers need between 45 and 300 hours per year of off-site and school-based professional development to reap the most impact from professional development (Wei et al., 2010). Another study found that 30 or more hours would have positive impacts on teacher learning (Guskey & Yoon, 2009). Darling-Hammond, Wei, Andree, Richardson, and Orphanos (2009) found that few teachers had professional development opportunities that went beyond two days. In addition, researchers found that anything less than 14 hours of professional development had no impact on student learning (Darling-Hammond et al., 2009). In spite of these various numbers, Desimone (2009) asserts that the amount of time teachers need for professional development remains unknown.

To put it in perspective, it may be helpful to compare the time teachers spend in professional development in the United States with teachers in high-achieving countries. In high-achieving countries, teachers received 100 hours of professional development annually along with 15-25 hours per week set aside for collaboration with colleagues (Wei et al., 2010). Data from 2004 to 2008 showed that the amount of time teachers in the United States spent in professional development had actually declined from 9-16 hours of in 2004 to 8 hours or less in 2008 (Wei et al., 2010), and a similar amount of time reported in 2011-2012 (Rotermund, DeRoche, & Ottem, 2017).

Guskey (2010) supports a model of professional development that emphasizes the need to share evidence of improved student learning with teachers before having them try



new instructional practices. Teachers may be more likely to “expend the effort needed to integrate technology into instruction when, and only when, they are convinced that there will be significant payoffs in terms of student learning outcomes” (Means, 2010, p. 287). Some researchers are beginning to argue, however, that professional development needs to be redefined (Jones & Dexter, 2014). In fact, Jones and Dexter claim, “The unprecedented growth of digital technologies and the rate at which technology evolves creates a need for greater flexibility in teacher PD (professional development)” (p. 368).

**Continuous organizational support.** One of the most neglected areas of professional development is sustaining any positive changes that have taken place as a result of teachers learning new instructional practices (Guskey, 2010). In many cases, professional development activities are “too short and offer limited follow-up to teachers” (Penuel, Fishman, Yamaguchi, & Gallagher 2007, p. 929). In order for new instructional practices to become commonplace, teachers must use them “out of habit” (Guskey, 2010, p. 388). Therefore, it is in the best interest of school administrators to continuously support teachers as they undergo professional learning. Senge (2006) states that “organizations learn only through individuals who learn” (p. 129). However, Koehler and Mishra (2005) argued that with regard to professional development, “traditional approaches lead to teachers becoming *consumers* of knowledge about technological tools, with the hope that teachers will be able to apply this general knowledge to solving problems particular to their classroom situations” (p. 94). Rather than teach teachers how to use specific tools, they should acquire a deeper understanding about integrating technology.

**Characteristics of effective professional development.** Carlson (2002) advises that professional development should “include a variety of learning strategies, including direct instruction, deduction, discussion, drill and practice, induction and sharing” (p. 8). The following steps should be adhered to when creating professional development opportunities for educating teachers:

- Provide an authentic learning environment so that teachers engage in concrete tasks with realistic scenarios.
- Aim at higher-order thinking skills.
- Encourage teachers to be mentors, tutors and guides of the students' learning process (rather than simple presenters of knowledge and information).
- Develop teachers' skills in learning how to learn.
- Promote cooperative and collaborative thinking.
- Give them opportunities to apply the new knowledge they have learned (Carlson, 2002; Zepeda, 2014).

By having teachers attend professional learning opportunities that are modeled based upon the recommendations above they, in turn, will be placed in the roles such as those of their students, learning how to learn.

Unfortunately, Darling-Hammond et al. (2009) describe the teaching profession as an “egg-crate model” of instruction, whereby teachers are isolated in their own classrooms for much of the school day with little interaction with other adults and a lack of “a strong tradition of professional collaboration” (p. 11).

**Twitter as a tool for professional development.** While professional development tends to occur in physical locations in which teachers learn and interact collaboratively (Penuel et al., 2007), another approach to professional development is now being considered. Carpenter and Krutka (2015) explored how teachers use online tools such as Twitter as a means to grow as professionals. According to a 2017 research study, 13% of teachers reported that they “leverage Twitter as an informal, self-directed form of professional learning” (Project Tomorrow, p. 5). In fact, Forte, Humphreys, and Park (2012) describe the use of Twitter as “grassroots professional development” (p. 112). While some researchers argue that professional development should be school based and situated within the context of a classroom (Hawley & Valli, 2007, as cited in Carpenter & Krutka, 2015), others are looking toward the increased use of Twitter by teachers for

professional development (Carpenter & Krutka, 2015; Davis, 2015; Visser et al., 2014). Sloep (2013) refers to this type of learning as professional networked learning in which “peers are members of a large network, every peer (in principle) has access to many other people. This guarantees that there will be some fellow member of the network who is able to provide help” (p. 101).

As one research study participant described her own experience with learning through online social media networks, “I can get ideas from people halfway across the world and blend them, modify them or use them to come up with a lesson of my own” (Ottenbreit-Leftwich et al., 2010, p. 1327). Further, Visser et al. (2014) question whether teacher education programs are preparing future teachers to take advantage of the learning opportunities that social networking sites such as Twitter have for their profession. Some researchers have found the strength of Twitter is in its teachers who happen to be “progressive thinkers who are in a position to build the trust and support networks necessary to strengthen leadership in educational communities” (Forte et al., 2012, p. 113). Wesely (2013) found evidence to suggest that a community of practice on Twitter that is focused on the professional development of teachers is able to “successfully support learning in a variety of ways” (p. 316).

Despite some of the strengths that Twitter appears to provide educators, some researchers have noted potential drawbacks. For example, as Sauers and Richardson (2015) caution, “educators may be apprehensive to use Twitter because of the ways they see and hear about it being used by the general public” (p. 130). If educators’ main exposure to Twitter contains accounts of bullying, celebrity obsession, or inappropriate use, they may have negative perception of it (Sauers & Richardson, 2015). In addition, the quality of the information teachers adopt from Twitter may not necessarily meet evidence-based teaching methods that have already been established. Further, some Twitter-using teachers may be promoting classroom technology as a result of incentives they have received from corporations, as discussed in a recent *New York Times* article

(Singer, 2017). Therefore, there are many considerations to take into account before accepting Twitter as a means of professional development for teachers.

#### **Section IV: Adult Learning Theory**

This section addresses the many different ways in which adults learn. It begins with a comprehensive explanation of the differences between formal and informal learning opportunities and presents the case that both types of learning may occur simultaneously. The following subtopics will be reviewed along with detailed discussions as to how each one is related specifically to teacher learning: (a) formal and informal learning, (b) social learning, (c) the transfer of learning, (d) self-directed learning, and (e) teacher beliefs. It also includes a detailed discussion regarding the role of online social networking as an informal outlet for teacher learning.

##### **Formal and Informal Learning**

Kolb (1984) defines learning as "the process whereby knowledge is created through the transformation of experience" (p. 38). Teachers learn about teaching in many ways. Some of these ways are formal while many are informal (Bransford et al., 2000). Some types of formal learning experiences include structured classroom settings, seminars, professional development workshops and degree programs within institutions (Malcolm, Hodkinson, & Colley, 2003). Knowles (1950) defined informal learning as occurring "when a group of people come together in a number of meetings for the purpose of learning something simply because they want to know about it" (as cited in Henry, 2011, p. 21). Informal learning happens through experiential learning, dialogue with others, and self-directed learning (Malcolm et al., 2003). However, both types of learning may occur simultaneously (Abramo & Austin, 2014; Marsick, 2009; Malcolm

et al., 2003). In addition, formal learning through schooling can be supplemented with informal learning on one's own (Dabbagh & Kitsantas, 2011).

With regard to adult learning that takes place in a work environment, Malcolm et al. (2003) proclaim that it is important to identify the attributes that contribute to formal and informal learning in order to increase learning. Marsick (2009) states that “the learning of individuals is situated within organizational contexts where people work” (p. 271). With regard to teacher learning in the workplace, Malcolm et al. (2003) found that they learn through both informal and formal means. For example, some teachers attend workshops and bring knowledge back to integrate into their classrooms practices. This knowledge and how teachers are using it may then be discussed with colleagues, informally, whereby they too may be able to apply the formally learned knowledge (Malcolm et al., 2003). However, in some cases in which teachers were trained in the use of computers, it was found that the learning was not transferred back to teachers' classroom practices because they did not have access to the same technology that was covered during the training (Malcolm et al., 2003), or in other instances, teachers are “too confused about how to get started” (Plair, 2008, p. 71).

Formal education now has more options as younger generations are increasingly forming online communities for learning (Tadros, 2011). Research has found that teachers, in many cases, are learning through informal means (Bransford et al., 2000; Hoekstra, Korthagen, Brekelmans, Beijaard, & Imants, 2009). Especially in today's digital world, “informal learning may be more pervasive nowadays because so many more people are knowledge workers who prefer to learn in this way” (Marsick, 2009, p. 272). Visser et al. (2014) support an informal method of learning by teachers through the use of digital means. In their research on the use of Twitter as a personal learning network (PLN) for teachers, Visser et al. found that even though “members of PLNs may not necessarily know each other in the traditional sense, interpersonal relationships do arise, resulting in organic collaborations” (p. 397).

Since there are no formal training or development programs to introduce teachers to Twitter, and the potential benefits that it may offer, teachers who use it appear to be learning how to do so informally, outside of the classroom. In fact, most of the learning that occurs online is informal (King, 2010, as cited in Merriam & Bierema, 2014, p. 191). Informal learning environments require that “the learner needs to consciously recognize, even if in retrospect, s/he was involved in learning” (Levenberg & Caspi, 2010, p. 324). Likewise, because the learner is charged with recognizing his or her participation in an informal learning opportunity that does not culminate in a “summative evaluation, there is no way to assess [its impact] other than by tracing the perception of learning” (p. 325). Further, there are relatively few rewards for teachers who choose to learn through informal means as provided by online learning (Merriam & Bierema, 2014). As more teachers begin to use Twitter to support their learning in an informal way, without the guidance that may be provided in more formal learning situations, Merriam and Bierema (2014) caution that they need help to “realize that information cannot be taken at face value and instead must be questioned” (p. 208).

### **Social Learning**

Bandura (1971) stated that, “in the social learning system, new patterns of behavior can be acquired through direct experience or by observing the behavior of others” (p. 3). Researchers have found that intelligence, once thought to be a fixed entity, can actually be taught “through social processes that include participation in certain forms of high-demand learning” (Resnick, 2010, p. 186). Despite this finding, Spillane and Seashore Louis (2002) found that within many schools, teachers have “limited opportunities for professional interaction” (p. 93). As a result, it may not always be known within a school what other teachers and their students are doing in their classes, especially with regard to uses of technology. In addition, unless teachers regularly meet with administrators, they may be detached in their views about each other’s roles and responsibilities.

Resnick (2010) defines social capital as “the opportunities that some people have, and that organizations can create, for acquiring knowledge and other resources through interactions with others” (p. 191). Teachers and other school members should have the opportunity to express their thinking and to learn from each other. According to Spillane, Halverson, and Diamond (2001), “other school leaders and followers also matter in that they help define leading practice” (p. 27). The goal is to bring together the school members as a community in which “there is commonality of purpose, a shared vision, and understanding of how to complement one another’s efforts” (Senge, 2006, p. 217).

Tondeur, Coopert, and Newhouse (2010) studied the effects of having ICT (information, communication, and technology) coordinators in seven elementary schools. In particular, they examined how successful the schools were at integrating technology into their curriculums. They found that teachers were more likely to integrate technology when they had “one-to-one support, role modeling, scaffolding, peer collaboration and peer support” (p. 305). However, in their study, most of the ICT coordinators spent much of their time in one-on-one training sessions with individual teachers. One of the side effects of the lengthy individual training sessions is the loss of those teachers due to potential high turnover rates. Still, the ability to collaborate with peers has been found to be one of the key components to the successful adoption of technology.

Teachers need “deep engagement with other colleagues and with mentors in exploring, refining, and improving their practice as well as setting up an environment in which this not only can happen but is encouraged, rewarded, and pressed to happen” (Fullan, 2007, p. 55). Further, teachers should be a part of any new initiative in which their learning is involved. Moreover, they need to feel empowered by their school leaders, and they need to have a shared vision for how new initiatives will help their schools. Carlson (2002) advises: “The basic principles of adult learning should be incorporated, meaning the training program is highly social and cooperative, with opportunities to share experiences” (p. 8). With more teachers in attendance at

professional development workshops, opportunities for sharing and collaborating increase.

**Community of practice.** Wenger (2011) defines a community of practice as a group “formed by people who engage in a process of collective learning in a shared domain of human endeavor” (p. 1). There are three crucial characteristics of a community of practice, according to Wenger:

- (1) the domain, a shared topic of interest that members are committed to;
- (2) the community, whereby members engage in joint activities and discussions where they learn from each other; and
- (3) the practice, in which members are practitioners who share resources and help each other address problems, seek advice, coordinate efforts, document projects, seek experience and request information (pp. 2-3).

Initially, communities of practice developed as a result of “physical proximity” (Sauers & Richardson, 2015, p. 131). However, with advances in communication technologies, online professional communities of practice have formed.

As Sauers and Richardson (2015) emphasize, “it is essential that we understand the nuances of these professional communities of practices [such as Twitter] in an effort to improve the educational experiences for all” (p. 128). In their study of school leaders who use Twitter, Sauers and Richardson found that school leaders were creating communities of practice with Twitter, suggesting that leaders may need the support of other leaders since they may not have many peers within their school community. In another example of how Twitter was used to form a community of practice, Wright (2010) found that pre-service teachers who used Twitter to communicate their reflective thinking during their teaching practicums “valued the regular contact within [the Twitter] community, mitigating their feelings of isolation” (p. 263). Another added benefit to online communities of practice is that they “enable lifelong learning, evolve over time, enable



collaboration and reflection, facilitate learning skills development and connect both formal and informal learning” (Sauers & Richardson, 2015, p. 132).

### **Transfer of Learning**

How are some teachers able to transfer new ideas and instructional practices that they have learned through an online community forum such as Twitter to their classrooms? Broad (1997) defines learning transfer as “the effective and continuing application by learners—to their performance of jobs or other individual organizational, or community responsibilities—of knowledge and skills gained in the learning activities” (p. 2). Foley and Kaiser (2013) state that there are some barriers to being able to transfer learning to new situations. Some of these barriers include: (a) a lack of foundational knowledge with which to build upon, (b) not having a model that demonstrates how to incorporate new learning, and (c) a lack of opportunities to practice new learning in a real world situation (Foley & Kaiser, 2013).

Foley and Kaiser (2013) also discuss several key factors with applicability to learning with online social networks that help learners to transfer new learning to their situations: scaffolding, schema, and purposeful reflection. In a learning community such as Twitter, scaffolding occurs when “the learners serve as the temporary support structure for each other in the learning process” (p. 10). Foley and Kaiser use an example to describe a schema of a person who has not been in school for 20 years and returns to take a course. This person’s schema of a classroom is one in which the teacher is the center of all knowledge. However, the person now discovers that the role of the teacher has changed to a facilitator and the students in the classroom must contribute and construct their own knowledge. Thus, with the new knowledge in hand, the old schema shifts to incorporate this new knowledge (Foley & Kaiser, 2013).

With purposeful reflection, Foley and Kaiser (2013) state that learners need this opportunity to help them stay “engaged with the subject and to start laying roots for

meaningful transfer by creating relevance” (p. 12). With the online social network, Twitter, moderated chats are held weekly and there is usually a knowledgeable guide, or moderator, who controls the direction of the discussions. Reflection occurs during these moderated chats as the moderator asks participants questions encouraging them to think about their own teaching practices when answering them. An example of a question from the #4tchat discussion forum asks teachers: “What are your best question strategies that promote critical thinking?” By posing a question such as this, teachers are given the opportunity to consider strategies they have utilized in their own classrooms and to share information with a wider audience that may, as a result, try the given strategies in their own teaching.

### **Self-directed Learning**

What makes a self-directed learner? Why do some learners actively seek out information to learn on their own? Why are some teachers more innovative than others? Brookfield (2013) defines self-directed learning as “learning in which decisions around what to learn, how to learn it, and how to decide if one has learned something well enough are *all* in the hands of learners” (p. 90). Self-directed learning and self-regulated learning are sometimes used interchangeably. In self-regulated learning, the knowledge to be learned is pre-defined and learners can decide how they will work toward the goal of gaining such knowledge (Brookfield, 2013). Merriam and Bierema (2014) attest that “it is also important for adults to take control of their learning and become independent, self-directed learners” (p. 50).

One of the ways in which self-directed learning takes hold is when learners realize there is something that they want to learn about on their own terms (Brookfield, 2013). Bransford et al. (2000) refer to this as metacognition, whereby learners have “the ability to recognize the limits of one’s current knowledge, then take steps to remedy the situation” (p. 47). Especially in today’s digital society, “people around the world are

taking their education out of school and into homes, libraries, Internet cafes and workplaces where they can decide what they want to learn, when they want to learn and how they want to learn” (Collins & Halverson, 2010, p. 18). Zepeda (2014) further states that “teachers need to champion their own professional learning in tandem with collaborative and reflective approaches with colleagues, so that job-embedded professional development becomes part of the work day” (p. 1).

Thurlings, Evers, and Vermeulen (2015) sought to explain why some teachers might be more innovative than others. They found a number of factors to explain innovative behavior including self-efficacy and motivation. Moreover, Brookfield (2013) argues that by being able to take the responsibility of learning in one’s own hands, learners are free from “educational totalitarianism” (p. 95). In the case of teachers, by creating their own personal learning networks on Twitter, they have access to new ideas and are able to supply ideas for others, and they may experience a sense of freedom from many of the constricts they have regarding what and how they should learn.

Bandura (1971) argued that in order for people to learn and use information, they need reinforcement to go along with their new learning. With regard to classroom teachers who have learned new technical techniques through Twitter, reinforcement for them may be in the form of increased student learning and engagement. Thus, after witnessing transformations in their classrooms, teachers may be more likely to further pursue new learning through their social media networks. It may also be that self-directed learners are more reform-oriented as suggested by Forte et al. (2012). They found that teachers who were using Twitter were more “open to change” (p. 110).

### **Teacher Beliefs**

Teacher beliefs influence the likelihood of teachers participating in continuous learning opportunities, especially with regard to using technology. Teachers are more likely to focus on their past experiences with using technology to inform their beliefs

about its use as an instructional tool (Mueller et al., 2008). In a four-year longitudinal study, Kim et al. (2013) compared 22 teachers who underwent professional development training in various technology tools. The teachers were questioned about their beliefs regarding the nature of knowledge and learning. Results revealed that, “teachers’ beliefs about the nature of knowledge and learning and beliefs about effective ways of teaching were related to their technology integration practices” (p. 82). As a result of their study, the researchers suggest that interventions for teachers should be designed with a focus on the understanding that “students can be a source of their own knowledge” (p. 82), thereby altering the roles that teachers traditionally take. Further, teachers’ roles would change from those who transmit knowledge to students through mainly direct instructional methods to becoming facilitators who help students uncover their own knowledge.

McCombs, Daniels, and Perry (2008) found that for elementary-aged students who had teachers with learner-centered beliefs, the students have “greater interest in and liking of school and academic subjects as well as more positive perceptions of their competencies” (p. 30). Mishra and Koehler (2006) would concur that teachers’ values need to be addressed when determining the most beneficial uses of technology in teaching. More significantly, teachers should have positive experiences with integrating technology that, in turn, will help contribute to changing their beliefs (Mueller et al., 2008). Moreover, it was found that “professional development with a focus on the integration of technology for student-centered practices appears to have a positive effect on shifting beliefs and practices” (Palak & Walls, 2009, p. 437).

In a longitudinal research study in which teachers were given access to various technologies, as well as support for using them, the results showed that “teachers’ own personal attitudes changed so that they mastered certain types of computer-related technologies, increasing their self-confidence” (Sandholtz et al., 1997, as cited in Mumtaz, 2000, p. 333). Therefore, teachers may be more likely to integrate technology comfortably within their classrooms as their confidence with it increases.

## **Online Social Networking as a Learning Tool**

A key component for social learning is the shared experience (Mayes & de Freitas, 2013). Kaplan and Haenlein (2010) define social media networks as “a digital environment where people can gather, critique and share digital media items such as data, information, images and video recordings across established online networks (as cited in McDonald & Danino, 2015, p. 61). Twitter is one such example of a social media network that teachers are using to engage in shared experiences. Users of Twitter post their own messages (tweets), and they can share other users’ messages (re-tweets) with their followers (Corbeil & Corbeil, 2011). The number of tweets per day is estimated at over 500 million (Internet Live Stats, 2016). Information on Twitter is sorted by hashtags (#) that represent different topics that users are discussing. The vast number of discussion topics has led to a “worldwide online community” (Corbeil & Corbeil, 2011, p. 16), whereby users can easily find discussion groups that share their own interests. Twitter can be used for both asynchronous and synchronous communication (Davis, 2015). Further benefits of the use of Twitter for learning include the “accelerated pace of communication” (Sauers & Richardson, 2015, p. 129), whereby users can post information and receive responses in a time-efficient manner.

In a survey by Forte et al. (2012), teachers reported using Twitter as a means of “improving their practice and using social media in creative ways with their students” (p. 112). In moderated Twitter chats, participants engage in synchronous discussions answering questions posed by a moderator. For example, teachers who participate in the #4thchat discussion meet on Monday evenings at 8:00 P.M. eastern. These types of Twitter discussions “may provide practitioners with on-demand resources and opportunities to engage in reflective thinking and be a part of an online community of practice that spans a global network of professionals” (Davis, 2015, p. 1557).

Zepeda (2014) writes about a teacher who follows 60 educators on Twitter who “write about their experiences in a relatable way and share innovative and creative lesson

plans that [this teacher] incorporates into his own teaching practice” (p. 30). This same teacher was able to produce results from incorporating what he had learned into his teaching. In another example of a teacher’s response to using Twitter for professional development, the teacher writes, “I don’t wait for PD (professional development) to come to my school district, I can seek it out via Twitter” (Visser et al., 2014, p. 404). Cuban (2013) suggests that when teachers are faced with the challenge of integrating technology, one of the first questions they will ask is, “What happens if I need immediate help?” (p. 116). With Twitter, the possibility for teachers to receive immediate help and feedback from a significant number of fellow teachers and education experts exists. Another feature of Twitter that may enable learning is the ability for individuals to pursue topics in a non-linear fashion, that is, learning is iterative, representing the ways people actually learn (Wesely, 2013).

Dewey (1916) stated that “learning is a cognitive and social process that develops through conversation” (as cited in Corbeil & Corbeil, 2011, p. 19). Using Twitter as a platform for teachers to communicate may enhance both of these processes. Likewise, McDonald and Davino (2015) argue that “the most valuable element of social media networks is the communal characteristic that governs actions in the shared digital space” (p. 62). There are many benefits to having an online network of support. For example, some teachers receive emotional support and feedback from their social networks, especially since they are available on an as-needed basis (Davis, 2015; Visser et al., 2014). A second benefit that Twitter provides for teachers is the ability to sort through information and “choose what best applies to their own learning needs” (Davis, 2015, p. 1555), thereby personalizing the information directly to the learner. Third, teachers may be more trustworthy and likely to use ideas endorsed by other teachers because an element of trust exists between them (Masterman, 2013). Fourth, the connections on Twitter allowed teachers to “feel less professionally isolated” (Visser et al., 2014, p. 408; Bransford et al., 2000; Wright, 2010). Although Davis (2015) encountered mostly

positive feedback from teachers in how they used Twitter, she also discovered that teachers are disappointed that many administrators do not view Twitter as a legitimate resource for professional development.

Tadros (2011) notes that there is a potential drawback of having teachers using social media: the possible development of a digital divide. Wherein some teachers may easily adopt social media for learning new technologies, others “are technophobes and others simply not willing to learn or do not have the time to learn or devise new methods of teaching” (p. 93). Visser et al. (2014) found teachers who are more proficient with technology are using Twitter more frequently for professional purposes.

In a higher education setting, Tadros (2011) suggests that one potential solution would be to partner tech-savvy instructors with those who are not as comfortable with technology to help them facilitate ways to use technology in their teaching. In another study, Forte et al. (2012) found that many teachers initially tried using Twitter for personal communication that “evolved into use as a professional tool because of its value” (p. 111). Further, Wright (2010) found that pre-service teachers who used Twitter to communicate their reflective thinking during their teaching practicums “valued the regular contact within [the Twitter] community, mitigating their feelings of isolation” (p. 263).

Another possible drawback may be the lack of expertise that teachers are exposed to when they connect with others on Twitter. For example, with regards to professional learning communities for teachers, Spillane and Seashore Louis (2002) state, “What stimulates real change is sustained interaction between teachers and an outsider who uses research to question conventional practice” (p. 99). With regard to teachers who are learning new knowledge and skills, it is unclear to what extent research supports the ideas they implement using technology. For example, one teacher on Twitter posted a link asking for suggestions on how to use social media in her classroom. It is possible for her to receive numerous responses; however, those ideas may not necessarily adhere to

theories of learning and the responsibility is on the teacher to figure out how to use the new tools in ways that support her students' learning. Likewise, "teachers need to be able both to make good choices among curriculum options and to study and deeply understand the teaching implication of the choices they ... have made" (Darling-Hammond et al., 2005, p. 189). Thus, when teachers implement new ideas they have learned about, they should be well informed about how their students might respond.

In a research study by Davis (2015), teachers responded positively to the use of Twitter as a tool for professional development. The use of Twitter helped establish a sense of belonging as well as meaningful professional development. Further justification regarding the use of social media networks for professional development comes from McDonald and Danino (2015), who state, "Large groups of individuals from varied physical locations, cultures and practices can come together in a common digital environment to share the social process of education" (p. 64). Likewise, Macià and Garcia (2017) found that teachers who belonged to many different networks tended to post more content and participated more frequently in Twitter conversations.

Visser et al. (2014) illustrate an example of how teachers are gaining professional development via Twitter. In their survey, they found that teachers follow live conferences and take notes with Twitter. Even if they are not in attendance, teachers reported feeling a sense that they are gaining from the experience virtually. Overall, teachers felt that they were able to learn about "the latest research, pedagogical strategies, and best practices" and the experience of using Twitter as professional development "was transformative in nature, resulting in [self-reported] improved classroom practice" (p. 407). Furthermore, Laurillard (2013) attests that "peer-to-peer learning is facilitated in a powerful way, and on a global scale, we see how learning can be socially situated in a way never previously possible" (p. 28). Bransford et al. (2000) describe the sense of community that arises from individuals who come together to learn, stating that "they can engender a sense of



the excitement of learning that is then transferred to the classroom, conferring a sense of ownership of new ideas as they apply to theory and practice” (p. 25).

### **Chapter Summary**

This literature review gave an in-depth analysis of four sections that supported this research study: (a) an historical overview of traditional classroom teaching, (b) the use of technology to transform pedagogy, (c) current methods of teacher preparation and professional development, and (d) adult learning theory. The first section began with a history of how traditional teaching methods were established. From the one room schoolhouse with 50 students to current school systems in which students are separated into grades by age, teachers are still using some of the same teaching methods to educate students. The following description summarizes the current state of affairs in our schools: “Teaching is often viewed as telling, learning is equated with remembering, and a didactic teacher-centered pedagogy dominates most schools” (Spillane & Seashore Louis, 2002, p. 91).

The second section included a discussion on the ways technology can be used to transform pedagogical practices. It addressed the ways technology can facilitate student-centered learning through: (a) problem-based learning, (b) knowledge building communities, and (c) forming a participatory culture. Each of these teaching approaches provide options for teachers to shift traditional teaching practices to those that are more likely to engage students as they build higher-order thinking skills. This section also reviewed literature suggesting the use of technology to alter traditional assessments. Once traditional assessments have been altered, classroom learning can be geared toward more meaningful experiences for students and less of a focus on preparation for tests.

The third section discussed the preparation of pre-service teachers and professional development provided to in-service teachers. This discussion reviewed the literature

regarding the preparation of future teachers at their schools of education and pointed to a lack of instruction in teaching them to learn to integrate technology into their teaching. One of the key problems identified is that professors are not modeling ways in which technology should be used in the classroom. With regard to the professional development for in-service teachers, the literature revealed that many forms of professional development are inadequate to meet teachers' needs. Professional development tends to occur sporadically, fails to take into account the specific needs of teachers involved, and provides little follow-up support.

In the fourth section, the lens of adult learning theory was used to establish a framework for understanding how teachers learn. This section uncovered ways in which social media networks such as Twitter can facilitate communication between groups of teachers. As strong proponents of a professional community for teachers, Spillane and Seashore Louis (2002) conclude that “teachers who have found a network of colleagues with whom they can discuss their professional practice—either inside or outside their school—are more likely to be engaged in improving their practice in ways that have the potential to affect student learning” (p. 93). This section also outlined the role of teacher beliefs and how they impact teachers' willingness to learn how to incorporate technology in their teaching.

Lastly, this section described what it means to be a self-directed learner. In an effort to learn more about how teachers use Twitter to support their professional learning, four research questions were devised and are addressed in Chapter III, Methodological Approach.

### **Conceptual Framework**

The conceptual framework categories below were derived from the four research questions presented at the beginning of this chapter: (1) How are teachers using Twitter

for their professional learning and development? (2) What do teachers report learning from their use of Twitter? (3) What do teachers say they do with the information they have learned from using Twitter? (4) What support do teachers have when they want to implement what they have learned from Twitter? The various descriptors under each of the categories help explain them further. Throughout the course of data collection, the descriptors were revised and refined. Further, the descriptors served as the final coding legend resulting from this iterative refinement process.

A. How Twitter is used

- As a source of motivation and support
  - Feedback
  - Encouragement
  - Peer accountability
- To form collegial networks
  - Teachers feel less alone
  - Build lasting relationships
  - Safe space to share
- As an opportunity to reflect on their teaching practice
  - Challenge thinking/assumptions
  - Modify teaching practices
  - Offers an outside perspective
- As a window into other teachers' classrooms
- To access curricular resources in a timely manner with hashtags

B. What is learned

- Technology integration techniques
  - Learn about digital tools and how to apply them
  - Collaborate on projects with others
- Strategies to implement curricular resources

- Innovative ideas
- C. How learning is used
  - Transform teaching practices
    - Become more student-centered
  - Identify and act on other opportunities
  - Teach others about Twitter
  - Adapt new knowledge to fit teachers' needs
  - Make global connections
- D. Support for teachers
  - School Environment
    - District-level (superintendent)
    - School-level (principal)
  - No support

### Chapter III

#### METHODOLOGICAL APPROACH

The purpose of this research study was to explore how elementary school teachers use the social networking website, Twitter, to support their professional learning and development. The assumption was that a better understanding of this phenomenon would provide teachers, administrators, and other leaders in the field of education with additional support networks to call upon in an effort to improve teaching practices. In seeking to understand how some teachers engaged in learning with Twitter, this study addressed four research questions:

1. How are teachers using Twitter for their professional learning and development?
2. What do teachers report learning from their use of Twitter?
3. What do teachers say they do with the information they have learned from using Twitter?
4. What support do teachers have when they want to implement what they have learned from Twitter?

This chapter outlines the methodology used to explore the research questions and includes discussions on the following areas: (a) rationale for a mixed methods approach, (b) description of the research sample, (c) overview of information needed (d) overview of the research design, (e) methods of data collection, (f) data analysis and synthesis,

(g) literature on methods, (h) ethical considerations, (i) issues of trustworthiness, and (j) limitations of the study. The chapter concludes with a brief summary.

### **Rationale for a Mixed Methods Approach**

A two-phase mixed methods approach was used for this study. Referred to as “explanatory sequential mixed methods” (Creswell, 2014, p. 15), the more expansive quantitative first phase involved distributing an online survey to teachers who use Twitter. The second phase, in which follow-up interviews were conducted, was used “to explore in greater depth theoretically relevant patterns” (Hesse-Biber, 2010, p. 112) from individual cases.

This research study explored how some teachers use Twitter as a form of online professional learning. In order to fully understand how this was being done, a mixed methods approach was employed. Johnson and Onwuegbuzie (2004) define mixed methods as “the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study” (p. 17).

Before selecting a mixed methods approach, each approach was considered separately in order to understand each one’s individual strengths and weaknesses (Johnson & Onwuegbuzie, 2004). By adhering to the fundamental principle of mixed research in which different strategies, approaches and methods are combined to “result in complementary strengths and nonoverlapping weaknesses” (Turner, 2003, as cited in Johnson & Onwuegbuzie, 2004, p. 18) this research study aimed to take advantage of the strengths of each method.

More specifically, this research study incorporated a within-stage mixed-model design. In this type of design, both types of data were collected simultaneously in a survey (Hollstein, 2014; Johnson & Onwuegbuzie, 2004). The survey served as the

primary means of data collection with both open-ended (qualitative) and closed-ended questions (quantitative) (see Appendix A: Survey: Twitter as a Professional Learning Tool for Teachers).

Quantitative data were gathered from two separate 5-point Likert rating scales within the survey, in addition to a series of closed-ended questions. In an effort to understand the data more thoroughly, triangulation was achieved through follow-up interviews and document analysis (Creswell, 2014).

Creswell (2014) has stated that using a mixed methods approach results in “a stronger understanding of the problem or question than either by itself” (p. 215). Further, Rossman and Wilson (1985) have also stated that when “each data type is well developed, elaboration can lend strength to an argument and provide a different perspective on the same phenomenon” (p. 633). Finally, by using both qualitative and quantitative methods, a more complete understanding was gained regarding how teachers are increasingly taking their learning to the online social network, Twitter, by integrating numerical data with verbal explanations.

### **Description of the Research Sample**

Purposeful and convenience sampling were used to select the sample for this study. According to Merriam (1998), purposeful sampling in qualitative research allows the researcher to select qualities for a sample “from which the most can be learned” (p. 61). Since the goal of this study was to explore how elementary school teachers use and learn from Twitter, the recruitment of participants took place solely on Twitter. Further, Onwuegbuzie and Collins (2007) have stated that convenience samples include the choice of setting along with “groups and/or individuals that are conveniently available and willing to participate in the study” (p. 286).

With Twitter, messages that are posted are known as tweets. Tweets are limited to 140 characters. Therefore, when composing tweets to recruit participants for this research study, each word or abbreviated word was carefully selected. All recruitment tweets included a link to the online survey. Initially, recruitment was to be limited to teachers of fourth grade in light of the researcher's own experience working with this grade. Fourth grade teachers were targeted with the hashtag, #4thchat. The use of hashtags is a convenient way to search topics and keywords on Twitter, and they enabled the targeting of specific groups of interest. For example, in addition to #4thchat, each grade level has its own hashtag: #kinderchat, #1stchat, #2ndchat, #3rdchat, and so on.

Over the course of four weeks, January 31, 2017 through March 2, 2017, 180 tweets were sent from the researcher's Twitter account. These tweets included messages to specific hashtags (#s) as well as tweets to individual Twitter users. With the use of an application called Tweetdeck, which allows tweets to be scheduled, several tweets were scheduled to post at different times throughout the day. For example, tweets were sent in the early mornings (6:00 A.M.–8:00 A.M.), around midday (11:00 A.M.–1:00 P.M.), after school hours (3:00 P.M.–5:00 P.M.), evenings (6:00 P.M.–8:00 P.M.) and at night (9:00 P.M.–11:00 P.M.). This ensured that potential participants could be selected from different time zones.

At the conclusion of the four weeks, a total of 211 teachers responded to the online survey asking about their use of Twitter. This response rate included teachers from countries around the world due to the global reach of Twitter as a social network. However, in order to maintain consistency with the literature that primarily focuses on professional development and teacher learning in the United States, the sample was reduced to 107 kindergarten through fifth grade teachers who teach in the United States. The next section provides a detailed discussion about the methods used to obtain the research sample.



## Recruitment Methods

In an effort to encourage potential participants to complete the online survey, participants were informed that upon completion of the survey, they were eligible to enter their email addresses into a drawing for a \$25 Amazon gift card. This amount was later increased to \$50 at the realization that getting enough participants to complete the survey was challenging. Roller and Lavrakas (2015) have stated that tactics such as this must be used “to gain cooperation from those who have been chosen to be studied” (p. 28). Moreover, potential participants were also told the odds of winning were 1 in 100. Figure 2 illustrates the first recruitment tweet that was sent on January 31, 2017, with an abbreviation of the letter “T” for teachers and the #4thchat hashtag to reach fourth grade teachers:

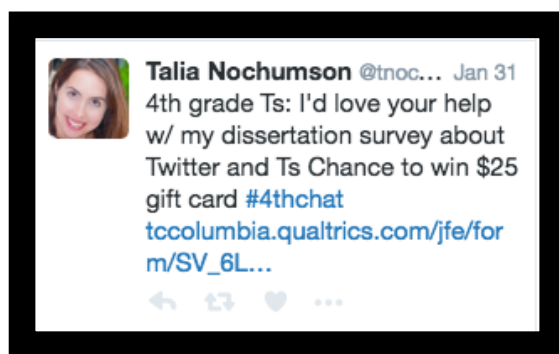


Figure 2: Initial recruitment tweet

After a few days of sending this same tweet (Figure 2) at different times on Twitter, only a few responses had been recorded in the survey. A change was made to shorten the URL address of the link to the survey using a web tool called TinyURL. This tool allowed for fewer characters to be used up by the survey link as illustrated in Figure 3:

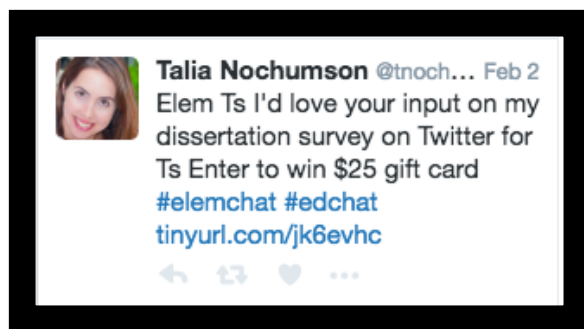


Figure 3: Second recruitment tweet

To comprise a sufficient sample of elementary school teachers, their respective grade level hashtags were targeted with recruitment tweets. However, when the number of responses remained low at the beginning of the survey distribution (three total responses after four days of tweets), additional hashtags were included to broaden the exposure of the recruiting tweet to more potential participants. The tweet in Figure 3 also shows the expansion to the hashtags, #elemchat and #edchat. Research was done through Google and Twitter to determine other widely used hashtags by elementary school teachers. The following hashtags were then targeted in recruitment tweets: #edtech, #edchat, #mysteryskype, #elemchat, #gloaledchat, #geniushour, #lessonUP, #sschat, #satchat, and #edugladiators.

In addition to targeting potential participants through the use of specific hashtags, individual Twitter users were also targeted with tweets to their individual Twitter accounts. Leaders in the field of education, many of whom have thousands of followers, received tweets asking them to share the link to the online survey with their followers. For example, a superintendent and active Twitter user with over 20,000 followers re-tweeted the link to the survey to his followers. By contacting this user and asking him to share the tweet with his followers, the recruitment tweet received more views and re-tweets.

Visser et al. (2014) used a similar approach in their research study. They received 542 completed responses to their survey by tweeting it to their followers and having the survey re-tweeted by prominent leaders in the field of education. The method used by

Visser et al. helped inform the direction of this research study in that re-tweets by other Twitter users, especially by those with thousands of followers, led to an increase the survey response rate.

In some instances, recruiting participants involved contacting individual users whose Twitter profiles identified them as teachers of grades kindergarten through fifth. These individuals received tweets to their individual Twitter accounts asking them to take the survey and share it with other K-5 teachers as Figure 4 shows:

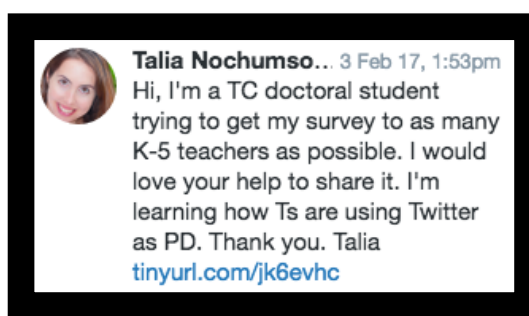


Figure 4: Tweet sent to individuals

As a result of reaching out directly to individual Twitter users with high numbers of followers, the recorded responses increased. Responses were received from teachers all around the world including: China, Singapore, South Africa, Ireland, Australia, the UK, Canada, and the United States. At the end of the three-week data collection period, 211 total responses were recorded, with 107 included in the final sample size.

In the recruitment tweets that were sent to potential participants through the use of hashtags or through messages directed at individual Twitter users, none specifically mentioned this research was only looking for participants in the United States due to the limited number of characters. Since the literature is based primarily on professional development as it occurs in schools throughout the United States, responses from other countries were not included in the final sample. Thus, the following criteria were used to select participants:

1. All participants must have an active and public user account on Twitter.
2. All participants must teach children in the elementary grades, K-5.
3. All participants must teach in the United States.

Fabrigar and Wegener (2011) caution that when selecting the size of a sample, little theoretical or empirical evidence exists to suggest specific guidelines to follow. However, Onwuegbuzie and Collins (2007) recommend that “the size of the sample should be informed primarily by the research objective, research question(s), and, subsequently, the research design” (p. 288). For research designs that explore correlations between variables, the recommended number of participants is 82 (Onwuegbuzie & Collins, 2007). Thus, with a sample of 107 teachers, the sample size was sufficient for this research study.

### **Overview of Information Needed**

The four research questions in this study served as a guide to obtaining information about how teachers learn from Twitter and apply what they have learned to their teaching practices. Three categories of information were needed to answer the research questions (Bloomberg & Volpe, 2008): (a) *Perceptual information* helped determine how participants conceptualized and made meaning of their experience using Twitter; (b) *demographic information* provided profile information concerning the personal and professional backgrounds of the participants; and (c) *contextual information* helped describe the cultural and environmental contexts in which the participants use Twitter.

#### **Perceptual**

The perceptual information was gathered through interviews with teachers. This information included teachers’ perceptions of:

- the support they receive when they want to implement new ideas in their teaching,
- the use of online social media networks to support their learning,
- the changes that have taken place in their own teaching practices as a result of using online social media networks, and
- the choices they make regarding whom they follow on Twitter and the information they seek.

### **Demographic**

A demographic inventory at the beginning of the online survey collected the following demographic information:

1. School Type
  - a. Public
  - b. Private
  - c. Charter
  - d. Other (i.e., home school, online)
2. Location of school
3. Number of students in your school
4. Percentage of students receiving free/reduced lunch
5. Number of years you have been a teacher in this school
6. Highest degree
7. What grade level do you currently teach?
8. What subjects do you feel most comfortable teaching?
9. What subjects do you feel less comfortable teaching?
10. Is access to high-speed Internet available? Please explain.
11. How long have you been a Twitter user?
12. Frequency of Twitter use

## **Contextual**

Within an online social media network such as Twitter, teachers may feel a sense of belonging and purpose, especially within an established discussion forum such as #2ndchat. Contextual information was gathered through document analysis of the types of tweets that users posted to the #2ndchat community. These posts provided a deeper understanding of the types of information teachers were looking for, and the types of connections they engaged in with other Twitter users.

## **Methods of Data Collection**

The methods of data collection that were used in this mixed methods research study included: (a) an online survey, (b) interviews, and (c) document analysis. In a recent study with a similar approach to recruiting participants as this study, Carpenter and Krutka (2015) conducted a survey of teachers via Twitter using several different hashtags (#edchat and #edtech) during a 5-week period in which they tweeted a link to their survey several different times during the day. In addition, they asked prominent educators to re-tweet their survey to their followers to gain a wider audience. As a result, 755 individuals completed their survey (Carpenter & Krutka, 2015). For this study, the survey was tweeted via Twitter to numerous hashtag discussion groups several times throughout the day, including during moderated chat sessions. Additionally, individual users whose profiles revealed them to be teachers of the elementary grades were targeted with tweets throughout the course of four weeks.

## **Phase I: Survey**

Data were collected in an online survey from elementary schoolteachers who use Twitter. The purpose of the survey was twofold. First, it examined how and what teachers reported learning from their participation in Twitter. Second, the survey was used to understand their reports about how their teaching practices have changed as a result of

their use of Twitter. By using an online method of data collection, this research study was able to offer “an electronic extension of familiar research techniques, widening the scope of data available to the researcher” (Merriam, 1998, p. 128). A further benefit of online surveys includes the capability for participants to “select the time and place for participation” (p. 8), which can be empowering for them.

Bebell, Russell, and O’Dwyer (2004) have stated that, “although it may seem efficient to ‘borrow’ surveys or items that have been used for other research or evaluation, doing so may fail to capture the full range in which teachers are using existing and recently acquired technologies for a variety of purposes” (p. 60). It was for this reason, a survey was drafted specifically to elicit responses from teachers about how they used and learned from Twitter.

Iarossi (2006) described four criteria to consider when writing survey questions. First, survey questions should be brief and not include any extraneous words. Second, the questions should be objective and not lean toward or suggest a particular type of response. Third, survey questions should use simple language that all participants will likely understand. Lastly, the survey questions should be specific, without allowing for open interpretation by the respondents.

The survey that was used in this research study was designed to gather both quantitative and qualitative data simultaneously. Results from the survey were used to gain an understanding of the context in which teachers use Twitter and to guide the development of questions for the follow-up interviews in Phase II. The survey itself was pilot tested and is described in the following section.

**Pilot study.** A pilot study took place in the fall of 2016. The online survey, *Twitter as a Professional Learning Tool for Teachers*, was field tested with a convenience sample of teachers who use Twitter (n=24). Teachers self-reported the extent to which they use Twitter for specific purposes using two different rating scales. The first rating scale checked for frequencies based on a 5-point Likert-type scale with response choices

of “everyday,” “a few times per week,” “a few times per month,” “a few times per year,” and “never.”

The second rating scale also used a 5-point Likert-type scale to ask participants to indicate the extent to which Twitter helped them incorporate different teaching strategies in their classrooms. For the questions on this scale, possible responses ranged from “extensively” to “not at all.” At the end of the pilot study, participants were asked about their reactions to the length of the survey and the clarity of the questions. In addition, participants in the pilot study were asked to give any feedback to help improve the overall survey.

The remaining questions in the pilot survey consisted of closed-ended “yes,” “no,” “maybe,” and “I plan to do so in the future” and open-ended questions. The closed-ended questions were typically followed by an open-ended question to acquire more information regarding the participants’ responses. For example, Question 19 asks, “Have you implemented new teaching methods, ideas or activities that you learned from Twitter in your teaching practice?” The possible responses are “yes,” “no,” and “I plan to do so in the future.” If participants select “yes,” they are prompted to answer a follow-up, open-ended question, “How did your students respond to the new teaching methods, ideas or activities that you implemented in your teaching?” This example demonstrates how the quantitative and qualitative data were gathered simultaneously.

General analyses from the pilot survey of 24 completed responses revealed that the instrument was an appropriate length given that 96% agreed that the length is “just right.” In addition, 82% responded that the questions are “very clear,” with the other 18% agreeing that they were “moderately clear.”

The final question seeking feedback on the pilot survey allowed participants to offer suggestions for improvement. Five participants responded, with three of them commenting on the importance of this topic. One participant thought the questions may have been repetitive, and another participant felt that some answer choices were hard to



answer with either “yes” or “no.” Lastly, one participant suggested enlarging the text boxes of the open-ended questions to encourage lengthier responses.

**Statistical analysis of pilot survey.** Exploratory factor analysis was performed on both rating scales to identify “a smaller number of factors underlying a large number of observed variables” (Gaur & Gaur, 2009, p. 131). Gaur and Gaur caution that a sample size of less than 100 is not suitable for factor analysis and that the ideal sample size is greater than 500. However, for purposes of analyzing the pilot study, factor analysis was performed using the sample of 24 completed survey responses.

Both rating scales had incidences where some of the results from the factor analysis revealed that a few questions loaded onto two factors. To deal with a situation such as this, Gaur and Gaur (2009) recommend removing such questions from the analysis or to make changes to the questions “based on theoretical considerations” (p. 143). As a result, those questions were revised in the final survey.

**Reliability.** To ensure that the results from both rating scales produced reliable measures, internal consistency reliability of scores was investigated using Cronbach’s Alpha (McMillan, 2008). Gaur and Gaur (2009) suggest a Cronbach alpha above 0.70 as a “reasonable test of scale reliability” (p. 134). Three of the four factors from rating scale #1 resulted in a Cronbach alpha greater than 0.70 in the pilot study. For factor 3, the deletion of question Q6\_9 that asks, “How frequently do you use Twitter to further explore topics you are comfortable teaching?” resulted in a Cronbach’s alpha of 0.785. Thus, this question was deleted for the final survey.

Rating scale #2 was also tested for reliability in the resulting two scales. For both of these scales, the Cronbach’s alpha was above 0.70. Therefore, these factors met the standards for scale reliability (Gaur & Gaur, 2009).

By asking similar questions both qualitatively and quantitatively, reliability can be obtained if the responses to those questions are similar (Hesse-Biber, 2010). Evidence of this type of reliability appeared in this survey. For example, in the first rating scale

section, a quantitative question asks participants to specify the degree to which they engage in moderated Twitter chats. Later, a qualitative question is asked requiring participants to describe their experience as a result of participating in a moderated Twitter chat. A cross-tabs analysis of these two items revealed a perfect relationship ( $p$ -value = 0.00), demonstrating reliability within the survey instrument.

Finally, McMillan (2008) indicates that “reliability should also be established with individuals who are similar to the subjects in the research” (p. 155). The pilot study participants were representative of the sample that comprised this dissertation study. The pilot study participants consisted of educators who actively used Twitter for educational purposes.

**Validity.** Validity of the survey was done with the face validity test (Gaur & Gaur, 2009). Face validity tests are done by sharing the survey with experts and participants and then analyzing their responses qualitatively (Gaur & Gaur, 2009). For this research study, the piloting of the survey with 24 participants elicited feedback for analysis and informed the final survey design.

### **Final Survey Design**

The pilot study helped identify any methodological changes in all areas of the research design including (a) the survey design, (b) interview questions, and (c) analysis of data. The final survey contained 45 items. These items included both closed-ended and open-ended questions, along with two 5-point Likert rating scales. The items on the rating scales reflected the four main factors that had resulted from the factor analysis of the pilot study. In the case of Rating Scale #1, *Frequencies of Twitter Use*, the four main factors that resulted from this scale were categorized as: (a) formation of a learning community, (b) reflection on teaching practices, (c) teacher knowledge, and (d) collaboration and communication. Therefore, only questions that pertained to these

four categories were kept in the final survey itself. The following table (Table 1) illustrates the survey questions that comprised the first rating scale:

Table 1

Rating Scale #1: Frequencies of Twitter Use

<b>Factor 1: Formation of a learning community</b>	<b>Factor 2: Reflection on teaching practices</b>	<b>Factor 3: Teacher knowledge</b>	<b>Factor 4: Collaboration and communication</b>
Support teachers who are new to Twitter	Reflect on my own teaching practices	Search for higher-order thinking activities	Connect with experts in the field of education
Connect with the same teacher on more than one occasion	Engage with others who challenge my thinking	Learn about subjects I am less comfortable teaching	Engage students in collaborative experiences with other students
Connect with more experienced teachers		Ask for suggestions on teaching strategies	Allow students to post classroom updates
Participate in moderated chats with other teachers		Follow links to articles about education	

Likewise, for the second rating scale, The Extent to Which Twitter Helps Teachers in their Teaching Practices, two main factors were produced: (1) student learning opportunities, and (2) personal impact. As a result, only constructs that fit within those two categories remained in the final survey design.

Table 2

## Rating Scale #2: The Extent to Which Twitter Helps Teachers in Their Teaching Practices

<b>Factor 1: Student learning opportunities</b>	<b>Factor 2: Personal impact</b>
Design student-centered instruction	Enhance your reputation as an educator
Create authentic learning opportunities	Get motivated to teach lessons
Engage students in critical thinking tasks	Gain confidence in my own teaching abilities
Involve students in global connections	
Incorporate technology into curricular objectives	
Provide collaborative opportunities for students in the classroom	
Expose students to other cultures	

**Phase II: Interviews**

In the follow-up interviews, the goal was to further explore the ways in which teachers use Twitter and to discover if there was convergence between the survey data and the interview data. The online survey asked teachers to provide their email addresses if they were willing to participate in a 15-minute interview with the researcher. The questions in the interviews were informed from the results of the online survey (see Appendix B: Interview Questions).

Merriam (2009) advises piloting interviews “to learn which questions are confusing and need rewording, which questions yield useless data, and which questions, suggested by your respondents, you should have thought to include” (p. 95). To gain a sense of the interview process and to become familiar with the tools that would be used for the dissertation interviews, interviews were piloted with three participants during the pilot study.

For this study, 19 participants participated in the final interview process. Before selecting the participants to be interviewed, the quantitative data from the online survey was analyzed. The findings from the quantitative analysis revealed areas in which the researcher wanted to explore in greater depth. More specifically, the analysis of the quantitative data resulted in several findings with statistically significant relationships. Hesse-Biber (2014) supports this methodology as she states, “Qualitative research can draw on quantitative findings to explore in more detail issues and discrepancies” (p. 66). With this in mind, some of the follow-up interview questions were designed to gain further clarification with regard to specific quantitative findings. Table 3 illustrates some of the quantitative findings along with participants who might have been able to provide further information:

Table 3

## Participant Interviews: Questions Informed from Quantitative Data

<b>Quantitative findings from online survey</b>	<b>Participants who can provide more information</b>	<b>Questions to elicit more information</b>
75% of teachers reported that their teaching has changed as a result of incorporating ideas learned from Twitter.  What is it about Twitter that contributes to this change?	Teachers who have reported a change in their teaching practices.	A large number of teachers reported changes in their teaching practices. Is this true for you? If so, what is it that you are doing differently now?
73% reported that they engage with others who challenge their thinking (every day, weekly & monthly).  How is this happening? What is the result of their having their thinking challenged?	Teachers who have engaged with others who challenge their thinking.	Many participants reported having their thinking challenged by others when they use Twitter. Is this true for you? If so, what does that mean to you?

Table 3 (continued)

Quantitative findings from online survey	Participants who can provide more information	Questions to elicit more information
71% reported that Twitter motivates them to teach lessons.  What is it about Twitter that is motivating to teachers? Are there other platforms that are also motivating?	Teachers who responded that Twitter motivates them.	In what ways does using Twitter help motivate you to teach?
69% reported that their administrators support their online learning. 16% said admin do not support it and 16% said admin is not aware of their online learning.	Participants who reported their admin is supportive and participants who did not have supportive administrators.	In what ways are administrators most supportive? Do they support other teacher-led activities?

**Interview protocol.** Interviews were scheduled via email. Participants were given the option to choose Skype, Facetime, Google Hangout or mobile devices to partake in the interview. The audio from all of the interviews was digitally recorded using a downloaded software tool called Audacity. Participants acknowledged their consent with the informed consent document that they received via an online electronic signature application, DocuSign (see Appendix D: Informed Consent—Interviews). An online transcription service, Trint, was used to convert the audio to text. According to Creswell (2014), themes will emerge once data analysis begins. Upon receiving the interview transcripts, each was coded for themes using the software application, NVivo, which was suitable for this purpose (see Appendix C: Coding Themes from NVivo). The search for patterns within the interview data began once the codes had been determined (McMillan, 2008). This format was used for all participant interviews.

**Document analysis.** The review of documents provided a further opportunity to understand the context in which teachers use Twitter to support their own professional learning. For this study, tweets were analyzed as documents. Merriam and Tisdell (2016) assert that “web pages, papers available through file transfer protocol, and various forms

of ‘electronic paper’ can be considered documents that are simply accessed online” (p. 184). Two different groups of tweets were collected and analyzed.

The first collection of tweets resulted from a purposeful sample drawn from the 19 interviewees in order to explore some of their tweets in greater depth. Using an Excel spreadsheet, the tweets from all 19 interviewees were gathered from a 3-month period (March, April, and May, 2017). The categories that had emerged from the interviews served as a guide for sorting participants’ tweets. Of the 19 participants, the top three users whose tweets comprised almost all categories were included, as were the least three users whose tweets were not as representative across the different categories. By separating the types of tweets in two extreme groups, the characteristics of users’ tweets were compared for maximum variation sampling (McMillan, 2008).

The second collection of tweets was gathered from the #2ndchat online archives. In reviewing all of the elementary chat forums, only #2ndchat and #4thchat had their archives up to date. Tweets from one #2ndchat discussion forum on the topic of assessments and evaluation was reviewed to gain a more comprehensive understanding regarding how teachers used the forum to learn. Within the tweets posted to the forum, common themes were explored. These themes shed light on three main areas: (a) the types of questions teachers asked during Twitter chats, (b) the types of information that was shared, and (c) the responses they received from others. This information helped to conceptualize how teachers perceived the Twitter environment to be supportive and engages them to learn. With regard to the number of tweets needed to complete the document analysis, Bowen (2009) states that “even a few can provide an effective means” (p. 33) to corroborate data.

During the analysis of tweets, it became known to the researcher that participants’ Twitter usernames could potentially be identified if text from their tweets was entered into the advanced Twitter search function. It was during this stage of analysis that the researcher submitted an addendum to the IRB protocol seeking consent from the

purposeful sample of interviewees whose tweets would be used as examples of ways teachers use Twitter to learn. Eighteen out of the 19 interviewees consented to the use of their tweets in this final written report.

### **Data Analysis and Synthesis**

The conceptual framework guided the data analysis and helped to organize the data that was collected. With mixed methods research, Hollstein (2014) has stated that it is important to determine “at what stages and at how many different stages in the research process the integration of approaches takes place” (p. 12).

Onwuegbuzie and Teddlie (2003) have stated that with mixed methods research, analysis of data can be an iterative process. In this study, the data from the online survey were analyzed before the selection of interviewees began. The fundamental principle of mixed methods data analysis allows for “the use of quantitative and qualitative analytical techniques, either concurrently or sequentially” (pp. 352-353). This fundamental principle guided the data analysis phase.

A side-by-side comparison of the data took place in which one set of data was presented first (i.e., quantitative), followed by a discussion of the qualitative findings (Creswell, 2014). When analyzing the qualitative responses from the online survey, the “frequency and prevalence of social phenomena” (Hollstein, 2014, p. 10) was documented. Hesse-Biber (2010) describes this method as quantizing, whereby “qualitative codes are grouped into variable-like categories that are used as a heuristic device for analyzing qualitative data quantitatively” (p. 100). By counting the frequency in which themes appear, themes cannot be weighted too high or too low (Onwuegbuzie & Teddlie, 2003).



## Literature on Methods

### Surveys

Surveys can be used to collect qualitative and quantitative data. The collection of quantitative data included demographic data along with information obtained via two separate rating scales. Hesse-Biber (2010) has stated that quantitative data gathered through surveys “can be useful for establishing generalizability of qualitative results” (p. 6).

Iarossi (2006) discusses the design of survey questions and states that the questions “must ensure that the scale categories are sufficient to discriminate” (p. 65). For one of the rating scales in the survey for this research study, the choices on the 5-point Likert-type scale include “extensively,” “quite a bit,” “some,” “minimally,” and “not at all.” One of the primary benefits to using surveys is “the efficiency of collecting the same data from many people” (Ridenour & Newman, 2008, p. 63).

However, there are some drawbacks to using open-ended questions in a survey (Iarossi, 2006). First, they require more time and effort from participants compared with closed-ended questions. Thus, participants may choose not to answer them fully. Second, there is a “higher variability of answers” (Iarossi, 2006, p. 71) given that respondents may write freely in their own words to express their ideas. As a result, it may be more of a challenge to interpret their responses. Furthermore, research supports the use of closed-ended questions in terms of increased reliability when compared with open-ended questions (Iarossi, 2006). However, according to Zohrabi (2013), “it is better that any questionnaire include both closed-ended and open-ended questions to complement each other” (p. 255).

### Interviews

Interviews are used to gather information from research studies in which questions are exploratory in nature (Hesse-Biber, 2010; Hollstein, 2014). According to Hollstein

(2014), interviews are best suited for obtaining participants' own perceptions and interpretations of phenomena. In addition, interviews can provide narrative explanations of the quantitative data (Hesse-Biber, 2010). According to Onwuegbuzie and Collins (2007), the recommended number of interviews that should take place in a phenomenological research study is 10. For this research study, 19 participants took part in the interview process.

Interviews that are designed to gather qualitative data through open-ended questions are defined as semi-structured interviews (Merriam, 2009). With semi-structured interviews, "specific information is desired from all the respondents" (p. 90). For this research study, semi-structured interviews were conducted, with the questions being determined as a result of responses to the online survey. The order of the questions and any follow-up questions asked was based upon the flow of the interview and the responses obtained (Merriam, 2009).

There are six different types of interview questions according to Patton (2002, as cited in Merriam, 2009). These types of interview questions include: (a) experience and behavior questions, (b) opinion and values questions, (c) feeling questions, (d) knowledge questions, (e) sensory questions, and (f) background/demographic questions.

### **Document Analysis**

The analysis of documents in a research study may provide a rich source of data (Merriam, 2009). According to Merriam, documents are "a product of the context in which they were produced and therefore grounded in the real world" (p. 156). In general, documents are easy to access, free, and ultimately offer researchers access to information that may have taken inordinate amount of time and effort to gather (Creswell, 2014; Merriam, 2009).

In this research study, document analysis of teachers' tweets provided a deeper understanding of the context in which teachers use Twitter for professional learning

(Bowen, 2009). Merriam (2009) has stated that it is best to have “basic descriptive categories early on” (p. 152) to facilitate the process of document analysis. Likewise, Bowen (2009) states that “predefined codes may be used, especially if the document analysis is supplementary to other research methods” (p. 32). Thus, for the document analysis in this study, the categories generated in the conceptual framework served this purpose.

One of the concerns with document analysis is with quantizing qualitative data (Merriam, 2009). Instead of coding data and measuring frequencies, Merriam has argued that “the *nature* of the data can also be assessed” (p. 153). Bowen’s (2009) three recommendations for analyzing documents were followed: (a) skimming (superficial examination), (b) reading (thorough examination), and (c) interpretation.

Another concern related to the use of documents for analysis is the possibility that the source may not be representative of the sample (Merriam, 2009). In addition, Merriam has cautioned that researchers may be hesitant to include analysis of documents that do not fit with their emerging data. However, that is more likely to occur when documents are being used to support findings as opposed to being used to generate categories and theoretical models (Merriam, 2009).

Since this research study analyzed educators’ tweets from Twitter, Merriam’s (2009) discussion about the use of online information as a data source was a valuable guide. One of her arguments regarding the use of online information obtained through email or websites is the lack of emotional response in written text. The lack of “inflection, body language, and the many other nuances that often communicate more vividly than words” (p. 158) may be an obstacle when interpreting online information. Likewise, online discussion groups are likely to have their own types of terminology (Merriam, 2009). Further, Merriam has pointed out that some types of exchanges may be with individuals who do not represent themselves accurately online. Lastly, one other potential shortcoming with online information is “version control” (p. 160), that is,

webpages come and go resulting in the instability of information. With this research study, participants in moderated Twitter chats may delete their tweets at any time. However, archives of the moderated Twitter chats were available online.

### **Ethical Considerations**

The participants in this research study were informed about and protected from any potential harm. The overall risk of harm to participants in this study was minimal. The guidelines set forth by the Teachers College Institutional Review Board (IRB) were followed.

Informed consent was a priority throughout the survey and interview processes. Participants were introduced to the informed consent on the first page of the online survey, which required their agreement before proceeding (see Appendix E: Informed Consent—Online Survey). No identifying information was collected unless participants agreed to provide their email addresses to be contacted for follow-up interviews. With the interviews, potential participants were also informed of the purpose of this research study and that they may end their participation at any time without penalty. All names in the final written report were given pseudonyms.

As previously discussed, during the analysis of documents, which involved participants' tweets, the researcher became aware of the existence of an advanced Twitter search function capable of identifying Twitter usernames, and potentially revealing the names of the interview participants. Greenhalgh, Rosenberg, and Wolf (2016) faced a similar issue in their research study. In an effort to maintain the anonymity of Twitter users in their study, they modified or excerpted users' tweets. However, those efforts are not sufficient for concealing identities since the search function in Twitter is capable of revealing usernames with even a few words.

In an effort to deal with the possibility of participants' loss of confidentiality, permission was obtained from Teachers College, Columbia University to submit an additional consent form to participants seeking their permission for some of their tweets to be used in the final written report (see Appendix F: Modified Informed Consent—Interviews). Participants were informed that there would be a small chance of being identified and that the tweets being used were educational in nature and exemplified how teachers used Twitter to learn.

The document analysis also involved examining tweets from the #2ndchat Twitter discussion forum. The novelty of gathering data from an online Twitter discussion forum may have posed ethical issues that needed to be addressed (Merriam, 2009). More specifically, the main question to consider was whether or not “the researcher [was] ethically justified in using publically available information as data for a research study” (p. 162). By its very nature, Twitter is designed as an open resource whereby users' accounts are public unless they are specifically made private. Further, documents that are in the public domain, including an online forum such as Twitter, do not need to have the author's permission in order to analyze them (Bowen, 2009). Thus, users are aware that the information they tweet is available to be read and shared by an indeterminate number of other users.

Merriam (2009) has cautioned that identifying information may be revealed in online messages. For this study, any identifying information was not included in the written report. Gaining informed consent from all individuals who participate in moderated chats was impractical due to the nature of chats as free-flowing discussion groups that participants can join or leave at any time.

Merriam (2009) has urged researchers who gather information from online documents to consider three critical issues: (a) the effects of the context on the data, (b) the effects of software functionalities on the data gathering process, and (c) the effects the medium has on ethical practice. With regard to the effects of the context on the data,

the assumption was that information shared in tweets during moderated #2ndchat and discussions would provide valuable insight into the information that teachers share, re-tweet, and seek help with.

A commitment was made to keep any identifying information of the participants confidential. Any documents related to this research study were stored on a password-protected computer or in a locked file cabinet. The researcher was the only individual to have access to this information.

### **Issues of Trustworthiness**

Every effort was made to ensure that this research is accurate and can be trusted (Creswell, 2014). Ensuring that the methods being used in this research study accurately represent the research problem being addressed was critical (Hesse-Biber, 2010). To enhance the overall validity of this study, the data were triangulated (Ridenour & Newman, 2008). Data triangulation was accomplished through multiple forms of data collection including an online survey, participant interviews, and document analysis (Merriam, 2009). By having access to a wide variety of data sources, there is a greater likelihood of having a “full and rich interpretation” (Ridenour & Newman, 2008, p. 58).

Hesse-Biber (2010) has stated, “Some mixed methods studies may require a mixed process of validation, using qualitative and quantitative approaches to validation” (p. 87). Since this research study used a mixed methods approach, the same terminology for validating the findings cannot be used for both qualitative and quantitative data. For quantitative data, the terms *reliability* and *validity* are applied; for qualitative data, the terms *credibility* and *dependability* are applied. The following section discusses these differences as they apply to the quantitative and qualitative data that were collected.

## **Quantitative**

**Reliability.** The results of the pilot study in which the online survey was distributed suggest that the reliability scores from the two Likert rating scales were adequate (McMillan, 2008). For both of the rating scales used in the survey, factor analyses resulted in Cronbach alpha scores above .70 demonstrating a sufficient level of reliability (Gaur & Gaur, 2009). In addition, Hesse-Biber (2010) notes that by asking similar questions in both the quantitative and qualitative portions of the research study, “the extent to which research findings from similar questions yield similar responses” (p. 66) will help to establish reliability. For example, in cross-tabs analysis of some of the survey questions, strong relationships were revealed during the pilot study. In questions pertaining to administrators’ support of teachers’ use of Twitter and teachers’ engagement in moderated Twitter chats, a perfect correlation (p-value = 0.00) resulted, thus demonstrating reliability within the instrument.

**Measurement validity.** McMillan (2008) states that it is important to pilot test a new instrument to determine validity before actual data collection begins. The survey intended for use in this research study was evaluated in a pilot test of with 24 participants. Factor analysis was used to determine construct validity (Ridenour & Newman, 2008). The results of the pilot study suggested that the survey was effective at obtaining the type of information being sought. In addition, the researcher was able to interview three participants during the pilot study. By conducting interviews with participants during the pilot study, the researcher was able to reflect upon and gain interviewing skills that were beneficial for interviewing participants in the dissertation research study.

## **Qualitative**

The qualitative data from open-ended survey questions and interview questions were deemed dependable and credible. For this research study, the participants were purposefully selected to have certain criteria making them dependable. All participants

responded that they were elementary (K-5) schoolteachers who use Twitter for educational purposes. Therefore, because they are professionals in their field, their responses were deemed credible.

### **Limitations of the Study**

One of the main limits with a research study such as this one is generalizability (Slavin, 2007). In this study, if a relationship was shown to exist between variables, “it is still necessary to ask how generalizable that relationship is to some wider population, or across other samples” (Punch, 2003, p. 38). Further research would be needed to show how widespread the relationship is (Punch, 2003). Thus, in terms of qualitative research, the overall attempt is “to gain a comprehensive understanding of a phenomenon”; however, there can be “no claims that what is ‘true’ in one setting is equally ‘true’ in another” (Neuman, 2014, p. 72). However, Maxwell (1992) discusses the difference between internal and external generalizability (as cited in Onwuegbuzie & Teddlie, 2003), whereby internal generalizability can be applied to similar groups. The ability to generalize the findings between similar groups “is typically more important” (Onwuegbuzie & Teddlie, 2003, p. 354).

With qualitative data, the potential for researcher bias is another limiting condition. The researcher, having been a teacher who holds her own assumptions and perceptions related to her individual experiences using Twitter, made her own decisions, either conscious or unconscious, about which information gathered through the qualitative data collection is presented and discussed. By recognizing and acknowledging this as a possibility, a conscious effort was made to interpret the data as objectively as possible, in part by documenting her assumptions in Chapter I.

Another limitation of this study is that teachers who responded to and completed the online survey may have been more enthusiastic users of Twitter. Teachers who may



have tried using Twitter and decided it was not helpful may not be amongst the participants in the sample (Carpenter & Krutka, 2015). Therefore, the responses may be skewed in favor of using Twitter. Likewise, the sample in this study was also limited to those participants with access to technology (McMillan, 2008). Moreover, with regard to internet-based surveys, McMillan cautions that some respondents may believe their information is not entirely protected and can be traced back to them. Therefore, more participants may have been included, but their lack of trust may have prevented them from participating.

Lastly, there are limits with subjective questions (Iarossi, 2006). First, there is no right answer to subjective questions. Determining the plausibility of participants' responses is the task of the researcher. Second, "different respondents may interpret the same categories differently" (p. 65), thereby making it difficult to compare their responses. For example, based on different experiences people may have had such as cultural, moral, professional, and geographic, they may vary in their own interpretations of the questions (Iarossi, 2006). Third, the reliability of the participant is dependent on factors such as his or her mood at the time of taking the survey or interview.

### **Chapter Summary**

This chapter presented the methodology used to undertake the research for this dissertation study seeking to understand how elementary school teachers use Twitter to support their professional learning and development. By incorporating qualitative and quantitative methods, the results were grounded in both subjective and objective realities, thereby providing a "more robust ... and thorough explanation of the problem than either quantitative or qualitative research procedures could alone" (McMillan, 2008, p. 310). Three approaches were used to triangulate the data, and as a result, establish reliability and validity within the data: (a) an online survey, (b) interviews, and (c) document

analysis. With the data collected, analyzed, and synthesized, the findings are presented in the next chapter.

## Chapter IV

### FINDINGS

The purpose of this research study was to explore how elementary school teachers use the social networking website, Twitter, to support their professional learning and development. The assumption was that a better understanding of this phenomenon would allow educators, administrators, and other leaders in the field of education to proceed from a more informed perspective about its use with regard to the professional learning of teachers. This chapter presents the key findings obtained from the online survey, interviews, and document analysis.

Several steps were taken during the data analysis phase of this research study carefully aligned with data analysis procedures (Bloomberg & Volpe, 2008; Creswell, 2014; McMillan, 2008; Miles, Huberman, & Saldaña, 2014). First, qualitative data were quantified. In this step, responses to qualitative questions were given codes, and their frequencies were recorded as numeric data. Second, the quantitative data were analyzed using statistical measures. Third, findings from qualitative data collection and quantitative data collection were analyzed. Lastly, interpretations of the quantitative and qualitative data were made.

Throughout the data analysis process, patterns emerged from the data. Hesse-Biber (2010) recommends presenting qualitative findings as frequency counts and percentages. By doing so, the patterns that had emerged were then compared and contrasted, and

themes were then developed (Hesse-Biber, 2010). The qualitative findings were used to “draw on quantitative findings to explore in more detail issues and discrepancies” (p. 66).

The qualitative and quantitative data collected from the online survey were analyzed in three different programs: Qualtrics, SPSS, and NVivo. Since Qualtrics was used to disseminate the survey online, it also proved effective in analyzing the results, especially for the qualitative data collected from the online survey. With Qualtrics, cross-tabs analysis was also used to explore relationships between variables. Several key findings that emerged from the cross-tabs analysis are discussed later in this chapter. In addition, Qualtrics was used to code responses to the qualitative questions from the online survey and to calculate the frequencies of those responses. Item analysis was performed with SPSS software to assess the reliability of the survey questions as well as to confirm the results from the cross-tabs analysis done in Qualtrics. Lastly, NVivo was used to code the data from the interviews.

This chapter is organized into sections that present the findings from the following: (a) the online survey, (b) participant interviews, and (c) the analysis of documents. The last section applies the findings from the data collection to the research questions. Within each research question, the survey and interview responses pertaining to each question are presented along with detailed evidence to provide answers to the questions. The goal was to discover if there was any convergence, whereby any findings obtained from the qualitative and quantitative methods resulted in agreement (Hesse-Biber, 2010). With agreement between the qualitative and quantitative data, it could be argued that the research findings would hold more validity (Hesse-Biber, 2010).

As per the discussion in Chapter III, a purposeful and convenience sample of teachers was obtained through the use of Twitter messages, known as tweets. Initially, tweets were posted with the hashtag #4thchat to recruit as many fourth grade teachers as possible. However, this hashtag did not result in a sufficient number of participants. Therefore, the number of hashtags was expanded to include all elementary grade levels,

K-5th (i.e., #kinderchat through #5thchat) as well as educational topics most likely to be frequented by elementary school teachers (i.e., #edtech, #sschat). In some cases, potential participants were contacted via direct tweets to their Twitter accounts if their Twitter profiles identified them as elementary school teachers. In all cases, a link to the online survey was included in the initial contact along with the request to complete the survey.

In total, 211 people completed the online survey, and 107 respondents met the official criteria for participation, which are discussed in the survey participant demographic section. An exact response rate could not be calculated because the number of elementary school teachers on Twitter is unknown. Of the 107 respondents, 48 agreed to be contacted for follow-up interviews. In total, 19 of those participants completed the interview. All participant names used in the interview descriptions are pseudonyms.

### **Research Questions**

The research questions that guided this mixed methods study were:

1. How are teachers using Twitter for their professional learning and development?
2. What do teachers report learning from their use of Twitter?
3. What do teachers say they do with the information they have learned from using Twitter?
4. What support do teachers have when they want to implement what they have learned from Twitter?

### **Phase I: Online Survey**

This section discusses the findings from the online survey that was distributed during a period of four weeks (January 31, 2017–March 2, 2017). Qualtrics, an online

survey application, was the main data collection tool and was provided free of charge by Teachers College, Columbia University. With this program, a professional-looking survey was created and the information collected was stored in the password-protected program. The following image (Figure 5) illustrates the first page of the survey that potential participants viewed:

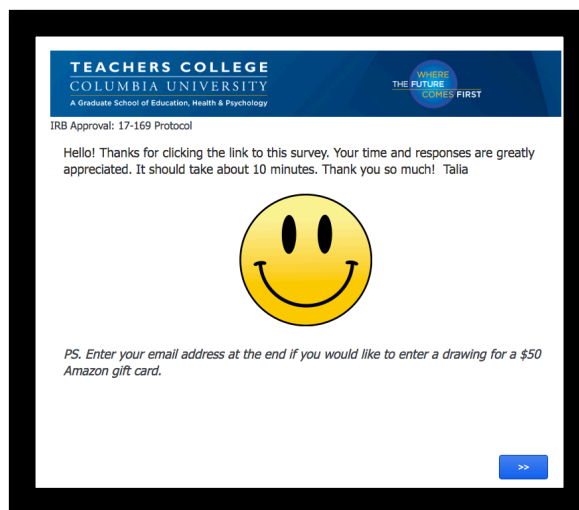


Figure 5: Introductory page of the online survey

### Survey Reliability

As previously discussed in Chapter III, the online survey used in this research study consisted of two 5-point Likert rating scales: Rating scale #1 checked for frequencies of teachers' Twitter use for various purposes, and rating scale #2 asked teachers to indicate the extent to which Twitter helped them incorporate different teaching strategies in their classrooms. A series of closed-ended questions, including demographic data, followed by open-ended questions were used to gather explanations to respondents' choices on the closed-ended questions.

To ensure that the results from two rating scales embedded within the survey produced reliable measures, the internal reliability of scores was investigated using

Cronbach's Alpha ( $\alpha$ ) (McMillan, 2008). Gaur and Gaur (2009) suggest a Cronbach alpha above 0.70 as a "reasonable test of scale reliability" (p. 134). For the first rating scale in the survey, the Cronbach alpha was found to be .840. The second rating scale produced a Cronbach alpha of .924. Both rating scales achieved high levels of internal reliability.

### Survey Participant Demographics

In total, 107 participants satisfied the criteria for participation in this research study. The following criteria were used to select participants:

1. All participants must have an active and public user account on Twitter.
2. All participants must teach children in the elementary grades, K-5.
3. All participants must teach in the United States.

Overall, a total of 31 states were represented, with the greatest number of respondents representing Illinois (14), Iowa (11), New York (8), Texas (7), and Massachusetts (6). Table 4 presents an overview of the survey participant population according to school type, number of years teaching, highest degree earned, current grade teaching, length of time as an active Twitter user, frequency of Twitter use, and availability of high-speed internet.

Table 4

Survey Participant Sample (n = 107)

<b>Characteristics of Participants</b>	<b>N</b>	<b>%</b>
<b>School Type</b>		
Public	93	87%
Private	10	9%
Charter	2	2%
Online	0	0
Other (Library; retired)	2	2%

Table 4 (continued)

<b>Number of Years Teaching</b>		
First year	7	7%
1-2 years	9	8%
3-5 years	32	30%
6-10 years	19	18%
11-15 years	15	14%
16-20 years	13	12%
21-25 years	6	6%
More than 25 years	4	4%
Not ascertained	2	2%
<b>Highest Degree Earned</b>		
Bachelors	27	25%
Masters	74	69%
PhD/Doctorate	1	1%
Other (Masters +30; National Board Certified; Ed.S)	5	5%
<b>Current Grade Teaching*</b>		
Kindergarten	28	26%
First	29	27%
Second	33	31%
Third	37	34%
Fourth	46	43%
Fifth	39	36%
*11% of participants taught more than one grade level		
<b>Length of Time as an Active Twitter User</b>		
Less than 6 months	8	7%
6 months to 1 year	10	9%
1-2 years	22	20%
More than 2 years	67	63%
<b>Frequency of Twitter Use</b>		
Daily	69	65%
2-3 times per week	30	28%
Once per week	2	2%
2-3 per month	5	5%
Once every 2-3 months	1	1%
<b>Access to High-speed Internet at School</b>		
Yes	106	99%
No	0	0
I do not know.	1	1%

The demographic data from the table above revealed some interesting characteristics about the participants in this research study. Notably, almost two-thirds



(63%) of survey respondents have been using Twitter for more than two years, and 65% of respondents reported using Twitter on a daily basis. Thus, the data indicate that the sample of participants leans heavily toward frequent and longer-term Twitter users. It is also worth noting that almost all respondents said they have access to high-speed Internet at their schools.

Participants who reported teaching more than one grade level included gifted and talented teachers, instructional coaches, instructional technology specialists, special-education teachers, and library media specialists. Some teachers also taught combinations of grades such as pre-K through first grade, and fifth and sixth grades.

### The Frequencies of Teachers' Use of Twitter

The online survey asked participants to rate the degree to which they used Twitter for different purposes. In an effort to learn how teachers used Twitter every day, the items from the 5-point Likert scale were rearranged in descending order. Table 5 presents the results from the first 5-point Likert rating scale:

Table 5

Frequency of Teachers' Use of Twitter (n = 107)

To what extent do you use Twitter to do the following:	Never	A few times per year	A few times per month	A few times per week	Everyday
6. Follow links to articles about education	0	4 4%	16 15%	<b>44</b> <b>41%</b>	<b>43</b> <b>40%</b>
4. Reflect on my own teaching practices	9 8%	8 7%	29 27%	<b>34</b> <b>32%</b>	27 25%
2. Connect with experts in the field of education	9 8%	24 22%	<b>31</b> <b>29%</b>	23 21%	20 19%
8. Use Twitter for personal purposes	<b>31</b> <b>29%</b>	22 20%	14 13%	23 21%	17 16%
7. Engage with others who challenge my thinking	14 13%	16 15%	<b>31</b> <b>29%</b>	<b>31</b> <b>29%</b>	15 14%

Table 5 (continued)

To what extent do you use Twitter to do the following:	Never	A few times per year	A few times per month	A few times per week	Everyday
11. Connect with the same teacher on more than one occasion	7 7%	21 19%	<b>44</b> <b>41%</b>	24 22%	11 10%
12. Search for higher-order thinking activities	6 6%	21 19%	<b>39</b> <b>36%</b>	30 28%	11 10%
3. Learn about subjects I am less comfortable teaching	16 15%	23 21%	<b>37</b> <b>35%</b>	21 19%	10 9%
10. Support teachers who are new to Twitter	15 14%	<b>36</b> <b>34%</b>	34 32%	17 16%	5 5%
13. Allow students to post classroom updates	<b>79</b> <b>74%</b>	10 9%	6 6%	7 7%	5 5%
5. Ask for suggestions on classroom strategies	11 10%	31 29%	<b>44</b> <b>41%</b>	17 16%	4 4%
9. Engage my students in collaborative experiences with other students	<b>50</b> <b>47%</b>	24 22%	24 22%	5 5%	4 4%
1. Participate in moderated chats with other teachers	13 12%	28 26%	<b>38</b> <b>36%</b>	28 26%	0

The responses to the rating scale above indicate that teachers are using Twitter in a variety of ways on a regular basis. In an attempt to uncover the most common ways teachers reported using Twitter, teachers who used Twitter “every day” and “a few times a week” are grouped together as “frequent users.” Notably, 81% of these frequent users follow links to articles about education. This is followed by more than half (57%) of frequent users reporting that they use Twitter to reflect on their teaching practices. Forty percent of frequent users of Twitter connected with experts in the field of education, and almost one-third (32%) of frequent Twitter users reported connecting with the same teacher on more than one occasion.

Almost half (47%) of all survey respondents said they do not use Twitter to engage their students in collaborative experiences with other students. Further, teachers were

least likely to participate in moderated chats every day. This finding may correspond to the fact that most moderated chats are held on a weekly or bi-weekly basis. Therefore, teachers may be more likely to wait for their preferred chat to take place as opposed to participating in any number of moderated chats that occur daily.

In Table 6, participants responded to the second 5-point Likert rating scale asking them to categorize the extent to which Twitter has helped them establish different types of teaching practices, as well as whether the use of Twitter has contributed to their confidence and motivation. As in the previous table, the categories are arranged in descending order listing the most extensive practices teachers engaged in as a result of their Twitter use.

Table 6

Frequency of Teachers' Use of Twitter in Their Teaching Practices (n = 107)

To what extent has Twitter helped you do the following in your teaching practice:	Not at all	Minimally	Some	Quite a bit	Extensively
3. Incorporate technology into curricular objectives (not ascertained)	4 4%	6 6%	31 29%	<b>38</b> <b>36%</b>	26 24%
5. Enhance your reputation as an educator	5 5%	11 10%	33 31%	<b>33</b> <b>31%</b>	25 23%
6. Get motivated to teach lessons	3 3%	6 6%	22 20%	<b>53</b> <b>50%</b>	23 21%
2. Create authentic learning opportunities	6 6%	6 6%	36 33%	<b>37</b> <b>35%</b>	22 20%
4. Provide collaborative opportunities for students in the classroom	<b>26</b> <b>24%</b>	15 14%	23 21%	23 22%	20 19%
8. Gain confidence in my own teaching abilities	5 5%	10 9%	36 33%	<b>37</b> <b>35%</b>	19 18%
3. Engage students in critical thinking tasks	11 10%	7 7%	<b>42</b> <b>39%</b>	30 28%	17 16%
1. Design student-centered instruction	6 6%	10 9%	<b>39</b> <b>36%</b>	36 34%	16 15%
7. Expose students to other cultures	29 27%	23 21%	<b>32</b> <b>30%</b>	14 13%	9 8%

The top two frequency categories in the table above, “extensively” and “quite a bit,” were combined for purposes of analysis to glean information about what teachers reported doing in their teaching practices to the greatest extent. The data from Table 6 show 60% of teachers reporting that Twitter helps them incorporate technology into curricular objectives. More than half of teachers (54%) claimed that Twitter enhances their reputation as an educator. Seventy-one percent of teachers reported that Twitter is motivational. Further analysis reveals that more than half of teachers (55%) reported that Twitter is helping teachers create authentic learning experiences, and 49% reported that Twitter helps them design student-centered instruction.

### **Statistical Analysis**

Statistical measures were used to discern relationships between items on the survey. More specifically, Chi Square was used “to determine whether the patterns of difference are different enough to be considered statistically significant” (Abbott, 2011, p. 454). The data in Table 7 illustrate the distribution of responses for items that produced statistically significant relationships ( $p < .05$ ) with teachers’ participation in a moderated Twitter chat.

Table 7

Cross-tabs Analysis: Participation in Moderated Twitter Chats (n = 107),  $p < 0.05$ 

Item (Category)		Participation in a moderated Twitter chat	Participation in a moderated Twitter chat	Participation in a moderated Twitter chat	Total
		YES	NO	Plan to do so in the future	
Q19. Implemented new teaching methods, ideas or activities that you learned from Twitter in your teaching practice	Yes	78	7	3	88
		88%	58%	50%	82%
	No	1	2	1	4
		1%	17%	17%	4%
	I plan to do so in the future.	10	3	2	15
11%		25%	33%	14%	
<b>Total</b>	89	12	6	107	
	100%	100%	100%	100%	
Q25. Classroom teaching has changed as a result of incorporating ideas learned from Twitter	Yes	72	5	3	80
		81%	42%	50%	75%
	No	4	3	1	8
		5%	25%	17%	8%
	Not sure	13	4	2	19
15%		33%	33%	18%	
<b>Total</b>	89	12	6	107	
	100%	100%	100%	100%	

Cross-tabs analyses revealed significant correlations between teachers' participation in moderated Twitter chats and whether they reported implementing new teaching methods and changes in their teaching practices. Of particular note is the fact that 88% of teachers who participated in moderated chats self-reported that they implemented new teaching methods, ideas, or activities in their teaching practice. In addition, 81% of teachers who participated in moderated Twitter chats reported that their classroom teaching has changed as a result of their participation.

Further analysis of the survey data revealed two items that had significant correlations with survey question #25: Do you feel your classroom teaching has changed as a result of incorporating ideas learned from Twitter? Table 8 illustrates the two items that resulted in significant correlations.

Table 8

Changes in Classroom Teaching as a Result of New Learning and Meaningful Experiences (n = 107),  $p < 0.05$

Item (Category)		Classroom teaching has changed as a result of incorporating ideas learned from Twitter	Classroom teaching has changed as a result of incorporating ideas learned from Twitter	Classroom teaching has changed as a result of incorporating ideas learned from Twitter	Total
		YES	NO	NOT SURE	
Implemented new teaching methods, ideas or activities that you learned from Twitter in your teaching practice	Yes	75	3	10	88
		94%	38%	53%	82%
	No	1	2	1	4
		1%	25%	5%	4%
	I plan to do so in the future.	4	3	8	15
<b>Total</b>	80	8	19	107	
		100%	100%	100%	100%
Engaged in a Twitter interaction that resulted in a meaningful experience	Yes	71	4	12	87
		89%	50%	63%	81%
	No	9	4	7	20
		11%	50%	37%	19%
<b>Total</b>		80	8	19	107
		100%	100%	100%	100%

The data show a relationship between changes in classroom teaching as a result of incorporating ideas learned from Twitter, and implementing new teaching methods, ideas, or activities learned from Twitter. The data indicate 94% of teachers experiencing such changes. Moreover, a significant correlation was revealed between teachers who



Table 9 (continued)

Item		Frequency of Twitter Use	Frequency of Twitter Use	Frequency of Twitter Use	Frequency of Twitter Use	Frequency of Twitter Use	Total
		Daily	2-3 times per week	Once per week	2-3 times per month	Once every 2-3 months	
Engage with others who challenge my thinking	Everyday	15	0	0	0	0	15
		22%	0	0	0	0	14%
	A few times per week	21	10	0	0	0	31
		30%	33%	0	0	0	29%
	A few times per month	22	8	1	0	0	31
		32%	27%	50%	0	0	29%
	A few times per year	8	5	1	2	0	16
		12%	17%	50%	40%	0	15%
	Never	3	7	0	3	1	14
		4%	23%	0	60%	100%	13%
<b>Total</b>		69	30	2	5	1	107
		100%	100%	100%	100%	100%	100%

The data from Table 9 above indicate that Twitter can be viewed as a tool for reflection with 67% of daily users responding that they use it to reflect “everyday” or “a few times per week.” Further, 52% of daily users engage with others who challenge their thinking “everyday” or “a few times per week.”

Table 10 illustrates the results from the cross-tabs analysis in which frequency of Twitter use correlated with several items from Likert rating scale #2:





Table 10 (continued)

Item		Frequency of Twitter Use	Frequency of Twitter Use	Frequency of Twitter Use	Frequency of Twitter Use	Frequency of Twitter Use	Total
		Daily	2-3 times per week	Once per week	2-3 times per month	Once every 2-3 months	
Get motivated to teach lessons	Extensively	19	4	0	0	0	23
		28%	13%	0	0	0	22%
	Quite a bit	34	16	1	2	0	53
		49%	53%	50%	40%	0	50%
	Some	12	7	1	2	0	22
		17%	23%	50%	40%	0	21%
	Minimally	3	2	0	1	0	6
4%		7%	0	20%	0	6%	
Not at all	1	1	0	0	1	3	
	1%	3%	0	0	100%	3%	
<b>Total</b>		69	30	2	5	1	107
		100%	100%	100%	100%	100%	100%
Design student-centered instruction	Extensively	15	1	0	0	0	16
		22%	3%	0	0	0	15%
	Quite a bit	25	10	1	0	0	36
		36%	33%	50%	0	0	34%
	Some	23	12	1	3	0	39
		33%	40%	50%	60%	0	36%
	Minimally	5	5	0	0	0	10
7%		17%	0	0	0	9%	
Not at all	1	2	0	2	1	6	
	1%	7%	0	40%	100%	6%	
<b>Total</b>		69	30	2	5	1	107
		100%	100%	100%	100%	100%	100%

The data from Table 10 above illustrate that the frequency of teachers' Twitter use is related to the different ways in which they use Twitter. For analysis purposes, "extensively" and "quite a bit" were combined to form a "high frequency" group. The items with the highest frequency, performed by daily Twitter users, include: get

motivated to teach lessons with 77%, incorporate technology into curricular objectives with 64%, and create authentic learning opportunities also with 64%.

One note of caution with regard to statistically significant findings comes from Braise (1999), who points out that even though some data may be statistically significant, “all findings are potentially useful and significant, regardless of whether they are ‘statistically significant’” (p. 123). Complementing these statistical findings is the qualitative data, gathered with the intent of gaining further insight into the quantitative results. The following section discusses the findings that resulted from analysis of the qualitative questions from the online survey.

### **Analysis of Open-ended Survey Questions**

The data discussed above involve the statistical analyses of the two 5-point Likert rating scales along with cross-tabs results of any items that yielded significant relationships. In addition to these data, qualitative data were gathered through open-ended questions in the online survey. The open-ended questions were analyzed, examined for themes, and then coded by keywords and phrases. As discussed in Chapter III, the process of analysis included side-by-side comparisons of quantitative and qualitative data. Qualtrics, an online program for collecting and analyzing data, allowed for participants’ responses to open-ended questions to be grouped together by common themes and counted for frequencies of responses, also known as quantizing the qualitative data (Hesse-Biber, 2010).

With regard to the themes that had emerged from the qualitative analysis in Qualtrics, Creswell (2014) states that they can be “shaped into a general description” (p. 200) in research studies that explore phenomena such as this study did. This section discusses some themes that emerged as a result of quantizing this qualitative data.

**Professional development.** Survey respondents were asked to give their opinions about what they believed to be the key components of professional development. The

responses to this question revealed that teachers have a broad perspective about the characteristics professional development should entail. The literature on successful professional development includes many of the same categories listed in Table 11, such as: Professional development is ongoing and situated within practice (Darling-Hammond, Hyler, & Gardner, 2017; Guskey, 2000), it includes hands-on and active learning (Darling-Hammond et al., 2017; Yoon et al., 2007), student learning outcomes will be impacted (Means, 2010), and professional development involves a variety of different learning strategies (Carlson, 2002).

More recent literature on the changing nature of professional development is also represented in participants' responses to what they believe comprises professional development. Namely, teachers have choice regarding which professional development to engage in according to their own needs (Davis, 2015; Jones & Dexter, 2014), professional development is available at any time and any place (Davis, 2015; Sauers & Richardson, 2015; Visser et al., 2014), information is available for immediate use (Zepeda, 2014), the learning experience can be personalized (Ottenbreit-Leftwich et al., 2010; Visser et al., 2014), the latest research is represented (Visser et al., 2014), and the information can be differentiated for individual teachers to meet their own learning needs (Wesely, 2013).

When coding the responses to this question, the most commonly used terms were turned into categories, and then all responses were grouped into as few categories as possible (Creswell, 2014; Miles et al., 2014). Categories were kept if they contained a minimum of five respondents. For this particular question, 100 out of 107 participants provided responses, with most participants listing multiple components. The most frequently used terms used to describe professional development were “applicable” and “relevant,” with 36 participants including one or both of these terms in their responses. Table 11 lists the categories that emerged from analysis of the responses:

Table 11

The Key Components of Professional Development (n = 100)

<b>Categories</b>	<b>Number of respondents</b>	<b>Categories</b>	<b>Number of respondents</b>
Applicable/relevant	36	Time to explore/practice	12
Engagement	16	Change in practice/new skills	10
Interactive/Hands-on	16	Impact students	8
Choice	15	Ongoing/Follow-up	7
Needs-based	15	Teacher input/teacher-led	6
Differentiated/Personalized	15	Available at anytime	6
Immediate use	14	Easy to implement	5
Current pedagogies/research-based	14	High interest topics	5

Participants were also asked to compare their experiences using Twitter with other professional learning opportunities they may have had, and to distinguish what Twitter provides them with that the other opportunities do not. Categories were maintained if they contained at least five respondents. Table 12 represents participants' responses as to what Twitter provides them for their professional learning and development that is not found in traditional professional development:

Table 12

Features of Twitter Not Found in Traditional Professional Development (n = 99)

Categories	Number of respondents	Categories	Number of respondents
Instant access to information and resources	28	Professional learning community/like-minded educators	12
Choice	27	Daily global opportunities	10
Access to other educators, authors, and experts	21	Current information/authentic examples	8
Flexibility/Ongoing/Informal	20	Succinct ideas/specific information	8
Personalized/relevant	18	Ease of use/free	7
Different perspectives/new ideas	14		

With regard to the use of Twitter for professional development, most participants responded that the instant access to information and resources distinguished it from other professional development opportunities they have had. One participant commented on the instantaneous nature of Twitter:

Twitter provides me with immediacy. I can connect quickly with other educators on Twitter. Most of the chats I participate in are weekly, which is more frequent than other forms of PD. They are also entirely optional; if I have a schedule conflict, or if the topic doesn't apply to me, I am under no onus to participate.

Choice was the next most commonly referred to feature of Twitter that distinguished it from other forms of professional development. Having the option to choose when, where, and how they learned was found to be a major feature of Twitter that participants appreciated. One respondent described what choice meant to her:

With Twitter you can pick and choose. I can search for chats I am interested in at that moment. I can also search for authors/teachers I know from PD or reading. So it's geared toward what I need for professional growth at that moment.

In similarity to choice, personalization was another key feature of Twitter that contributed to teachers' learning. For example, one participant wrote, "Personalization! I choose what knowledge I want to pursue, who I want to follow, and when I want to do the learning. Twitter, done right, is the most engaging, authentic learning experience for teachers."

Access to other educators, authors, and experts was also widely reported by participants as another key feature of Twitter. This access included connecting with teachers from around the world as well as with more experienced teachers and experts. As one teacher in a small school noted, "It allows me to talk with other same grade teachers. Since I am in a small school, I don't get that inside the school walls."

Hearing from different perspectives was another feature Twitter provided that differed from traditional professional development opportunities. In contrast to traditional professional development, one respondent claimed that "Twitter provides me with a variety of different peoples' ideas rather than just the person or people running the professional development session." Likewise, another participant commented on the immediacy of responses and the range of perspectives:

Twitter gives immediate responses and feedback to questions. I wouldn't email a colleague a question late at night, but I wouldn't hesitate to post a question on Twitter then, and chances are, I'll have several answers to my question by morning. It also exposes me to a lot of different perspectives and resources beyond what are known at my school.

**Professional learning.** In an effort to understand how participants sought new information to bring to their teaching practices, they were asked the open-ended question, "When you want to learn something new related to your teaching, what do you do?"

Table 13 illustrates participants' responses to this question.

Table 13

How Teachers Sought New Information to Bring to Their Teaching Practices (n = 99)

<b>Categories</b>	<b>Number of respondents</b>	<b>Categories</b>	<b>Number of respondents</b>
Use Twitter	53	Pinterest	12
Online research/Google	38	Read books	11
Ask colleagues/peers	31	Ask my online personalized learning network (PLN)	8
Reading blogs	17		

Most teachers reported using Twitter to learn new information to utilize in their teaching. For respondents who answered that they used a social networking tool such as Twitter when they wanted to learn something new, a follow-up question asked them, “In what ways does it help you to learn?” Table 14 shows the responses by teachers regarding how Twitter helps them learn.

Table 14

Teachers’ Reports on How Twitter Helps Them Learn (n = 88)

<b>Categories</b>	<b>Number of respondents</b>	<b>Categories</b>	<b>Number of respondents</b>
Learn from others’ experiences/See what other teachers are doing	44	Opportunities for reflection and professional growth	13
Global connections with others	30	Current topics are featured	10
Inspiring ideas	24	Moderated chats engage	8
Ease of sharing ideas and resources	16	Sense of belonging	7
Access to professional publications/blogs/videos	13	Immediate answers	5



The majority of participants said that Twitter helps them learn by allowing them to see what other teachers are doing and learn from their experiences. With regard to seeing what other teachers are doing on Twitter, one participant described her experience:

Twitter helps me learn by seeing the great ideas other educators are bringing to their classrooms. I see what others are doing, and I feel empowered to change my practice to better serve my students and community. Also, I love to keep up with current educational research and trends via Twitter.

Some teachers also spoke of wanting to learn as a result of seeing inspiring ideas on Twitter. As one teacher put it:

It helps motivate me, it gives me windows to classrooms world wide, and it inspires me. I am always on fire ... always. I have grown more this past year than any other year. I was teacher of the year ... years ago, yet I am stronger now in every way.

Some participants also reported that they felt comfortable using Twitter to ask questions, which contributed to their learning. For example, one participant commented on using Twitter to ask questions: “If you tweet out a question, you are almost guaranteed a response. You can also search the plethora of chats that are available to find what you need.”

In an effort to further understand how teachers use Twitter to support their professional learning, they were asked the open-ended question: “How would you generalize about the information you decide to pursue on Twitter?” In response, 40% of teachers (39 out of 96) replied that they follow links from highly reputable educators. Another 25% said they look for information on specific subject matter, while 17% said they follow links to information that looks interesting to them. Other answers with fewer respondents included: following hashtags, searching for technology-related information, clicking links to blogs, connecting with other teachers of the same grade-level or subject, following experts and authors, and following anyone who is an educator.

As noted earlier, a remarkable percentage of teachers (81%) who took part in moderated Twitter chats reported changes in their teaching. An open-ended question asked teachers to describe how their teaching has changed as a result of their Twitter use. Table 15 illustrates some of the changes teachers reported to their teaching practices.

Table 15

Changes in Teaching Practices as a Result of Twitter Use (n = 72)

Categories	Number of respondents	Categories	Number of respondents
Use digital tools/Integrate technology	19	Personal learning network keeps me focused and supported	8
Incorporate engaging/authentic learning opportunities	18	Collaborate with other classes/Share student work	7
Gain new ideas/resources/instructional strategies	17	Reflect on my own teaching	5
More willing to try new ideas/Not stagnating	13	Aware of latest research	5
Became a global educator/Connect with authors	11		

The responses in Table 15 indicate that teachers are changing how they teach in many different ways. For example, some teachers reported that they are using digital tools and integrating technology; as one participant noted, “I have used class iPads for more active learning. We are taking the idea from another Twitter user who posted an activity using SeeSaw (an online student portfolio).” Another participant attributed her new approach to teaching to her use of Twitter:

I am better than I have ever been. I try things and let go of perfection. I love what I do and see purpose daily. I blog now. I am hands on. I am also pressured by Twitter to do my best.

Some other teachers expressed their willingness to take risks in their teaching as a result of having a supportive personal learning network to turn to for help. The following participant example illustrates this point: “I am more likely to take chances on trying a new approach in my teaching since I have seen examples of how an idea can work.”

When asked whether they had engaged in a Twitter interaction that resulted in a meaningful experience, 81% (87 out of 107) reported that they had. In most instances, teachers said they were able to meet face to face with other educators they had been in touch with via Twitter. One participant wrote about her meaningful experience:

The most meaningful experience was running into a teacher friend that I only knew from Twitter. I found that the fellow educator was incredibly passionate about student learning—and it made me feel like I was less alone. In my school, I have to interact with teachers who are going through the motions or who are grizzled veterans. Running into the fellow educator made me feel like I’m not alone.

According to another teacher who met some fellow educators at a conference after meeting on Twitter first, “When we meet F2F (face-to-face) there is no disappointment—who they are on Twitter is WHO they are.” Another teacher described an in-person meeting by stating, “I work in a very large district and have connected with other teachers whom I would not have otherwise. These connections have led to a sharing of ideas even off of Twitter.”

Some of the more meaningful experiences that teachers reported involved interactions with authors on Twitter. The most salient of these resulted in students having some of their poetry published in a poet’s book for teachers, re-tweets from authors or illustrators of students’ work that had been shared, and connecting via Skype directly with authors. As one teacher described her students’ experience with an author, “My students felt like a rock star had interacted with them.” Lastly, several respondents reported having other opportunities, such as presenting at conferences, open up to them as a result of their Twitter use.

**The formation of a professional learning network.** In addition to meeting fellow educators in person, teachers referred to the connections they made through Twitter as their personal learning network or PLN. Within these networks, some teachers continuously collaborate with some of the educators they met on Twitter. As one teacher described this new relationship, “Last year I saw a request for a Mystery Hangout, so I reached out to the teacher. After the Hangout, we stayed in contact, and this year we are collaborating by having our students read each others’ blogs.” Echoing this sentiment, another teacher stated, “Staying connected broadens my ‘colleagues’ to work with.” Another participant described feeling “fulfilled” upon noticing when “someone else comes to Twitter seeking what I usually seek, and I am able to provide them with inspiration or tips or a challenge. Through Twitter I can give AND take.”

Despite the fact that a majority of teachers reported engaging in Twitter interactions that resulted in meaningful experiences, 29% (31 out of 107) of teachers reportedly encountered some Twitter exchanges that were unproductive. Table 16 illustrates some reasons given by teachers as to why those exchanges were unproductive:

Table 16

Reasons for Unproductive Twitter Exchanges (n = 26)

Categories	Number of respondents
Lack of commitment/not enough participants in chat	8
Misrepresentation of individual’s role/self-promotion	7
Too many tangents resulted in time wasted/irrelevant information	7
Discussion became repetitive and/or confusing	4

**Moderated Twitter chats.** Participants were asked specifically if they had participated in a moderated chat. Out of 107 participants, 89 (83%) replied “yes,” 12

(11%) answered “no,” and 6 (6%) said they would like to participate in the future. An open-ended follow up question appeared only to those participants who answered, “yes” to having participated in a moderated chat. This question asked them to describe their experience as a result of their participation in a moderated chat. Table 17 illustrates those responses.

Table 17

Results of Participants Experiences in Moderated Twitter Chats (n = 81)

<b>Categories</b>	<b>Number of respondents</b>	<b>Categories</b>	<b>Number of respondents</b>
Introduced to new ideas immediately	26	Shared ideas and resources with others	9
Connected with a diverse group of educators	13	Learned what others are doing in their classrooms	8
Provided opportunity for professional growth	12	Made global connections, including experts	7
Grew professional learning network	11	It was engaging/fun	6
Overwhelming/Difficult to follow	10		

Participation in moderated chats resulted in a wide-range of experiences. For the most part, teachers reported being introduced to new ideas. As one participant remarked: “It’s immediately motivated me to reflect on my teaching practices and curriculum ideas. It’s given me many ideas for the classroom, and connected me to smart educators.” Some of the ideas participants gained were aimed at helping them with challenges they faced in their classrooms. For example, one participant shared an experience: “I learned about a few new resources in an ed tech chat this week. We discussed difficulties in using technology when students don’t have access at home and how to overcome some of those.”

As for connecting with others globally, the following response illustrates an example of one participant's experience: "Engaged with colleagues around the country and world, grew my professional learning network. Learned a lot. Reflected a TON."

A few participants found the pace of moderated chats to be overwhelming and difficult to follow. In one example, a participant described her take on it: "It was a little overwhelming when I first did one, but then I got the hang of it. I always learned a few takeaways from the ones I did." For those participants who reported having difficulty following the chats, most of them still said they were enjoyable. As an example, one participant described her experience: "We were asked to participate in one as part of an institute day. I thought it was fun and an experience that I was happy to participate in ... but also sort of stressful and hard to keep up with."

**Support for Twitter use.** In response to the closed-ended question, "Do the administrators in your school or district encourage your online learning?" 68% (73 out of 107) of participants said "yes," followed by 16% (17 out of 107) who replied, "no," and another 16% who answered, "They are not aware of my online learning." This question was worded generally to explore how much administrators supported online learning as a broad category of learning, including Twitter. When asked to describe in an open-ended question how they are supported, the majority of participants responded that they are encouraged to share what is happening in their classrooms via Twitter. One participant described how her district encourages her use of Twitter:

We are encouraged to post ideas and happenings in our classroom to Twitter as well as to look at the happenings in our peers' classrooms. We are encouraged to utilize online professional development opportunities and to participate in ed [educational] chats.

The second most frequently cited level of support had to do with administrators who were active on Twitter. Supportive administrators were described as those who re-tweeted teachers' tweets, liked their tweets, and shared interesting and useful links with them. As one participant described, her administrators "ask what I'm learning—

encouraging us to participate in chats—sharing ideas and sites that might be of help or value.” Several participants remarked on their districts’ Twitter chats in which they were encouraged to participate. For example, one participant said, “Administration provides PD hours for online learning. District has a Twitter chat once a month to encourage Twitter use across the district.”

Some other ways in which teachers felt the support included: (a) providing professional development on how to use Twitter, (b) providing time for teachers to learn how to use it, and (c) providing incentives for using it, such as professional development credits or increases in pay.

In contrast to supportive administrators and districts, several teachers did not have support or encouragement for their online learning with Twitter. Four participants responded that their administrators do not see the benefits of Twitter. As one participant wrote, “They shut down Twitter at one point. I had to beg to get it open. They are slowly turning around and using it and see its benefits. However, no one talks about it.” A few participants remarked on having administrators who feared social media:

Administrators fear the unknown. They don’t like it because it opens yourself up to people that you don’t know. They avoid it because they hear negative stories of social media and that’s all they see.

The survey results indicated that more than two-thirds of teachers had supportive administrators, yet the levels and types of support they received reportedly varied.

## **Phase II: Interviews**

In an effort to further understand how teachers use Twitter for their professional learning, the second phase of this research study involved interviews with teachers who completed the online survey and had given permission to be contacted for follow-up interviews. This section presents a discussion of the key findings obtained from semi-structured interviews with 19 participants. As discussed in Chapter III, the process of

analyzing the interviews was an inductive one, whereby codes and categories emerged after thorough analysis of the content (Roller & Lavrakas, 2015). This process involved “inductive reasoning, thinking and theorizing” as well as a constant comparison of codes in order to capture a comprehensive understanding of the subject matter (Taylor, Bogdan, & DeVault, 2015, p. 159).

The participants, identified by pseudonyms, shared their experiences with using Twitter. Illustrative quotes from interview transcripts are embedded within each finding in an attempt to portray different perspectives held by the participants. Four major findings, in alignment with the four research questions, resulted from the interview phase of this research study:

1. All (100%) participants reported using Twitter as a source of motivation and support. Feedback, encouragement, and peer accountability were the most frequently cited reasons.
2. Almost two-thirds of the participants (63%) reported that they learned technology integration techniques from their use of Twitter.
3. Almost three-quarters (74%) of participants reported that they use the information learned from Twitter to transform their teaching practice, and 74% also said they used the information to identify and act on other educational opportunities.
4. Almost two-thirds (63%) of the participants acknowledged having some support from their school environment when they wanted to implement what they have learned from Twitter.

### **Participants and Recruitment for Interviews**

A total of 48 participants out of 107 had acknowledged their willingness to be contacted for follow-up interviews in the final question from the online survey. One of the challenges with regard to interviewing participants was determining “what



participants to gather qualitative data from in the second phase” (Creswell, 2014, p. 224). Further, according to Creswell, “quantitative results typically inform the types of participants to be purposefully selected for the qualitative phase and the types of questions that will be asked of the participants” (p. 224). With this in mind, a purposeful sample of potential interviewees was devised to include participants who met criteria that targeted frequent Twitter users. In total, 32 survey respondents met all five of the following criteria to be contacted for follow-up interviews:

- Teachers who reported changes in their teaching practices
- Teachers who responded that their thinking was challenged when they engaged with others on Twitter
- Teachers who reported that Twitter motivates them to teach their lessons
- Teachers who reported that their administrators were supportive of their use of Twitter
- Teachers who have been active Twitter users for 6 months or longer

In response to an email request to the 32 qualified candidates for a follow-up interview, 19 participants responded with dates and times that would work with their schedules. These individuals were subsequently interviewed, and their profiles are described in the next section.

### **Participant Profiles**

The participant profiles in Table 18 provide a contextual element to the interview findings. Most of the data were compiled from the demographic information provided by participants during the first phase of this research study, the online survey.

Table 18

## Interview Participant Profiles

Participant	Geographic region of the United States	Years of teaching experience	Grade level(s)	Subject area most comfortable teaching	School Type	Length of time as Twitter user	Highest degree earned	% of students receiving free/reduced lunch
Aaron	Midwest	1-2	5 <sup>th</sup> & 6 <sup>th</sup>	Social studies	Private	More than 2 years	Masters	11-20%
Allison	West	3-5	3 <sup>rd</sup>	Social studies	Public	More than 2 years	Masters	90-100%
Courtney	Midwest	3-5	1 <sup>st</sup> , 2 <sup>nd</sup> , 3 <sup>rd</sup>	Technology	Public	1-2 years	Bachelors	81-90%
Derrick	Northeast	3-5	4 <sup>th</sup>	Math	Public	More than 2 years	Masters	90-100%
Diana	West	16-20	2 <sup>nd</sup>	All	Public	More than 2 years	Bachelors	21-30%
Holly	Southeast	11-15	3 <sup>rd</sup>	Math	Public	6 months-1 year	Masters	51-60%
Jessica	Southeast	16-20	K-5	Reading	Public	More than 2 years	Masters	81-90%
Justine	Midwest	11-15	4 <sup>th</sup> & 5 <sup>th</sup>	Science	Public	More than 2 years	Masters	1-10%
Kampbell	Southeast	3-5	K-5	Reading	Public	More than 2 years	Ed.S	41-50%
Libby	Midwest	3-5	5 <sup>th</sup>	Reading	Public	More than 2 years	Masters	31-40%
Margot	Midwest	3-5	2 <sup>nd</sup>	Reading	Public	More than 2 years	Bachelors	71-80%
Nina	Northeast	25+	4 <sup>th</sup>	Reading	Public	More than 2 years	Masters	11-20%
Pearl	South	25+	4 <sup>th</sup>	Writing	Public	More than 2 years	Masters	90-100%
Roxanna	Northeast	16-20	5 <sup>th</sup>	All	Public	More than 2 years	Masters	1-10%
Simone	Midwest	20+	1 <sup>st</sup>	Math	Public	6 months-1 year	Masters	21-30%
Sylvie	West	11-15	1 <sup>st</sup> -5 <sup>th</sup>	Music	Public	More than 2 years	Bachelors	71-80%
Samantha	Northeast	16-20	2 <sup>nd</sup>	Science	Public	More than 2 years	Bachelors	71-80%
Stacey	West	16-20	5 <sup>th</sup>	Technology	Public	More than 2 years	Bachelors	41-50%
Wendy	West	3-5	K-12	Technology	Public	6 months-1 year	Masters	0

## Finding #1

*All (100%) participants reported using Twitter as a source of motivation and support with feedback, encouragement and peer accountability as the most frequently cited reasons.*

In order to gain detailed accounts, participants were asked to describe how they use Twitter for their professional learning. In all cases (100%), the top theme that emerged showed that teachers reported Twitter as a source of motivation and support for their professional learning. Four other categories were also uncovered to help explain how teachers use Twitter for their professional learning: (a) to form collegial networks, (b) as an opportunity to reflect on their teaching practice, (c) as a window into other teachers' classrooms, and (d) to access curricular material in a timely manner with hashtags. This section describes each of these themes further.

See Appendix H (Distribution Chart—Finding #1) for the complete distribution of findings reported by participants as helping them learn with Twitter. Table 19 provides a summary of data related to the first research question.

Table 19

### Outline of Finding #1

**FINDING #1: How are teachers using Twitter to support their professional learning and development?**

**Main Finding:**

- All (100%) participants reported using Twitter as a source of motivation and support with feedback, encouragement and peer accountability as the most frequently cited reasons.

Participants also reported using Twitter in the following ways for their professional learning:

- To form collegial networks (15 of 19, 79%)
  - Teachers feel less alone
  - Build lasting relationships
  - Safe space to share
- As an opportunity to reflect on their teaching practice (11 of 19, 58%)
  - Challenge thinking/assumptions
  - Ideas for modifying teaching practices
  - Offers an outside perspective
- As a window into other teachers' classrooms (9 of 19, 47%)
- To access curricular resources in a timely manner with hashtags (8 of 19, 42%)

**A source of motivation and support.** Even though the purposeful sample included teachers who reported that Twitter motivates them to teach their lessons, teachers also described how the motivation and support they received contributed to their professional learning. Three sub-categories emerged as teachers described the ways in which Twitter provides them with motivation and support: (a) feedback, (b) encouragement, and (c) peer accountability.

**Feedback.** Some of the teachers expressed that Twitter users, in most cases, other educators, provided them with feedback that they could use directly in their teaching practices. Sylvie, an elementary music teacher, talked about how she used the feedback she received to improve upon her own teaching:

I have got great ideas for lessons that I would never have thought of on my own.... And then the built-in community to again debrief on those lessons and make them better for both me and whoever shared them with me.

Holly, a third grade teacher, elaborated further with regard to the support system that Twitter offers her:

I feel like I have a support system: My professional learning network. You have that support system you can ask someone who's not with you every day or not someone that sees you every day. You can ask them, 'What do you think about this or have you tried this?'

Kampbell, an elementary teacher from the southeast, talked explicitly about sharing her own classroom projects and the feedback she receives:

I think we're getting, I think we're getting honest, honest feedback. Giving honest feedback and really just putting things out there ... what works and what doesn't work.

Kampbell discussed the give and take she experienced, which enabled her to feel comfortable contributing to her Twitter support system, too.

**Encouragement.** Jessica, a reading teacher with almost 20 years of experience, was joyful as she talked about the encouragement she received from other educators on Twitter:

You know if you're in these four walls of this building and everybody dealing with the same challenges and it becomes a real ... are we doing anything right? And yet, once a week, I was being reignited by these educators around the country that were like, 'No, we are doing well.' We are making an impact.

Aaron, a fifth and sixth grade social studies teacher, echoed this sentiment in his description of how the Twitter community helps support him with encouragement during his workdays at school:

There's days at lunch where I'll go on Twitter to get a quick refresh of the day ... and I think, you know, this class had this issue and they'll be like, 'Keep doing this, keep doing that'.... So it's kind of like, what you're doing is right, what you're doing is correct and people see it and they'll tell you, 'Hey, you know, try this, try that.'

Not only are teachers getting encouragement to continue what they are doing; some of them are receiving suggestions for other options and possible solutions to test out.

**Peer accountability.** Several teachers described feeling accountable to others on Twitter. Some teachers expressed the notion that if they posted an idea or activity they were going to try in their classrooms, other teachers on Twitter would check back in with them to find out how it went. Pearl, a veteran teacher with over 25 years of experience, gave her perspective on how Twitter held her accountable to her peers:

When you first get on and you haven't met these people, but you send out a 140 character tweet, and you say 'I'm going to do such and such in my classroom' somebody at some time is going to come back and say 'Hey, Pearl, how did such and such go in your classroom?' So you've had that commitment of, 'If I put it out there then I'm going to kind of do it.' And I have more of a certainty of doing it.

Pearl also described undertaking her own informal investigation of peer accountability from the thousands of Twitter followers she has:

I thought it was just me ... so I asked that one time, I said 'How accountable do you feel because you say something on Twitter?' and a lot of people tell me the same thing.... They say, 'If I put it out there, then I feel like I need to follow through.'

With Twitter making some teachers feel accountable to each other, there may be a greater likelihood that teachers will try new ideas in their classrooms. Diana, a second grade teacher, elaborated on how Twitter made her feel accountable:

There could have been times in the past where I let things get to me, being connected on Twitter and being challenged to put your values and beliefs out there, it makes you own it more. Now when you are back in your classroom, you remember what you just discussed. And you remember what you tweeted, and you actually start looking for evidence of that so that you can tweet it out.

Kampbell had a similar take on being held accountable to others on Twitter who also motivate her to learn and grow as an educator:

And so there's that accountability piece there where we're meeting weekly to chat and to keep kind of ... keep going and I think sometimes we feel like in education we're very isolated within ourselves. And I think that's a huge motivating factor, to feel that connectivity with other educators and so it pushes you forward, gives you new ideas, and lets you know that there will be someone that you can share this feedback, and celebrate your successes or kind of reflect on any failures or any areas of growth. And so I think that's huge.

**To form collegial networks.** More than three-quarters (79%) of interviewees reported using Twitter to form collegial networks. Key features of these networks as described by some teachers included: (a) enabling them to feel less alone, (b) providing them with an opportunity to build lasting relationships, and (c) allowing them to have a safe space to share.

***Feeling less alone.*** Justine, a fourth and fifth grade science teacher from the Midwest, recounted how Twitter has helped her feel less alone in her school environment:

Twitter has opened up more doors for me whereas I kind of felt like I was alone in my school at times where I had this great new idea and didn't feel like it was really being listened to. Whereas on Twitter, I found people who shared views that I had professionally and were trying new things similar to what I was thinking about it and you know I could really start that conversation with other people that were directly with me.

Wendy, a K-12 technology teacher who lives and teaches in a rural area, shared how Twitter connected her with other teachers who engaged her in professional conversations:

So I'm finding that I'm able to have more professional conversations with other educators so especially being in a place that's fairly isolated. I'm able to have conversations about professional practices, activities, all sorts of conversations related to teaching with people that I just wouldn't normally be able to talk with.

Samantha, a second grade teacher, opened up about her discovery of other teachers on Twitter who shared similar viewpoints:

So at my school and some schools, when there's not like one-to-one with devices or if they're hesitant about spreading the technology, you're sort of alone on your own island. And finally I wasn't alone. So that was really cool.

Diana also expressed her feelings of no longer being alone:

Like I'm not alone, because this is not an easy job. When you have other teacher friends who are on the same page as you and are trying to do what's best for kids, but then they might be running into a problem here and there and then it makes you feel like okay, you know I'm human, that person's human. It makes you feel better about it.

She found others with whom she could relate. By becoming aware of other teachers' challenges, her own challenges were put into perspective and became more manageable.

***Building lasting relationships.*** Several teachers discussed how they formed lasting relationships with other teachers they met through Twitter. In many instances, a Twitter relationship led to face-to-face meetings. Jessica related an example of how an initial meeting on Twitter with another teacher can grow into a lasting relationship:

It's also very possible that I've followed you for 6-8 months and watched what you've done with your kids. And we've been able to tweet a little bit back and forth maybe even private message, and now I'm truly growing from our relationship that is being built, and that we show up at the same conference in 6 months, or that we can even tag team from across the country and start leading conferences.

Jessica's description reveals how lasting relationships can start slowly and then build as teachers begin to get to know each other better.

Aaron discussed how educational conferences are beginning to support teachers getting to know each other in real life by hosting Tweetups where educators can meet face-to-face:

Tweetups are big, because if you get the one-on-one chance to connect with the person, now I'm going to say, 'Hey, I know more about you.' So Tweetups are getting big with conventions and conferences because people want to interact face to face.

Derrick also shared his views on the relationships he has made through Twitter, noting that he now has a "global staff lounge," which has led him to meet other educators. As a result, he does not feel limited to the connections solely available in his school building.

**An opportunity to reflect on teaching practices.** More than half the interview participants (58%) described using Twitter to reflect on their current teaching practices. Three main categories emerged to help explain how participants viewed Twitter as an opportunity for reflection: (a) Twitter challenges their thinking/assumptions, (b) it provides ideas for modifying teaching practices, and (c) it offers outside perspectives.

***Challenges thinking/assumptions.*** One teacher, Sylvie, described how Twitter helps her grow by challenging her own beliefs:

There are a lot of people on Twitter, at least that I communicate with, that are forward thinkers like I am, and good ... the tip of the pencil, if you will. And so they both have similar ideas to me but also challenge me to stretch those ideas.

Kampbell elaborated further on how Twitter allows her to see where others are coming from:

When I'm engaged in a Twitter chat, if there's a quote or question and I can read some of the different responses in that same thread, it gets me to kind of think outside of what I would normally be thinking and seeing other people's perspectives and collecting their ideas. And also, you know saying 'Well, you know I never thought of it that way but what about this.'

Stacey also described how her thinking is challenged and the reason she believes it is impossible to disregard ideas that she may not agree with:



It really does challenge because you have to look deeper into those 140 characters and just you can't just say well that's ridiculous, 'I don't agree with that.' You know you kind of have to look at the pattern of their posts and where it's coming from. And then you're challenged to say, 'Do you agree with that or do you not agree with that?'

***Modifying teaching practices.*** The opportunity to reflect on their teaching practices also introduced teachers to ways in which they might consider modifying their teaching practices. Aaron described his thought processes he undergoes when weighing in on adopting new ideas in his own teaching:

When I see people have ideas, I start to reflect upon my own teaching and my own style, and I start to wonder, 'Is this something that's good for me, is it something good for my students, or is it something I would like to try in my classroom?' Rather than simply doing my old routine over and over again, I'm getting the experience of other teachers and they're challenging me to say, 'Hey, you know, Try this in your classroom, it's worth it, this is what the result was, why don't you try too?' And I say, I'm not really sure, and then I think to myself, 'Should I do it?'

Not only is he gaining ideas, Aaron is able to envision what the outcome might be in his own classroom since other teachers have described how the implementation of new ideas had worked for them.

Margot, a second grade teacher, experienced a thought process similar to the one Aaron went through when trying to determine how to incorporate new ideas in her teaching:

I am more reflective in my thinking and more purposeful in thinking about you know why am I doing this. It just it gives me motivation to try new things because I know other people have tried it but it also allows me to fail. And then I can ask others for help.

The fact that other teachers have tried new ideas and posted the outcomes on Twitter appears to entice teachers into modifying their own teaching. Consequently, the more experienced teachers on Twitter are having an impact that is twofold. First, they are challenging other teachers to try new ideas, and second, they are serving as a source of support as teachers attempt to bring new ideas to fruition in their own classrooms.

*An outside perspective.* The last theme that emerged regarding teachers' use of Twitter for reflection is the outside perspectives they gained from other educators. As some teachers had mentioned, they may be caught up within their own school buildings and the daily challenges occurring in their classrooms. With Twitter, some teachers remarked on having a renewed sense of support. Campbell communicated the importance of having an outside perspective in her teaching:

So no one really disagrees or says this is this is how we can do it better because we're so.... I don't know if we're afraid because we're so closely linked to people we work with each day.... But I think for some reason, and this is a good thing for me, on Twitter when I'm engaged in a Twitter chat, if there's a quote or question and I can read some of the different responses in that same thread, it gets me to kind of think outside of what I would normally be thinking.

Aaron also expressed the importance of having an outside perspective into his teaching:

So you get that motivation to say, 'OK people from outside are seeing that it's good' because sometimes the vision within your own school is so narrow, but the outside vision is broader to keep on this track.

**A window into other teachers' classrooms.** Almost half (47%) of the teachers responded that Twitter provides them with a look into other teachers' classrooms. In many instances, teachers said this helped them envision incorporating the ideas and activities being performed by other teachers into their own teaching. Courtney, an elementary technology teacher from the Midwest, explained how seeing another teacher implement an idea in her teaching prompted her to consider doing it too:

And then over the summer you know on Twitter ... I see other teachers of students even younger than mine who got these tips and these tricks and the strategies to help their younger kids be able to log in. I'm like 'Oh gosh, they've got they've got preschoolers who are logging into their Google account, what's my excuse?'

Diana touched on a common problem that afflicts many teachers once they have settled into the teaching profession: witnessing examples of good teaching in action:

And the problem I feel that most teachers face on a day-to-day basis is that you never get to go see your colleagues teach. You never get to see an

exemplary lesson in action. On Twitter, if friends post things, even if it's not actually them teaching, but it's how they taught something, it can inspire you. It's also got a lot of good examples.

**Accessing curricular resources in a timely manner with hashtags.** Hashtags (#) are used to tag keywords or phrases to facilitate the search for specific information. Of the 19 participants in the interview, 8 teachers described how the use of hashtags contributed to their professional learning by enabling them to find detailed information on various topics. Kampbell talked about how hashtags are beneficial to her: "By searching just based off a hashtag either for a grade level or a subject or a specific lesson, it has kind of opened up the amount of resources that I have." The importance of hashtags to find resources on Twitter was an impetus for Jessica to teach other teachers at her school how to use them:

Hashtags are huge and I try to spend and invest a lot of time on behalf of my staff showing them the benefits of a hashtag. Because we're all weak in different areas or maybe getting the advanced degrees in something different or, our interests are different. So being able to hashtag you know #readingmatters, just that hashtag connects me to teachers I would never know existed. And some of these are people that are gurus in the teaching of reading.

Jessica touched on another point that several other teachers also noted: the ability to connect to experts with the use of a hashtag. Holly described connecting her third graders with a scientist through the use of a hashtag:

We connected with a scientist in Canada and she Skyped with us through Twitter. An #actualivingscientist hashtag. And so there's so much to be learned and I think the connections that you make are wonderful.

## **Finding #2**

*More than half of the participants (63%) reported that they learned technology integration techniques from their use of Twitter.*

Teachers were asked to describe what they learn from their use of Twitter. In addition to technology integration techniques, teachers reported learning: (a) strategies to

implement curricular resources, (b) classroom management techniques, and (c) innovative ideas.

See Appendix I (Distribution Table—Finding #2) for the complete distribution of findings related to what teachers learn from their use of Twitter. Table 20 provides a summary of data related to the second research question:

Table 20

Outline of Finding #2

**FINDING #2: What do teachers learn from their use of Twitter?**

**Main Finding:**

- More than half of participants (63%) reported learning technology-integration techniques from their use of Twitter. Two main categories emerged from participants' descriptions related to learning technology integration techniques: 1) collaborative opportunities facilitated with technology, and 2) learning about digital tools and how to apply them.

Participants also reported using learning the following from Twitter:

- Strategies to implement curricular resources (9 of 19, 47%)
- Classroom management techniques (8 of 19, 42%)
- Innovative ideas (5 of 19, 26%)

**Technology integration techniques.**

*Collaborative opportunities facilitated with technology.* According to several teachers, Twitter provides them with the means to collaborate with others using technology. In some cases, teachers worked on projects together where each class worked on a different part of the project. Sylvie, the music teacher, had this type of experience where she met another teacher who was able to help create the first part of a project for her class, who finished it:

I had a project last year where a teacher in Oregon helped me create.... He printed a bunch of 3D boxes.... And then we called his class and shared what we'd done with the boxes.... And that's the greatest one really.... We

were creating a motion detector music player for a blind student at our school.... And my kids did all the soldering and electronics on it, and he printed the boxes to house them. And so then before we put them up over the school, we showed his class how they worked and what we'd done.

Pearl discussed how her fourth grade students typically respond when they engage in collaborative projects with other classes:

I discovered technology integration and how engaging it was for my students and how wonderful it was to be able to connect them to other classrooms and do collaborative things with other people. And it just made it somewhat more empowering for my students.

Aaron also used Twitter to learn technology integration. He had his fifth and sixth grade social studies classes collaborate via padlet with another class in Australia. He explained how the teacher in Australia mentioned using padlet as a way to collaborate:

My Australia thing, she's already saying, 'I'll set up a padlet for you. We'll start this communication. My students will answer any questions you have, your students have ... we'll set this up.' So I've heard of padlet but I never really used it. So now I'm excited to try padlet out to see how it is for note taking with my students. And that's starting off on the other half of the world.

***Learning about digital tools and how to apply them.*** Twitter appears to be the place to go when teachers want to learn about digital tools and how to apply them in their teaching. Samantha, the second grade teacher from the northeast, recounted how Twitter allowed her to find resources that can quickly help her implement new digital tools:

And so that's another thing to be able to do ... to see to find something that's like a quick thing that shows you how to do green screen or whatever or even like Mystery Skype.... Obviously I learned about that on Twitter and that was just because people were willing to help.

Courtney also learned some new technology techniques to try with her students. She turned to Twitter for help when she encountered a problem and she described being re-energized from her newfound learning:

It was the kind of thing that you do because you're stuck and then it kind of turned into this and in the end we figured out ... they made web sites so they could share back what they found. We found out how to embed their tweets on Web sites. And it was just really cool. It was the kind of thing we

were doing because it was the end of the year it starts to feel like it doesn't matter as much and all of a sudden we got them ... like I was re-invigorated.

Diana credited Twitter for teaching her about Google apps:

I wouldn't know the value of Google if not for my Twitter teacher friends. And so I'm learning how to do slideshows. I'm doing Google classroom and I'm still brand new to that. And that would not be happening if it were not for the people that I know on Twitter.

Like Diana, Stacey attributed Twitter with helping her learn how to approach a class project using a 3D printer:

I've just started dabbling in 3D printing, and there was a post ... and it led me to this video where these middle school students made a 3D cast for a penguin. And then I showed the YouTube video in my class today. And then we talked about how we can do it with our printer and what you know what are some of the things that you know. So that's something, you look at the post, you click on it, and then it gives you a video, and you show the next day in the classroom.

**Strategies to implement curricular resources.** Almost half of the participants (47%) reported learning strategies to implement curricular resources. Margot, the second grade teacher from the Midwest, talked about the enthusiasm she received from students and teachers at her school after she implemented poem in your pocket day:

A few years ago I saw tweets going around about a poem in your pocket day. I thought it was interesting. And so I looked it up and I thought it seemed like a really neat idea for kids. And so I tried it and it was very motivating to the students and it practiced a lot of reading fluency, it practiced you know talking to people, some social skills that we are working on and that idea came from Twitter and I've done the past three years. And the feedback that I've gotten from it has been incredible.

Simone, a first grade teacher with over 20 years of experience, described learning to implement Ozobot robots into her teaching with the help of another teacher who was already familiar with using them:

We have Ozobots which are a tiny little essentially robot that you can program them with iPads or you can program them with ... using markers and color codes. And there was a teacher in California who I follow on Twitter and she has some in her classroom and so we've exchanged ideas back and forth through Twitter and messaging on Twitter and I was doing a story map and I'm like, 'How did you do this, what are you thinking?' And

you know it helped me work out and solve the problem of how I was going to present this to my kids and be able to use this piece of technology in retelling a story.

The exchange between Simone and the teacher in California reveals her level of comfort in reaching out to other Twitter users and asking them questions. The resulting relationship may turn into a lasting one where the teachers share back and forth what they have been doing in the classrooms with their students.

**Classroom management techniques.** Several teachers noted that they learned about flexible seating arrangements from Twitter. Holly, the third grade teacher from the southeast, stated that she always began her conversations with her colleagues with “On Twitter I learned ...,” and she described how she learned about flexible seating:

Flexible seating is a big thing. I was easing myself into flexible or choice seating. And I did have alternative seating, different seating styles and but this year, I saw a lot of teachers on Twitter doing the choice seating where they don’t have assigned seats. And that’s one change that I’ve made.

Allison, a third grade teacher, talked about learning classroom management techniques from other teachers on Twitter:

I’m gaining ideas from other teachers getting their perspective... What has worked in their classes trying to replicate what they’re doing. So yeah I actually definitely change the way I teach. From even just like classroom management just getting ideas on how to get a group of kids to listen or you know what I mean.

**Innovative ideas.** Five of the participants highlighted the impact Twitter has on their ability to keep ideas new and innovative. Justine noted that, “because of Twitter ... I can find those things easily, and they are updated instead of old news.” Likewise, Simone remarked on the accessibility of new ideas on Twitter versus the slow pace with which new ideas are introduced into schools, mainly through organized professional development:

I think probably Twitter more than anything allows teachers in the classroom to keep up with recent trends better than anything else. Because before with professional development and stuff, you know the trend would

hit, but by the time your school district had adopted those new trends, it might be three or four years down the road.

Margot provided a mixed opinion regarding the trends that she was exposed to on Twitter.

I personally am motivated to learn new things and to try new things because I want what's best for my kids and I want ... you know something that's new and something that's innovative while still sticking to you know like just high expectations and traditional things that I know will make students successful.

On the one hand, it seemed as though Margot wanted to know more about the latest ideas and trends, however, on the other hand, she maintained that keeping more traditional, proven practices was still important in her teaching.

### **Finding #3**

*Almost three-quarters (74%) of participants reported that they use the information learned from Twitter to transform their teaching practice, and 74% also said they used the information to identify and act on other opportunities.*

Five different categories emerged when analyzing the responses to the question regarding what teachers do with the information they have learned from Twitter. The five categories were as follows: (a) transforming teaching practices, (b) identifying and acting on other opportunities, (c) teaching others about Twitter, (d) making global connections, and (e) adapting new knowledge to fit teachers' needs.

See Appendix J (Distribution Chart—Finding #3) for the complete list of ways participants reported using Twitter to help them learn. Table 21 provides a summary of data related to the third research question.



Table 21

## Outline of Finding #3

**FINDING #3: What do teachers do with the information they have learned from Twitter?****Two Main Findings:**

- Almost three-quarters (74%) of participants reported that they use the information learned from Twitter to transform their teaching practice, and 74% also said they used the information to identify and act on other opportunities.

Participants also reported using the information they learned from Twitter in the following ways:

- Teach others about Twitter (13 of 19, 68%)
- Make global connections (11 of 19, 58%)
  - Students participated in global activities
  - Teachers connected globally with other teachers
  - Connected to experts and/or authors
- Adapt new knowledge to fit teachers' needs (8 of 19, 42%)

**Transformation of teaching practices.** One area of teaching in which teachers expressed major changes include allowing students to have more control over their own learning. Libby described how Twitter has helped her change: “I guess that Twitter has really helped me hone are: my you know letting go of my teacher control freak tendencies and letting my students lead things more.” Not only is Libby letting her students “lead” more; she is also revamping some of her current practices with respect to the ways she teaches reading and writing. Derrick echoed the idea of letting students take more control over their own learning:

It's more now about getting kids to discover and that's not easy for teachers to do on their own. And I get so many ideas from Twitter that people out there, math people who I'm connected with that give me all sorts of number talks, math routines, just some daily activities kids can do that otherwise would have come from a textbook had I not learned these things and been connected with these people.

Simone, a first grade teacher for over 20 years, completely changed her morning work routine after learning about morning tubs. She no longer uses worksheets as soon as students enter the classroom. Here she describes the change in her routine:

I have five table groups and I have five tubs each week so each day a table group gets a different tub.... So there's a fort building tub, and they can take that and build a fort. And if the group gets a fort built in the 20-minute time period then they can utilize that fort throughout the day when they have opportunities to go and work in different spaces in the room, they don't need to be at a desk and they can utilize that fort.... They get a chance to socialize with their peers and a chance to do something fun.... I think probably this has been one of the most profound changes in teaching that I've made.

The change to morning tubs also had a positive effect on socialization in Simone's classroom:

It used to be a worksheet or last year I did journaling with questions you know different types of questions in the morning that they had to do but it was very much an individual activity where they were not really to talk with peers. So it was much quieter. My classroom's a lot noisier this year.

Even though Simone's classroom is noisier, she has come to accept the change and how her students are benefiting from the increased social interactions.

**Identify and act on other opportunities.** Almost three-quarters of interviewees (74%) also reported using Twitter to identify and act on other opportunities. In many cases, teachers were not actively looking for other opportunities, but because of the networks of teachers with whom they were connected, they found out about them. For example, Kampbell not only learned about a particular conference; she was asked to present at it:

I found out about a conference that I'm presenting at this year and presented at last year via Twitter. I attended last year and thought it was great but it just further opened up that social media world and so there are a couple of conferences that I've attended and things I've been asked to speak at, go do, because of my presence on Twitter.

Nina, a fourth grade teacher with over 25 years of teaching experience, explained how she collaborated with other teachers via Twitter to present at the ISTE (International Society for Technology in Education) conference:

I collaborated with six other people who I met on Twitter and we presented at ISTE which you know and many of us had just met for the first time, face to face, when we you know when we were presenting. But we had been doing all kinds of collaborative work via Google Hangouts, which you know, I never would have done that you know previous, previous to that. I mean it's hard enough to collaborate with your next-door neighbor.

Sylvie, the music teacher, described learning about other opportunities from people who re-tweeted tweets to her Twitter feed. Some of the re-tweets contained opportunities that she would not have known about otherwise, including being part of a published book:

I've been able to present. I've been part of a book that is being published at the end of the month full of stories from teachers all over the country.... Just that they were looking for submissions for the book and I thought well that sounds like a great thing for me to do. I'm probably not going to publish a book on my own ever, but being involved with a book is extremely appealing. It was through that re-tweet really. It's a person that I follow but don't interact with a lot. And so I was glad that was re-tweeted and brought to my attention.

The fact that almost three-quarters of participants (74%) described some type of opportunity that opened up to them via Twitter demonstrates the impact Twitter may be having on teachers with regard to exposing them to a wide range of experiences that may have gone unnoticed or would be not be typical for them to undertake.

Pearl had several opportunities come her way as a result of her connections on Twitter. In one case, she collaborated on a book with other prominent Twitter educators based on their shared experiences doing global projects with students. In addition, Pearl received funding for a Donorschoose proposal in which she requested Chromebooks for her classroom:

I tweeted it [a Donorschoose proposal] out, and within 24 hours I had my first project funded. So I got a Chromebook through Donorschoose. I've since you know gotten 17 Chromebooks for my classroom through

Donorschoose. I'm not sitting around waiting for my district. I'm taking the bull by the horns and doing what I can for my students.

By sharing the link to her Donorschoose proposal, Pearl recognized the opportunity Twitter afforded her to be proactive in gaining classroom supplies and resources for her students.

Samantha, the second grade teacher from the northeast, discussed how her presence on Twitter led to the opportunity to experiment with different educational products in her teaching:

As I became more active on Twitter a lot more opportunities opened up for me.... So, you know, I tested a lot of products and I ...would promote them just naturally because I loved using them in my classroom and that led to you know writing grants on education.

In similarity to Pearl, Samantha became an advocate for her students, utilizing Twitter as a source to gain new tools and provide innovative experiences for her students.

**Teaching others about Twitter.** Almost two-thirds of interviewees (63%) reported teaching others about the positive uses of Twitter. Some teachers said they presented about Twitter during organized workshops, whereas other teachers assisted colleagues who expressed interest in Twitter as a result of hearing about other teachers' successes with it. Nina, the veteran fourth grade teacher from the northeast, had the experience of presenting about Twitter during workshops. She explained how those presentations first began:

A lot of times people say that's really cool, you know, where did you learn that? And I'd say on Twitter on Twitter. I've, you know, I've offered many workshops on Twitter through ... you have like little mini Ed-camps in the district so I've offered that. I did a six-week course that people could receive credit for through the district and I taught that, about 15 people took that.

Justine also taught other teachers about Twitter during a professional development summer camp offered by her school district. Because of her Twitter use, she was asked to lead a Twitter workshop:

I do feel like I'm asked to talk to others more often at this building and district-wide to do learning opportunities. We do a summer camp where the teachers can come for PD and they ask me to present just because they know I'm on [Twitter] and they're on and they see some things I'm following and doing.

Despite some of their best efforts to encourage other teachers to use Twitter, in several cases, teachers have struggled with the task. Pearl found the experience of getting others to use Twitter a constant battle:

Although the people that I have trained on Twitter who jump on it and get going with it, find it invaluable. It's just hard to get that connection with a lot of people. I've tried and tried.

**Making global connections.** Several teachers discussed how the information they learned from Twitter enabled them to make global connections. Three themes emerged from the interviews in which participants discussed how they incorporated global connections into their teaching: (a) students participated in global activities, (b) teachers connected globally with other teachers, and (c) teachers connected students with experts and/or authors.

***Students participated in global activities.*** In Aaron's fifth and sixth grade social studies classrooms, students engaged in a collaborative project with students from Australia. As a result of this connection, Aaron explained how his classroom was globally connected:

I've gained more ideas it's made my teaching more national or global. Actually right now I'm communicating with a school in Australia and we're talking about Australia in my classes. So I'm getting first hand accounts and experiences that people are giving instead of just a book and a video.

The real-life connection with other students in a different country enhances the more traditional teaching methods used to learn about other cultures, as Aaron mentioned, books and videos.

Holly, the third grade teacher from the southeast, engaged her students in several global activities including a global math challenge, Mystery Skype calls, and connecting with a scientist from Canada.

My class frequently meets with other classes through Twitter, the global math challenge. So it's connecting my students to other people as well. We connect with other classes through mystery Skype. I've also implemented that this year that I haven't before. Mystery Skype and the global math tasks as well. We've done a couple of those and the kids are really interested in that. And there's just so much to gain.

Several other teachers mentioned connecting their students with Mystery Skype and Mystery Location calls in which the students have to ask yes-and-no geographic questions to figure out and guess the location of the mystery school. Roxanna summed up how her students viewed the use of Twitter and other social media as a result of the global connections and experiences they have had in their classroom:

So my kids don't see social media as a place to post your dinner picture. . . . They see it as a tool to connect people and to open the world to them. They don't look at the walls of the classroom anymore like that ends there.

***Connecting with experts and/or authors.*** The ability to follow, contact, and possibly connect with an expert or author via Twitter enhanced student learning in the classroom, according to several participants. Among them, Courtney described an exciting experience her students had when they connected to different experts at several zoos:

A student kept looking up online ... he couldn't find it in a book he couldn't find it in... So how do sharks sleep? You Google it and there's not a yes-or-no answer. So he and I looked online to see who knows about sharks, and we found the Georgia Aquarium.... So he wrote down his question and I took a picture of him and we tweeted it at the Georgia Aquarium.... I guess one of the foremost shark experts in the world tweeted us back with a video saying 'Hi Ahmad,' like he used my student's name like that.... That blew my mind like he's addressing my child directly.

As a result the shark expert's response to Ahmad, Courtney said that "all the other kids are like, 'Whoa, Ahmad's the coolest kid in school right now!' and they wanted to tweet at zoos, too." Roxanna's students also engaged in an encounter with an expert. Her students wanted to interview an astronaut, so they tweeted to an astronaut, who responded to them and participated in an interview.

***Teachers connected globally with other teachers.*** Jessica expressed her interest in seeing how other teachers around the globe educate their students, especially building their love for reading, and how Twitter allows her to find out:

And probably the biggest difference Twitter has had for me is it has connected me globally to teachers and is allowing me to have kind of almost a cutting edge feel of what's going on in education everywhere.... So being able to connect with teachers all of the world and see 'What are they doing and their classroom libraries.... What's making the difference for their kids becoming life-long readers?'

Libby remarked on how Twitter facilitates global connections with educators who are knowledgeable in many different areas of education:

I feel like there's a whole world out there. I mean I'm from a suburb of Chicago. I feel like there's a whole world out there of people who are studying different parts of education that I'm not even aware of yet.

**Adapting new knowledge to fit teachers' needs.** Some teachers (42%) reported taking what they had learned from Twitter and adapting it to fit their needs within their own classrooms. In Kampbell's case, she learned about something on Twitter that had been done with older students, and she wanted to use it with students in the younger grades:

And I think knowing someone has done it before and having that touchpoint resource is someone you can quickly link up to you to say, 'Hey I did this. This didn't work or what did you find with this?' Or if I saw someone did something with say their fifth graders and I really wanted to modify it and gear it down to Kindergarten or first grade, 'What ideas do you have?'

Allison discussed how she took an idea she learned from Twitter on student-led parent-teacher conferences and adapted it to fit her students:

And so I took that idea and kind of made it into my own. So my students could show their work and what they've been learning to their parents. So I've changed it that way.... So it challenges in the sense of let's say finding things that kind of fit what you want to do and kind of adapting them to your learners.

**Finding #4**

*Almost two-thirds (63%) of participants acknowledged having some support from their school environment when they wanted to implement what they have learned from Twitter.*

Participants were asked to describe the type of support they received when they wanted to implement new ideas that they learned from Twitter into their teaching practices. The participants who received support from their school environment tended to fall into two general areas: (a) district-level (superintendent) support, or (b) school-level (principal) support. However, in some cases, teachers found themselves supporting their administration in their attempts to expand Twitter use within their school districts.

Several teachers reported that having supportive superintendents and principals contributed to their continued use of Twitter for their professional learning. This section discusses the different levels of support teachers described, including those teachers who reported having little or no support. It is also worth noting that despite the fact that the purposeful sample of interview participants was supposed to include participants who reported having support from their administrators, the information some of them provided about that support showed a disconnect between what they reported on the survey and the information they contributed during the interview.

See Appendix K (Distribution Chart—Finding #4) for the complete distribution list of the support teachers received. Table 22 provides a summary of data related to the fourth research question.



Table 22

## Outline of Finding #4

**FINDING #4: What support do teachers have when they want to implement what they have learned from Twitter?****Main Finding:**

- Almost two-thirds (63%) of participants acknowledged having some support from their school environment when they wanted to implement what they have learned from Twitter. Most of these participants had support at the district-level (superintendent) or school-level (principal). However, in some instances, teachers were the ones to support their administrators.

Participants also reported that they received support from the Twitter community or no support at all:

- Twitter Community Support (11 of 19, 58%)
- No Support (5 of 19, 26%)

**School environment support.**

***District-level (superintendent).*** Several participants discussed the support they received directly from their school districts, including the superintendent. The teachers who felt the most supported had superintendents who were also frequent users of Twitter. Wendy, the teacher from a rural area, described how she and her administrators had few other teachers and administrators to connect with nearby. As a result, she and her administrators regularly engaged in their state's moderated Twitter chat. Wendy talked about the support she received from her administrators and how they modeled their use of Twitter for teachers in her district:

I feel very supported that if I come to [administrators] and say, 'Hey, I got this idea on Twitter' they're not going to laugh at me. They're going to understand what I'm talking about.... They talk about it at staff meetings every once in awhile when we go to professional development conferences, they are active participants in the Twitter chats that arise at those places. So frequently you're tweeting at the guest presenter and they'll be some of the people participating in those conversations so they're modeling as well as encouraging other people to do it.

Likewise, in Holly's school district, her superintendent is an active Twitter user who engages with Twitter-using teachers in the district by re-tweeting their tweets. An added benefit of their active tweeting is that parents who follow the tweets become aware of what students are learning about:

My superintendent actually re-tweets a couple of my tweets every now and then. And there are more and more people getting on Twitter and posting more things. And parents are seeing the things on Twitter.

Libby said her district encourages teachers to have Twitter accounts for their classes to tweet daily happenings. Likewise, Simone said her district encourages teachers to use Twitter, especially since the district provides in-service professional development on Twitter, and aspires to have all teachers to engage in Twitter chats. Courtney remarked on the support her district provides to teachers:

It's not being pushed by the district, but it's being very much supported by the district. The district is very technologically forward. Very tech positive.

The principals and the superintendent will participate as well. My district does use Twitter for professional development at this point at district chats. They do give the credit for professional development for those of you who submit a reflection afterward which I think is great because ... that's one of the ways they are trying to get people to participate.

Her district is providing professional development to its teachers through Twitter. By providing professional development credits, the district is expressing its belief that Twitter is beneficial to teachers and, subsequently, students.

Aaron, the private school teacher, said that despite his superintendent's encouragement for schools within the archdiocese to use Twitter, ultimately, it was up to individual schools to decide how they would support teachers:

But, you have to compete with public schools to show what programs you offer and all those other things. So I know the overall superintendent is pushing for it, but within some schools it's still reserved to do, so there's not much support to do things for it.

*School-level (principal).* Nina's experience within her school district was one in which she did not feel either completely supported or unsupported. However, because she learned about using hyperdocs from Twitter, she incorporated them in her classroom. During her evaluation, her principal was impressed with her hyperdocs lesson and inquired about where she learned it:

I don't feel that I'm not supported, but I don't feel Twitter is something that people in general in our district are latching onto and seeing that you know how many different resources you can find there are the connections that you can make.... So for instance this year my evaluation is based on you know I wanted to incorporate hyperdocs into my classroom and so of course the principal hadn't heard of it and wondered about it and asked where I got it and I said Twitter you know so he's supportive in that role. So he's not saying, 'OK you can't try this or you can't do this.' So in that sense I feel supported that I have the ability and the flexibility to try new things with my students that I learned on Twitter.

In similarity to Nina, Margot did not feel overly supported or unsupported. However, she described her principal's view of her Twitter use:

My principal is ... she is not really into social media. But she understands that I use it and that a lot of my ideas come from my Twitter account especially. And she's never been negative about it. And I think she sees the benefits of me being interactive on Twitter and how it affects our students.

Kampbell described how her principal claimed to support whatever is best for students, and if that meant teachers learning from Twitter, he supports it:

So he is supportive of whatever is best for students and whatever teachers feel and he trusts trust teachers' judgment in that. He has he has not said either way. You know we don't have a school Twitter account, which I wish we had. But he is encouraging to teachers that want to pursue Twitter accounts in their classroom. Our school does block quite a few things. You know social media sites and things like that, but it does not block Twitter. So teachers are able to use it and use it on the school computer if they want to record what students are doing.... So I would say that the administrators support it, yet have very limited knowledge themselves of Twitter, how to use it, and how to use it most effectively with our teachers.

Roxanna seemed able to convince her principal to support her use of Twitter for professional development as she stated, “Look, my principal knows flat out that's where I am to get my PD.”

*Teachers support administrators.* As mentioned earlier, Aaron had a superintendent who was an active Twitter user who encouraged other private schools within the archdiocese to partake in it as well. However, each school within the diocese had its own level of comfort with the use of Twitter. In Aaron’s situation, he believed his school should be doing more to promote itself using Twitter. Yet, Aaron’s principal seemed to be holding him back to some degree:

And so she’s very hesitant on a lot of things I want to push through. So she’s trying to push back ... but I won a national contest for social media. She was still very hesitant.... ‘Make sure you don't do this or that.’ I'm like, I know what I'm doing. I followed all the guidelines that you've set forth already. So she's not supportive of the interactions on Twitter as much. But, I've told her that's how your school gets out there, that's how your name gets out there, that's how you put your school forward.

Aaron had to guide his principal with regard to his own Twitter use, especially when it involved anything related to his school. In the end, though, he admitted that he had some success and “opened it a little bit for her.”

Roxanna was another teacher who found herself supporting the less-informed administrators in her school district with Twitter:

Twitter was shut down at my school, and last spring/summer I worked with one other person and we wrote the entire district's new responsible use policy. And we encourage social media. So it's been growing organically but very slow. So I encourage my superintendent is now on it. She uses it when she can. I did actually a Twitter training for our leadership team. So they don't support me. It's the other way around.

Even though she is a second grade teacher, Margot described being the point person for Twitter in her district. As a result, she has been supporting others within her district in teaching them how to use it:

I have the opportunity to do some professional development with our district on Twitter or about Twitter and kind of show them how it works. So our director of curriculum instruction you know if anyone has any questions she usually sends them to me and then I can tweet it out. . . . I think I'm probably still like the person who uses it the most in the district. But I have noticed more people from my area getting on Twitter. And we've been kind of promoting it through our professional development opportunities. It's creating a hashtag and hashtag your stuff.

**Twitter community support.** More than half of the participants (58%) reported that they had support from the Twitter community when they wanted to implement what they had learned from Twitter in their teaching. Sylvie used her community on Twitter not only as a source of reflection, but as a way to learn more about how other teachers incorporated similar ideas in their classrooms:

I have been able to check on my own teaching with other people. And so instead of writing about what happened during the day, I'm able to talk with teachers both in my subject area and not in my subject area about what they would do or what they have done in a similar situation.

Pearl also looked to her Twitter community for support when implementing new ideas or figuring out different practices to try in her classroom:

So that's definitely one of the things on my plate that I will be reaching out to my friends on Twitter and say OK I'm getting ready to do this now, help me through the process. Now what do I do, what do I need to present? You know all my talking points, that kind of thing, and that's where I can go to get information when I need it.

Diana discussed how she found her "tribe," or like-minded people, who helped her to accomplish what she wanted to do in her teaching:

Now, I feel like I'm much more supported in what I want to do. Whereas, sometimes depending on your site, depending on how many people are forward thinking and connected, you might not get as much support at your site. And it's not because people don't want to support you, it's just because they're not, they're not where you are. And so I feel like because I joined Twitter I found my tribe. So I'm doing everything.

**No support.** In Aaron's case, he had a supportive superintendent, and he was teaching his principal about the benefits that Twitter could provide to their school. Inevitably, Aaron felt that he really did not have any support, especially after he won a

national contest for a blog that he wrote about how his school incorporated different themes in their curriculum:

So when I spoke to my principal, she didn't expect me to do this [enter the contest].... And so that's where she got very hesitant on the supportive thing, 'Be careful with this, be careful with that.' So I tried to prove to her that it happened. The support wasn't all there.

He also had a hard time dealing with the micromanagement of anything he tried to do with regard to collaboration with other teachers:

I had to show her ... this is what I'm going to do.... Like if I sent an email to teachers, 'Let me know what you're doing,' she wanted to make sure it was ok. She would have to approve the email, 'Make sure you say this or that.' She wanted to make sure everything was OK. So but it was like, say hey run with it, I'll follow you, but she doesn't have a Twitter account. So she's not active on social media so she doesn't understand what truly goes up. That's the hardest part.

The lack of understanding of Twitter by administrators was also a source of frustration mentioned by some other participants including Samantha, the second grade teacher from the northeast. She had some very strong words for administrators who were unsupportive of their teachers' use of Twitter for professional learning:

I feel like if an administrator at this point doesn't know that Twitter is valuable then they're like living in a closet. And that's a scary thing.... Not to say that they all need to be using it, but they should all be able to see the value in it ... if leaders are going to move from having been a leader 10 years ago even 'til now if they're a good leader they have to be flexible and move with the times.

Stacey, who teaches in a rural school district, also did not have any support from anyone else in her district:

You know I'm a rural K-8 school with only 165 students and one teacher per grade and one principal. So we are our own district. We don't have anything. My administrator is not a connected educator. I have no support or encouragement. I don't think he knows what Twitter is or hashtags. You know, I mean so everything I do is purely self-motivated. There's nothing outside of just me doing it.

In trying to get all schools in Pearl's district to have Facebook and Twitter accounts, teachers found themselves facing an unexpected obstacle:

Every school was tasked with making a Facebook page and a Twitter account. But guess what's blocked in our school? So, we have both of those but nobody can post unless you're doing it on your phone or you do it after hours. So it's like, you know, it's this conundrum of they want us to have a social presence, but they're not trusting us to open up the sites within the school.

### **Document Analysis**

As discussed in Chapter III, document analysis served as triangulation for the data obtained from the online survey and interviews. Bowen (2009) defines documents as containing "text (words) and images that have been recorded without the researcher's intervention" (p. 27). For this research study, participants' tweets were analyzed. Tweets could be considered documents for the purpose of analysis since they satisfy Bowen's definition. Two different groups of tweets were analyzed separately. The first group of tweets to be analyzed came from a smaller, purposeful sample of interview participants. The purpose of analyzing tweets from a subset of interviewees was twofold: (a) to corroborate the interviews with other independent material (Bowen, 2009; Hancké, 2009), and (b) to examine contrasting cases that show evidence of using Twitter for deeper learning as opposed to more superficial of types of learning.

The categories from the conceptual framework served as a guide to sorting the tweets and facilitated the process of document analysis (Bowen, 2009; Merriam, 2009). However, a new category, "Share links to resources/inspirational ideas," was created, since it was evident that many teachers were also using Twitter for this purpose. McMillan (2008) supports this step in document analysis, as he acknowledges that the possibility of "creating new categories that make sense logically" (p. 286) exists. Likewise, the category, "Use hashtags to search for curricular information," was removed

from the document analysis due to the fact that the act of searching for information with hashtags would most likely take place in the search box instead of being posted as tweets. Further, the category, “Adapt new knowledge to fit teachers’ needs,” was not included because there were no tweets that corresponded to that category.

The second group of tweets to be analyzed came from a moderated chat among the #2ndchat community. The tweets to the #2ndchat community helped establish a sense of the context within which teachers use moderated chats for their learning (Bowen, 2009). Since the online survey produced two key findings related to moderated chats—(a) 88% of teachers who participated in moderated chats also implemented new teaching methods, ideas or activities in their teaching practice, and (b) 81% of teachers who took part in moderated Twitter chats reported that their classroom teaching has changed as a result of their participation—it was deemed necessary to explore some of the tweets from a moderated chat. This section discusses the analysis of tweets from the two different groups.

Also, as noted in Chapter III, the process of analyzing tweets included three recommended steps: (a) skimming, (b) reading, and (c) interpretation (Bowen, 2009). As a result of following these steps, tweets were examined for themes and substance. Bowen acknowledges that documents should “be assessed for completeness, in the sense of being comprehensive or selective” (p. 33). A selection process was undertaken in order to determine the purposeful sample of interview participants who would have their tweets further analyzed. The top three participants whose tweets seemed highly representative of the use of Twitter for professional learning were further analyzed and compared with three participants whose tweets were considered to be less representative in terms of content for professional learning.

Two participants, Margot and Simone, did not have their tweets analyzed due to the fact that Margot’s tweets were only accessible to her approved followers, and



Simone's Twitter handle could not be located. All other interviewees were easily found on Twitter with a search for their first and last names.

### **Document Analysis: Group 1**

This group consisted of tweets that were produced from a purposeful sample from the interview participants. In total, 17 interviewees' tweets from the months of March, April, and May 2017 were skimmed to determine the level of comprehensive content. Of these, the top three most representative interviewees were included in the final analysis, and the least three representative tweets from interviewees were included as well. This enabled the search for patterns and the uncovering of themes (Bowen, 2009). In addition, a comparison between the ways in which teachers used their Twitter accounts provided further insight into the complexities of how teachers use Twitter to learn. The following interviewees' tweets had fewer representative examples that represented the categories that emerged from the interview process: Allison, Jessica, and Wendy. On the other end, Nina, Stacey, and Libby had tweets that fulfilled almost all categories that had emerged from the interview process.

**Least representative tweets.** This category represents the three participants whose tweets were less representative in comparison to the other interviewee participants.

*Allison.* In her interview, Allison mostly described gaining ideas from others on Twitter and using them in her classroom. After reviewing three months of her tweets, it became clear that Allison mostly used her Twitter account to promote one of her school's athletic teams. However, there were a few examples in which she provided a look into her classroom with a tweet including three images of her students creating gliders that they would be testing to see how much cargo they could carry.

Allison also used her Twitter account to participate in moderated chats. There were a few examples of tweets in which she answered questions during a #3rdchat discussion. There was evidence to support her claim that Twitter helped change the way she teaches

in her response to a question in which she asserted that students should be given choices with regard to how they want to show their learning. However, there was very little beyond the aforementioned examples of substantial engagement in a learning process.

*Jessica.* The interview with Jessica revealed that she is an enthusiastic Twitter user who relies on hashtags to search for specific information and who enjoys learning from moderated chats. Despite little evidence of her actual participation in any moderated chats during the three-month period in which her tweets were reviewed, Jessica had mentioned that she does not necessarily need to give her “two cents worth” in order to gain ideas from them. Thus, in her case, it seems entirely possible that for much of her Twitter use, she is more of an observer than a contributor.

Jessica’s Twitter use involved mostly posting photos to Instagram and then sharing those links via Twitter. In reviewing her interview transcript, she had admitted to following more teachers on Instagram since she is “more visual and there’s a lot more pictures on there.” There was one example of a reflection in her Twitter feed in which she agreed with another Twitter user’s tweet about the impact of a school or district’s mindset on its students and teachers.

*Wendy.* In her interview, Wendy discussed using Twitter to engage in professional conversations with other teachers. There was evidence of her participation in her state’s moderated Twitter chat in which she posted responses to questions. In one of her response tweets, she described how she took attendance by having students answer a question of the day. Wendy also shared a few links to resources and inspirational ideas, such as a link to a YouTube video teaching math vocabulary.

In addition to sharing resources, Wendy had one example of a reflective tweet in which she acknowledged that she was still thinking about a professional development experience in which the theme was inquiry. Even though Wendy’s Twitter use was not as frequent as some of the other participants, her tweets showed that when she did use Twitter, she engaged in moderated chats, shared ideas, and was reflective.


**Most representative tweets.** The following users' tweets embodied the use of Twitter for professional learning as they covered almost all categories that emerged from the interview process. At more than 27,000 tweets, Nina was one of the more prolific users of Twitter. Her tweets covered almost all categories derived in the conceptual framework, with several examples occurring in the three-month timeframe in which her tweets were skimmed. Stacey and Libby did not necessarily have the highest number of tweets; however, their tweets exemplified many of the categories within the conceptual framework. Table 23 illustrates the tweets from Stacey, Libby, and Nina as they pertain to the first research question.

Table 23

## RQ1: Tweets Illustrating How Teachers Are Using Twitter

	Motivation & Support	Collegial Network	Reflect on Teaching
<b>Stacey</b>	Your pages are AMAZING! I cannot believe the resources you share. Eternally grateful. You are inspiring! #MEdChat	A9 We are better together. Sharing and connecting with other great ppl fills my soul. Thank you to all who inspire me daily. #MEdChat	
<b>Libby</b>	What an inspiring post to share with students as we embark on informational research! #iislearns	A6) The more I know my colleagues the more I expand my "expert" network; pop in to learn from rockstars @ something I'm working at #LearnLAP	Now I know what to work on as a T for next time... and the time after that... and...
<b>Nina</b>	Aww - you are awesome!!! Love all the support and great ideas you give and share! #twittasista #inspiration #yourock	I love you all #4thchat - You are truly a wonderful group! Hope your week is absolutely fantastic! #4thchat	I think that is one thing I really TRY to do, but I Write that into my plans - #4thchat

Table 23 (continued)

	Window into Other Teachers' Classrooms	Participate in Moderated Chats	Asking Questions
<b>Stacey</b>	<p>This looks so fun! Can't wait to see pictures of the actual event. Would love to try it 😊</p> <p><b>Kim Calderon</b> @CrazySciTeach Cardboard boats are coming together, getting ready for the STEM Cardboard Boat Regatta next Thursday #stem #scienceisfun #cardboard4life</p> 	<p>A5 Hopefully I have built a culture where they know the expectations &amp; fun is natural. Ss will get crazy at times. Redirect! #MTedchat</p>	
<b>Libby</b>	<p>This'll work. Just wanted to see an idea of how you work the assignments. THANK YOU!!! You've been SO helpful in tipping me all the way!</p>	<p>Thank you, @teresagross625!! I was so excited about this chat and it "exceeded expectations," as McGonagall would say! #learnlap</p>	<p>WOW. THANK YOU. This part is what's been keeping me from going all in. Would it be ok if I looked at your chart?</p>
<b>Nina</b>	<p>I'm going to say being a part of this group was a game-changer for me! I've learned so much from these gr8 folks. #4thchat</p>	<p>A7: Two years ago I did a Summer Math Camp via Google Classroom and @edmodo. About 5 kids joined. #4thchat Was thinking of trying again.</p>	<p>So do you only use 1 box and have small groups? 1 big group? Just thinking about how to manage. #4thchat</p>

In her interview, Stacey discussed how Twitter helped her to learn more about 3D printing. Her tweet in Table 24 demonstrates how she is using 3D printing with her students for technology integration. Her tweets also demonstrate that she is learning about new digital tools and using current ones to implement curriculum.

Table 24

## RQ 2: Tweets Illustrating What Teachers Learn from Twitter

	Technology Integration	Innovative Ideas	Strategies to Implement Curricular Resources
<b>Stacey</b>	Ss love <a href="#">@tinkercad</a> & then uploading file to <a href="#">@thingiverse</a> and using our <a href="#">@ROBO3D C2</a> to print straight from the Chromebook.	This takes <a href="#">#sketchnotes</a> and <a href="#">#doodling</a> to a new level! <a href="#">#edtechteamonline</a> Great for visual Literacy.	Ss make their own <a href="#">@quizizz</a> in Social Studies and then they become the teacher. <a href="#">#edtechteamonline</a>
		<b>Jeff Crews</b> <a href="#">@crewsertech</a> Google Released A New Drawing Tool to Use with Your Students <a href="#">educatorstechnology.com.in.is/bUm3J</a>	
<b>Libby</b>	<a href="#">@colbysharp</a> the#bestpartofmyday was chatting w/ a few of my Ss about the possibility of using <a href="#">@Snapchat</a> as a booktalk tool!		Wordless PBs are PHENOMENAL for developing inferring skills. I love them! The Wave by Suzy Lee is one such work of genius.
<b>Nina</b>	Great idea for a Flip Grid! I had students write letters, but love this more! <a href="#">#4thchat</a> <a href="#">#flipgrid</a> <b>Mrs. Huggins Class</b> <a href="#">@MrsHugginsCla...</a> Created my first <a href="#">@flipgrid</a> ! Having students introduce themselves at meet the teacher and showing them on the first day! <a href="#">#cecheetahs</a> <a href="#">#4thchat</a>	This makes a lot of sense doesn't it? Lots of great examples of empathy in Literary Fiction. <a href="#">@Glynn_ed</a> <a href="#">#4thchat</a> <b>Dena Glynn</b> <a href="#">@Glynn_ed</a> Novel Finding: Reading Literary Fiction Improves Empathy <a href="#">ift.tt/2ggX6VT</a> <a href="#">#edtech</a> <a href="#">#4thchat</a> <a href="#">#5thchat</a>	I have had Ss present lessons to classmates to share about their culture or to do language lesson. <a href="#">#4thchat</a> Well rec'd.

In answering the question about what teachers do with the information they have learned from Twitter, the tweets in Table 25 provide evidence that Stacey, Libby, and Nina transformed their teaching practices, pursued other opportunities, made global connections and shared ideas and resources. In her interview, Nina discussed how Twitter helped change her teaching by allowing her to collaborate with others, and connected her students to the world. Her tweet in the transformation of teaching practices in Table 25 illustrates her willingness to give her students control over their learning as an example of how she has changed.

Also, as she mentioned in her interview, Libby was trying to have her students lead more. Her tweet in Table 25 within transformation of teaching practices illustrates how

she tried to be less teacher-driven and more geared toward her students' needs, especially when asking them which areas of their writing needed feedback.

Table 25

## RQ3: Tweets Illustrating What Teachers Did with Information Learned from Twitter

	Transform Teaching Practices	Identify and Act on Other Opportunities
<b>Stacey</b>	<p>This class truly transformed the way I teach. Come take the journey. You will be amazed. <a href="#">#edtechteamonline</a></p> <p><b>Dominique Dynes</b> @DominiqueDynes Take a journey w/ <a href="#">#edtechteamonline</a> Learn more Tues, March 16 6pm CST</p>	<p>Super excited to be a Global Ambassador for <a href="#">@PenpalSchools</a> connect your Ss w/ other Ss around the globe!</p>
<b>Libby</b>	<p>A6) Ask Ss what they'd like to work on. "What area of writing would you like me to look at and give you feedback?" Let them choose. <a href="#">#G2Great</a></p>	<p>A7: Choosing to join <a href="#">@KateMessner's</a> <a href="#">#TeachersWrite</a> group this summer. Inspired by all of you at <a href="#">#TWTblog</a> and our March <a href="#">#SOL</a> challenge!</p>
<b>Nina</b>	<p>There's lots to be said about having Ss explore on their own! <a href="#">#4thchat</a> I love when they can teach ME!</p>	<p><a href="#">@walkingclassrm</a> Just got word proposal to present at <a href="#">@masscue</a> in October was accepted! Happy to be sharing this gr8 program!</p>
	Make Global Connections	Share Ideas and Resources
<b>Stacey</b>	<p>Ss are enjoying our <a href="#">@Skype</a> with <a href="#">@de_updates</a> <a href="#">#ArcticLive</a> Kelly Hogan! Super interesting about sampling sea floor!</p>	<p>Absolutely love using this site. Great for student choice.</p> <p><b>Eric Curts</b> @ericcurts ReadWorks <a href="#">digital.readworks.org</a> Free nonfiction &amp; literary articles w/ related resources <a href="#">#edtech</a> <a href="#">#engchat</a> <a href="#">#scichat</a> <a href="#">#sschat</a></p>
<b>Libby</b>	<p>He was so sweet. I wish the great Kate DiCamillo was in Twitter. He wanted to tell her how much BOWD meant to him.</p>	<p>Take some time for this one. There is powerful reflection in here for the benefit of all students. Thank you, <a href="#">@KinneyCourts!</a></p> <p><b>Courtney Kinney</b> @KinneyCourts "Love Justice: School as a Rehearsal for Life. There is no freedom w/o justice &amp; this means...love justice." ♥🐶 <a href="#">thejourneyproject.us/2017/06/05/lov...</a></p>

	Make Global Connections	Share Ideas and Resources
Nina	Classes pls join us 5/24 for twitter bookchat #4thbookchat 2:10 EST 5/24 All welcome. #4thchat #3rdchat #2ndchat #kinderchat #1stchat	<p>@KRSscienceLady Wow! This is a great resource! Amazing! #4thchat #ngss #elemsci #5thhat #6thchat</p> <p>Kathy Renfrew @KRSscienceLady  <a href="http://goo.gl/HTBzmu">goo.gl/HTBzmu</a> @NSTA's new enewsletter Next Gen Navigator.  @Redhdteacher @BlueberryMath  @ncarroll24 @biologygoddess  @NGSS_tweeps</p>

For the final research question about the type of support teachers have when they want to implement what they have learned from Twitter, there were hardly any tweets pertaining to support for teachers. However, Libby had one tweet illustrating how she felt supported in her school environment: “Lucky to work with such greatness: admin, staff, kids, parents. All heroes.”

### Document Analysis: Group 2

The tweets that comprised Group 2 were obtained from a moderated #2ndchat discussion forum that occurred on Wednesday, May 10, 2017. The topic for this particular #2ndchat forum was assessments and evaluation. Most of the participants in #2ndchat are second grade teachers. However, during this chat, it turned out that there was a high school teacher and author of several books about hacking, or transforming, traditional ways of teaching.

The #2ndchat discussion occurs on the second and fourth Wednesdays of each month at 8:00 P.M. eastern. To facilitate data analysis, and because the researcher did not follow the moderated chat as it was happening, an archive of the chat was obtained online from the #2ndchat web site. The conversation was skimmed, and screenshots of some of the tweets were organized in an Excel spreadsheet to facilitate analysis (see Appendix L: Document Analysis: Summary of #2ndchat Tweets for the content that was analyzed from the #2ndchat discussion forum). Following McMillan’s (2008) recommendations for data analysis, the next step after organizing the data was to code common words and phrases. Once this step was complete, categories were created from the coded data

(McMillan, 2008). Lastly, interpretations of the data were made and are presented in the following discussion.

During #2ndchat, a moderator posts questions (Q1, Q2, ...) to which participants post answers (A1, A2, ...). Any Twitter user can participate in moderated chats since they are open, free-flowing forums. It is important to note that when the #2ndchat hashtag appears in a tweet, it does not always indicate a Twitter user is engaged in a chat. The #2ndchat hashtag is also used to share information related to teachers of that particular grade and can also be used when Twitter users are engaged in a chat discussion. The use of the #2ndchat hashtag in conjunction with A1, A2, and so forth indicates that a Twitter user is partaking in a moderated chat, directly answering the moderator's questions.

**#2ndchat topic: Assessments and evaluation.** Typically, at the beginning of a moderated chat, the moderator will post the questions to be covered during the chat session. Figure 6 illustrates an example of a list of questions in the #2ndchat forum on assessments and evaluation. By posting the questions in advance, #2ndchat participants were given time to think and reflect on possible answers. Since moderated chats flow quickly, it can be challenging to follow the flow of the conversation. Several online tools are available, such as Tweetdeck, Hootsuite, and Tweetchat, that allow Twitter users to isolate chat conversations by their hashtags to make it more convenient to follow the conversation.

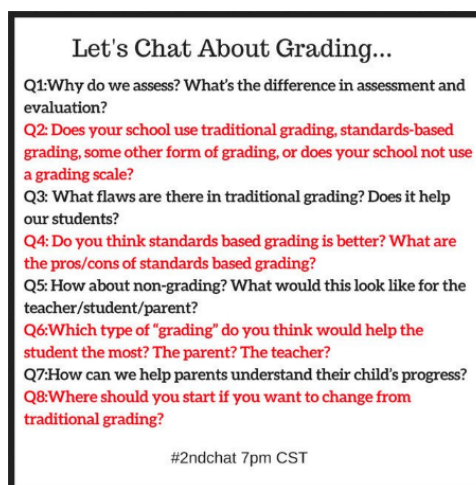


Figure 6. Sample of questions asked during #2ndchat



As a result of analyzing the #2ndchat about assessments and evaluation, common words and phrases were coded. Six categories, or themes, emerged as a result of analyzing the tweets: (a) welcoming community, (b) responses to moderator's questions, (c) sharing information and resources, (d) asking questions, (e) reflection, and (f) providing support and motivation.

**Welcoming community.** The welcoming atmosphere of the #2ndchat community was exemplified in tweets in which Twitter users welcomed each other and acknowledged that they were glad to be together. The following two tweets illustrate this example:

[@mollienye72](#) Hi, Mollie! Glad you are here! #2ndchat

[@mcarlson110](#) Hi Mary!! Good to see you!! #2ndchat

**Responses to moderator's questions.** The first questions posed to the #2ndchat group were, "Why do we assess? What's the difference between assessment and evaluation?" One teacher used an analogy to explain how she interpreted the difference:

[@MrsW2nd](#) #2ndchat best analogy I love .Treat your students like plants. Formative assessment is like watering, pruning and tending to help it grow

[@MrsW2nd](#) A1 cont: Summative is a measuring stick to see how tall your plant has grown. They are different and should be celebrated in growth #2ndchat

Another teacher lamented about the current state of affairs with regard to assessments, which generally include worksheets and tests. This teacher pondered the potential for changes in assessments and evaluations:

A1: I think the main problem with this is what could assessment/evaluation look like? Most get stuck on a worksheet/test. #2ndchat

**Sharing information and resources.** Teachers were willing to share information and resources to each other during the moderated chat. The first example illustrates a teacher sharing a screenshot of the spreadsheet program used for grading in her school:

[@MrsW2nd](#) ill send ou a screen shot though about what it kinda looks like. Check out [@kiddomapp](#) for a digital gradebook tool. Pretty neat [#2ndchat](#)

In the next example, a teacher shared a link to a recent article from *Education Week* discussing alternatives to traditional grading systems:

Traditional Report Cards are Obsolete - Work in Progress - Education Week Teacher [bit.ly/2lWKnLS](http://bit.ly/2lWKnLS) [#2ndchat](#)

Upon further investigation by following the link that was shared, it turned out that the teacher who shared the link to the article in *Education Week*, Starr Sackstein, is a regular contributor to a teacher blog on an author of several books about hacking, or transforming teaching and learning. One such book, *Hacking Assessment (2015)*, is described as “10 Ways to Go Gradeless in a Traditional Grades School.” Thus, teachers who participated in this moderated chat were exposed to ideas that veered away from traditional grading approaches. Further, they had an expert from the field engaging in the discussion with them.

**Asking questions.** Although teachers were generally responsive to the moderator’s questions, the chat also provided them with the opportunity to ask their own questions. At times, these questions stemmed from other Twitter users’ responses and began another discussion chain. One participant asked to see an example of a teacher’s grade book:

[@swkreed](#) Do you have a picture of what the gradebook looks like? Very interested in starting one myself. [#2ndchat](#)

**Reflection.** Several teachers reflected on their own experiences with grading and assessment. One teacher described how she sees enhanced learning in her classroom as a result of using more digital tools for students to demonstrate their learning:

A1:as I've incor more digital tools/options to show learning I see higher engagement and better effort to show what they know.  
#2ndchat

Another teacher reflected on her ideal grading system for her students:

@swkreed @DebraSerio For me, I'd like to see a portfolio app that allows for feedback/reflection/peer feedback and continued iteration and customization #2ndchat

**Providing support and motivation.** The discussion about assessment and evaluation had examples of support and motivation. After learning that one of the participants in the chat was Starr Sackstein, an author on books about transforming grading systems, one teacher expressed her relief that she was in attendance:

@mssackstein Thank you for coming to this chat! I'm frustrated w/ what we have now! I just don't know how to fix it! #2ndchat

Another teacher reached out to others asking for confirmation of her ideas:

@mcarlson110 Do you see what I'm saying? It's the same traditional grading system in a new wrapper. #2ndchat

Lastly, a final message of support from the #2ndchat moderator acknowledged the passion displayed during the chat by teachers who wanted to upend traditional grading:

I can tell you are all passionate about this too- lots of side conversations but they are GREAT side conversations! NEEDED!  
#2ndchat

## Chapter Summary

This chapter presented the findings from the online survey, interviews, and document analysis. These three different data collection methods helped provide a more complete understanding of how teachers reported using Twitter to support their professional learning. In addition, several areas of convergence between the online

survey data, interview data, and document analyses were revealed and are listed at the end of the summary. The major findings of each data collection method are summarized in the order in which they occurred.

In phase one, several key findings were uncovered from the online survey to explain how teachers reported using Twitter to support their learning. The findings from the online survey could be grouped in the following major categories describing the ways teachers used Twitter: (a) to access to information and resources, (b) as a source of motivation, (c) as an impetus for transforming their teaching practices, (d) to connect with others globally, and (e) to learn new curricular ideas, including technology integration.

In phase two, interviews were conducted with participants who met certain criteria targeting frequent Twitter users. It was hoped that those participants would be able to provide more information that would help explain some of the findings from the online survey. In this phase, interview data were described with extensive examples of quotations from participants. The use of participants' own words aimed to enhance their credibility by portraying them as accurately as possible. This phase uncovered four key findings that corresponded to the four research questions.

The primary finding from the interviews was that Twitter is a source of motivation and support for participants. This finding emanated from the descriptions of 100% of the participants as they discussed how they used Twitter. In discussing how they viewed Twitter as a source of motivation and support, several participants talked about feedback, encouragement, and peer accountability as the main characteristics of the support they received.

The second finding from the interviews was that almost two-thirds of the participants reported learning technology integration techniques from their use of Twitter. Participants described situations in which they used digital tools to collaborate with

others. In some cases, participants described the digital tools they learned about from Twitter and how they were applying them in their teaching.

The third finding was that almost three-quarters of participants reported that they used the information learned from Twitter to transform their teaching practices. In addition, almost three-quarters also said they used the information to identify and act on other opportunities that presented themselves via Twitter. More than two-thirds of participants spoke about their experiences teaching others about Twitter.

The fourth finding was that more than half of the participants had received some level of support from their school environment or district when they wanted to implement what they have learned from Twitter. Some participants also cited the Twitter community as being supportive of their learning and implementing new ideas in their teaching. A few participants mentioned that they had no support from their schools or districts. In contrast, a few teachers found themselves as sources of support for their schools or districts.

The final phase of data collection was document analysis in which two different groups of tweets were analyzed. This phase highlighted the fact that teachers may use Twitter in different ways, and for different purposes. The tweets that seemed to be least representative seemed to be posted in response to specific moderated chat questions, and there were a few reflective tweets. For the most part, however, teachers used Twitter for different reasons. For example, tweets from an interviewee who reported using Twitter frequently to support her learning mostly contained information to promote her school's athletic teams. At times, her tweets showed participation in moderated chats, or she shared photos from classroom activities. However, overall, her educational tweets were few. One possibility may be that she did not necessarily need to tweet educationally-focused messages herself in order to reap the benefits of new ideas that she learned about by observing moderated chats. This was an observation another interviewee made and it may hold true for many teachers.

On the other end of the spectrum, teachers who showed active engagement with Twitter had numerous examples demonstrating how they used Twitter to support their learning. Not only did these teachers participate in moderated chats, they contributed ideas, shared resources and often included photos to illustrate how activities were being done in their classrooms. These teachers had tweets with evidence of a supportive network of others who provided them with inspiration and motivation. In addition, there were examples of how their teaching was transformed. The more extensive Twitter users had examples of tweets that showcased other opportunities they were engaging in.

The second group of tweets that were analyzed came from a #2ndchat moderated discussion forum. Some of these themes, such as sharing information, reflection, and providing support and motivation, converged with similar findings from the online survey and interviews.

In an attempt to discover further examples of data agreement resulting from the three different methods of data collection, a table was created with examples from each source of data (see Appendix M: Areas of Agreement Between Data from Survey, Interviews, and Document Analysis for the content that was analyzed). The conceptual framework served as a guide when drawing connections between information from the survey, interviews, and documents. As a result, there was agreement across eleven categories. These categories are presented in the context of the research questions:

### **Research Question #1**

*How are teachers using Twitter for their professional learning and development?*

- As a source of motivation and support
- To form collegial networks
- As an opportunity to reflect on their teaching practice
- As a window into other teachers' classrooms

**Research Question #2**

*What do teachers learn from their use of Twitter?*

- Technology integration techniques
- Strategies to implement curricular resources
- Innovative ideas

**Research Question #3**

*What do teachers do with the information they have learned from using Twitter?*

- Transform teaching practices
- Identify and act on other opportunities
- Make global connections

**Research Question #4**

*What support do teachers have when they want to implement what they have learned from Twitter?*

- School environment
  - District-level (superintendent)
  - School-level (principal)
- No support
- Teachers as source of support

The findings that were presented in this chapter point to the variety of ways in which teachers reported using Twitter to support their professional learning and development. For the most part, teachers reported that they used Twitter to give and receive support, learn new ideas, gain access to resources, connect with others globally, and change their approach to teaching. The final section presents a discussion, including an interpretation regarding the implications of these findings.

## Chapter V

### DISCUSSION OF FINDINGS

The purpose of this mixed methods research study was to explore how elementary school teachers use the social networking website, Twitter, to support their professional learning and development. The assumption was that a better understanding of this phenomenon would allow educators, administrators, and other leaders in the field of education to proceed from a more informed perspective about its use with regard to the professional learning of teachers. The findings presented in Chapter IV have provided more information on the various ways in which teachers reported using Twitter to support their professional learning.

This chapter interprets the findings and provides a look at why teachers described Twitter as professional development. Many researchers agree on certain defining characteristics of effective professional development, yet there is still great unevenness regarding its implementation. This chapter explores teachers' perceptions regarding professional development, based on the sample of teachers who use Twitter extensively.

Before discussing the implications of the findings of this study, it is important to frame the findings in the context of the many challenges teachers face in their profession. This contextual framework may help explain how some of these challenges may have influenced teachers to use Twitter.

This chapter is organized into the following sections: (a) a contextual framework for the teaching profession, (b) summary of findings, (c) discrepancies within



professional development, (d) Twitter's role in teachers' professional learning and development, (e) conclusions, (f) recommendations for school leaders, policymakers, and teachers, and (g) areas for future research. It is followed by a brief summary.

### **A Contextual Framework for the Teaching Profession**

Throughout their careers, teachers face many challenges. Teachers are held accountable for their students' academic performance, which has led "to public shaming, and blaming, of teachers" (Carter & Lochte, 2016, p. 13) when schools do not meet expected performance standards. Further, public discourse regularly includes the view that "teachers are failing America's children" (p. 12). To add to the pressure and demands placed on teachers as a result of their performance evaluations, teachers also have a lot of uncertainty over the actual impact they have on their students (Fullan, 2007). One of the interviewees in this study echoed this sentiment as she expressed dealing with the daily challenges she faced by saying, "Are we doing anything right?" In many cases, "teaching decisions often are made on pragmatic trial-and-error grounds with little chance for reflection or thinking through the rationale" (Fullan, 2007, p. 24). Therefore, teachers do not necessarily have a deep understanding of the information they bring to their teaching practices and how or why they are using it.

The latest data on teacher attrition have shown that between 19%-30% of new teachers leave within the first five years of teaching (Sutcher, Darling-Hammond, & Carver-Thomas, 2016). In fact, the same research study found that the most important reason teachers reported leaving was due to dissatisfaction with their administrators. For teachers who chose to stay in their schools, having support meant that administrators focused on "school culture and collegial relationships, time for collaboration, and decision-making input" (p. 52). Hennessy (2014) describes the teaching profession as "isolationist, insular, teacher-centered" (p. 217). She concludes that allowing teachers to

have more authority and ownership over school-based decisions will improve their morale (Hennessy, 2014). Regrettably, few states, and the schools within them, offer the types of support needed to keep teachers in the profession (Sutcher et al., 2016).

Further, teachers are working in pressure-filled environments where they are expected to not only prepare and teach their lessons, but “deal with constant daily disruptions” (Fullan, 2007, p. 24), including behavioral and social issues. Derrick, an interviewee in this study, described some of the challenges he faced: “Teachers are very busy, it’s a hectic lifestyle getting ready for tests and we all have different types of learners so it’s very tough to collaborate ideas.”

These are just a few examples of the many demands placed on teachers in an overall environment filled with pressure. As a result, it is understandable that Twitter’s format and the immediate access to information may help alleviate some of the pressure felt by teachers. Twitter facilitates opportunities for teachers to draw support from each other as they attempt to tackle the current culture of high accountability and expectations for student achievement.

### **Summary of Findings**

Four research questions were posed to explore Twitter’s role in teachers’ professional learning and development. Table 26 illustrates the relationship between the research questions and summarizes each of the findings:

Table 26

## Summary of Findings to the Four Research Questions

Research Questions	Findings
RQ1. How are teachers using Twitter for their professional learning and development?	This purposeful sample of elementary teachers use Twitter as a source of motivation and support. Feedback, encouragement and peer accountability were the most frequently cited examples of motivation and support.
RQ2. What do teachers report learning from their use of Twitter?	Teachers reported learning to integrate technology into curricular objectives. Two main categories reflected their new technological learning: a) The technology appeared to facilitate collaborative learning opportunities, and b) teachers were introduced to new digital tools and how to apply them in their teaching.
RQ3. What do teachers say they do with the information they learned from Twitter?	Teachers reported using the information they learned in two main ways: a) to alter some of their teaching practices, and b) to identify and act on other educational opportunities.
RQ4. What type of support do teachers have when they want to implement what they have learned from Twitter?	Teachers reported having different levels of support from their superintendents and principals.

These findings will be referred to throughout this chapter in the discussion regarding teachers' views of Twitter as professional development. The findings also informed the conclusions that have been drawn, and are the basis upon which recommendations for K-12 policymakers, school leaders, and teachers at the end of this chapter were made.

### **Discrepancies with Professional Development**

In Chapter II, the literature on professional development revealed that there are areas of agreement among researchers regarding the defining characteristics that contribute to its effectiveness. However, there are also differences regarding the

implementation of effective professional development. Table 27 illustrates different researchers' viewpoints of professional development.

Table 27

Different Researchers' Viewpoints of Professional Development

<b>Characteristics of Effective Professional Development</b>			
<b>Agreement</b>		<b>Disagreement</b>	
Darling-Hammond, Hyler, Gardner & Espinoza, 2017; Zepeda, 2014; Guskey & Yoon, 2009; Yoon, Duncan, Lee, Scarloss & Shaply, 2007; Carlson, 2002	<ol style="list-style-type: none"> <li>1. Focuses on content</li> <li>2. Incorporates active learning</li> <li>3. Supports collaboration</li> <li>4. Uses models and modeling of effective practice</li> <li>5. Provides coaching and expert support</li> <li>6. Offers opportunities for feedback and reflection</li> <li>7. Is of sustained duration</li> </ol>	Opfer & Pedder, 2011	Teachers learned from professional development opportunities that did not consist of agreed upon characteristics of effectiveness, and it is possible that teachers do not always show evidence of learning or change after attending professional development opportunities that are considered effective.
Penuel, Riel, Frank, & Krause, 2009; Wei, Darling-Hammond, Adamson, 2010	School-based participation - it is easier to follow-up with teachers and to align professional development to the curriculum, as well as to evaluate the impact of student learning over time when professional development is school-based.	Guskey and Yoon, 2009	The inclusion of outside experts such as "program authors or researchers who presented ideas directly to teachers and then helped facilitate implementation" (p. 496) had the most impact on student learning, regardless of where the professional development took place.
Wei et al., 2010; Guskey & Yoon, 2009	Length of time—30 or more hours needed for professional development to be effective.	Desimone, 2009	The amount of time teachers need for professional development remains unknown.

As Table 27 illustrates, there are differing views between researchers with regard to effective features of professional development for teachers. Most notably, the seven characteristics that many researchers have agreed upon as leading to effective professional development are not reliable in all circumstances (Opfer & Pedder, 2011).

Hence, Opfer and Pedder argue that teacher learning is a complex process that cannot be addressed by viewing professional development as a simple process (teaching teachers) that results in a product (student learning). Instead, teacher learning is influenced systematically with regard to the individual teacher, the school, and the learning activity (Opfer & Pedder, 2011). It is important to keep this notion in mind when considering how professional development is generally regarded and what can be done to improve it.

### **Shortfalls of Professional Development**

Establishing high-quality professional development has been a challenge for many schools and districts (Gaytan & McEwen, 2006). As noted in Chapter II, some of the shortfalls of professional development include: (a) a lack of sustained duration (Guskey & Yoon, 2009; Wei et al., 2010), (b) it is unrelated to teachers' needs and is too generic (DeMonte, 2013; Guskey, 2000), and (c) there is little follow-up support (Bransford et al., 2000; Mueller et al., 2008). Further, there is little evidence to support the impact professional development has on student learning (Gaytan & McEwen, 2006). Lastly, Darling-Hammond et al. (2009) found that too often, professional development does not include "the job-embedded collaborative learning that has been found to be important in promoting instructional improvement and student achievement" (p. 25).

The New Teacher Project (TNTP, 2015) has put forth an urgent call for changes to professional learning and development for teachers. In its report, TNTP states that it will "take much more than tinkering with the types or amount of professional development teachers receive," and instead, a totally "new conversation about teacher development" is required (p. 3). This shift should take into account research showing that professional development is a complex system involving the teacher, the school, and the learning activity (Opfer & Pedder, 2011). Fullan (2007) would agree that any lasting changes need to happen systematically, and getting teachers to change their beliefs "can be most effectively discussed after people have had at least some behavioral experience in

attempting new practices” (p. 37). Therefore, this conversation about revamping professional development should take into account the findings of this study in which teachers reported that Twitter helps them learn new ideas to incorporate into their teaching practices.

Guskey (2002) points out that “change is primarily an experientially based learning process for teachers” (p. 384) whereby teachers need to try new instructional approaches in their classrooms to see if they are effective before they alter their attitudes and beliefs to accept new learning. In order for teachers to learn and change most effectively, it is important to recognize that professional development varies in intensity and its features will “work together in different ways under different circumstances in different contexts” (Opfer & Pedder, 2011, p. 386). The key idea is to recognize that combinations of factors will always be involved in any professional development. However, teachers must have options for professional development, and there is a case to be made for giving teachers the autonomy to manage their own learning through online social networks such as Twitter, and giving them the support they need to do so, especially when teachers expressed that traditional professional development does not always meet their needs.

### **Twitter’s Role in Teachers’ Professional Learning and Development**

Taking into account the research into effective professional development, it is also worth noting that the findings from this study revealed that teachers appear to be looking for alternative approaches when it comes to their own learning preferences, including professional development. In fact, it appears that teachers in this research study consider Twitter *as* professional development. This implication aligns with Jones and Dexter’s (2014) viewpoint that the “inadequacies of traditional formal PD models have prompted consideration of alternative formal models and how emerging technologies can be utilized” (p. 369). In the same way that instruction for students should be geared toward

their individual needs, so too should instruction for teachers be designed with their needs in mind. Davis (2015) recommends that school administrators receive “training as to how Twitter may benefit teachers’ professional development and growth” (p. 1556).

According to survey and interview participants, Twitter was considered a key source of their professional learning and development. Survey respondents reported that the top three features of Twitter that distinguished it from traditional professional development included: (a) instant access to information and resources, (b) choice about how, when, and what to learn, and (c) access to other educators, authors, and experts.

### **Instant Access to Information and Resources**

Adult learning theory maintains that “most adults are motivated to learn in order to deal with an issue or problem of immediate concern” (Merriam & Bierema, 2014, p. 53). For this reason, the instant availability of information can sometimes align perfectly with the nature of Twitter to help solve those immediate issues or problems. Davis (2015) also found that teachers appreciated the instant access to information. As one survey respondent described the instantaneous nature of Twitter: “Quick and easy—lots of professionals to connect with easily—effective and efficient sharing.”

**Superficial information.** There may be a downside to the instant availability of information and resources. As Merriam and Bierema (2014) caution, “Our capacity for deep reading and reflection without distraction is replaced by the act of decoding information without making key linkages and associations” (pp. 200-201). In other words, by not taking time to process and connect all the information, only a superficial understanding of the material may be gained. This may be especially true due to the fact that tweets are generally comprised of 140 characters or less.

With teachers reporting that they are learning from “quick and easy” sharing of information on Twitter, it may seem as though they regard any information shared with them by other teachers to be considered professional development. However, teachers

may not necessarily be referring to the information they get from single tweets as professional development. Instead, they may, in fact, be referring to the conversational flow, sense of connectedness, and frequent interactions with other educators that lead teachers to believe they are gaining professional development from Twitter. These components reflect a community of practice whereby the users are engaged in similar topics, they learn from each other, and they provide each other with various types of support (Wenger, 2011).

Nevertheless, there may be a flip side to any assumptions that teachers are trying untested or unproven teaching methods on a whim. In fact, more than a handful of teachers reported using Twitter as a starting point for new ideas. As one survey participant explained:

I took the knowledge from Twitter, did further research and gathered the tools that I needed and began the implementation the next week. If I needed to go back and revisit the skill, I just went back online. I could do this as many times as needed until I could implement the practice without any problems.

Evidently, some teachers are giving careful thought and conducting further research before implementing new ideas they have learned about. Stacey, a fifth grade teacher and interviewee, had this to say regarding superficial information on Twitter:

I don't follow people that put the superficial stuff on there.... I'm pretty picky about who I follow and I'm going to follow people that are giving me rich, you know, rich deep content.

Stacey's account is supported by the survey findings in which 40% of respondents reportedly followed links on Twitter from highly reputable educators. Therefore, teachers may be learning to filter information as being credible and reliable as they become more sophisticated Twitter users. Yet, understanding how teachers determine which information is credible and reliable is worth exploring. Especially in an era of "Fake News," teachers should have support in discerning credible suggestions.



**Trustworthy information.** As with any online information, the legitimacy and accuracy should be determined through careful reading and corroboration. With Twitter, teachers need to be especially critical of information presented to them. Likewise, they need to be able to determine whether or not the information meets their needs. Although there are educators on Twitter who have a wide range of experiences in teaching, little is known about the quality of the information they are sharing. As previously discussed in Chapter II, a recent *New York Times* article discussed corporations influencing educational systems as they provide incentives such as free classroom technology to teachers in exchange for teachers promoting their classroom technology (Singer, 2017). Even though the article mainly highlighted the ethical quandary some teachers faced as a result of the compensation they received, it revealed that there are teachers on social media who are receiving perks for promoting classroom technology and other resources for various reasons. Therefore, the article underscores the need for teachers to be critical of information sources when using social media.

In an effort to demonstrate that they were critical of the information on Twitter, some survey respondents mentioned staying away from promotional pitches, with one specifically stating that she avoided “those looking to promote their product.” It is unclear how many teachers actually ignore educators who heavily promote products to be used in the classroom.

In determining why teachers were becoming ambassadors for corporations and promoting their classroom technology, the *New York Times* (Singer, 2017) article pointed to a lack of funding from school districts to purchase classroom technology. As one participant in this study had exclaimed, “I’m not sitting around waiting for my district. I’m taking the bull by the horns and doing what I can for my students.” Although funding technology may be a primary issue, the article failed to consider another possibility: teachers may have been exploring alternative approaches to teaching and learning. Especially with social media, teachers may have found support from teacher ambassadors

who did find benefits from the classroom technology they were promoting. In fact, Stacey, an interviewee who tested several digital products, said that she “would promote them just naturally because I loved using them in my classroom.” These teachers may have been looking for changes in pedagogy, and not, as the article points out, a money-making scheme. Still, regardless of the motivations behind some teachers’ promotions of classroom technology, it is important for teachers to assess any and all information that is presented to them online.

**Curating information.** In an effort to determine how teachers curated information and selected whom to follow on Twitter, most teachers said they started off by following reputable educators and then followed people that they re-tweeted. In many instances, teachers read Twitter users’ profiles and reviewed the history of their tweets to verify their credentials. As one survey respondent described,

I find certain hashtags of ideas I want to pursue and then I look there. I’ll then review the bio of the user to check reliability and then investigate more. I tend to look through more reputable resources for the best links.

Teachers especially looked further into users’ profiles and histories when they disagreed with what Twitter users said. By delving deeper, teachers reported being able to get a better understanding of users’ backgrounds to see where they were coming from and, as a result, teachers said they were able to make informed judgments about the quality of the information in the tweets.

One area of concern with how teachers select the Twitter users they follow is the possibility that they only include like-minded users who may not offer alternative viewpoints. Thus, teachers risk putting themselves in a filtered bubble. However, almost three-quarters of surveyed teachers reported engaging with others who challenged their thinking. Therefore, it may be reasonable to assume that teachers are being exposed to alternative perspectives.

Although teachers have instant access to information and resources they still need critical skills to: (a) evaluate the qualifications of educators, especially those who may be ambassadors for specific products, (b) validate the information and resources, and (c) determine whether the information and resources will ultimately help their students learn.

### **Choice About How, When, and What to Learn**

Arguably, in many instances requiring teachers to take part in professional development, little choice is given to teachers with regard to what their specific learning needs are (Darling-Hammond et al., 2009). As one interviewee, Roxanna, mentioned in her interview:

The professional development my school offers is pitiful. Part of it is the state mandate, and part is what they have to do.... Twitter for me is I'm learning new things all the time that I need. That suits my needs. The personalized learning model, you can pick your Twitter chats for your own personalized learning.

Another interviewee, Sylvie, put the choice to learn in perspective: "For me as a learner, it's better to find it when I need it rather than have a day devoted to it that may or may not be relevant to me at all."

Each of these examples reflects the ways in which adults prefer to learn. When teachers do not have input on how they feel their needs should be met, they may be more likely to exhibit "resentment and resistance" (Knowles, 1984, as cited in Merriam & Bierema, 2014).

### **Access to Other Educators, Authors, and Experts**

With more than half of teachers (53%) reporting that they use Twitter when they want to learn new ideas to bring to their teaching, many cited the fact that they would have a support network to turn to in the event they had further questions or problems needing immediate answers. For some teachers, just knowing that help was easily

accessible as soon as it was needed allowed them to leave their comfort zones and attempt to try new ideas in their classrooms. This finding concurs with Guskey and Yoon's (2009) discovery that what educators really need is "just-in-time" (p. 497) assistance to help them integrate new curricula or methods in their teaching. Similarly, Tondeur et al. (2010) found that teachers were more likely to integrate technology when they had "one-to-one support, role modeling, scaffolding, peer collaboration and peer support" (p. 305). Twitter may seem to offer this sense of support because of the immediacy of responses that generally come from other educators who may have faced similar situations.

Access to other educators also included being able to see how and what they were teaching. With many schools providing "limited opportunities for professional interaction" (Spillane & Seashore Louis, 2002, p. 93), it is sometimes difficult to know exactly how other teachers implement curricula in their individual classrooms. In addition, teachers rarely get the opportunity "to observe each other's teaching and to provide constructive feedback" (Darling-Hammond et al., 2009, p. 11).

With Twitter, classrooms are somewhat opened for the world to see, as many teachers reported sharing pictures, videos, and descriptions of class activities they had done with their students. Teachers felt they were getting to see and learn about real-life experiences of other teachers. They witnessed other teachers' successes and failures as they tried new approaches in their classrooms. As a result, they were exposed to first-hand accounts from teachers who were unafraid to share their experiences, thereby paving the way for others to follow in their paths.

Despite the appearance of openness to other teachers' classrooms, it is worth keeping in mind that there may be teachers at nearby schools who are able to provide similar types of learning experiences for teachers. However, for teachers located in rural geographic areas, and for those whose district schools may have limited options for

teachers seeking new ideas and how to apply them, Twitter provides an outlet for them to connect to a wider world of educators.

### **Twitter and Effective Professional Development: Is There a Relationship?**

In this study, teachers described many features of Twitter that have helped them to learn. Table 28 compares the effective features of professional development as supported by the literature with what teachers in this study have said. In order to maintain a balanced presentation of facts, a column on how Twitter may not necessarily be able to meet the standards for effective professional development is included.

Table 28

Comparison of Effective Professional Development Features with Features of Twitter

<b>Key features of effective professional development</b>	<b>Features of Twitter that are similar to effective PD</b>	<b>How Twitter may not be meet the standards of effective PD</b>
1. Is content focused	The ability to search for, and delve deeper into specific subject matter with hashtags; content experts available; other educators may be able to guide teachers to helpful information	Teachers should have a rationale for seeking content before searching Twitter  May not include pedagogical content knowledge  Need to establish qualifications for content area experts  May be an overwhelming amount of content
2. Incorporates active learning utilizing adult learning theory	Informal learning through experiential learning, dialogue with others via moderated chats, self-directed learning	Limited in the use of tangible materials  Teachers may need help connecting theory and practice
3. Supports collaboration, typically in job-embedded contexts	Personal learning networks (PLN); teachers reported collaborating with other teachers	Limited in situating learning directly in the teacher's environment

Table 28 (continued)

Key features of effective professional development	Features of Twitter that are similar to effective PD	How Twitter may not be meet the standards of effective PD
4. Uses models and modeling of effective practice	Videos, pictures and descriptions of teaching practices; provides the appearance of a window into other teachers' classrooms	Information and material provided to teachers may be questionable with regard to effective practice  Content may not be linked to research on effective pedagogy
5. Provides coaching and expert support	Moderated chat leaders and other educators provide coaching; experts are accessible; PLN can provide coaching and expertise; new teacher chat (#ntchat); expert educators and authors are present on Twitter to share ideas; school leaders are using Twitter	Qualifications regarding who is considered to be an expert and/or coach need to be determined  Physical presence may be beneficial for teachers who prefer to learn in-person
6. Offers opportunities for feedback and reflection	Feedback and reflection during moderated chats and from PLN; Twitter users use hashtags to find similar discussion topics	Knowing the qualifications of individuals providing feedback is important
7. Is of sustained duration	Available to teachers at any time; chats are numerous; can be used as an extension of in-person professional development	Does not necessarily provide face-to-face or ongoing support throughout the school year which can be an effective means of sustained PD

When considering the most effective characteristics of professional development specifically listed by Darling-Hammond et al. (2017), and supported by other researchers (Carlson, 2002; Guskey & Yoon, 2009; Yoon et al., 2007; Zepeda, 2014), some similarities may exist with respect to features of effective professional development and characteristics of Twitter that participants regarded as being professional development. Therefore, there is a compelling case to be made in support of Twitter having a role in teachers' learning and development as the following discussion attempts.

**1. Professional development is content-focused.** With Twitter, teachers have an abundant selection of chats to choose, and in many cases, they may participate in a variety of chats. More than one-quarter of survey respondents reported looking for

information on specific subject matter. Each grade level has its own chat (i.e., #kinderchat, #1stchat, etc.), and each specialty subject area has its own chat, such as social studies (#sschat) and special education (#specialchat), and social justice and cultural competence are discussed in the #educolor chat. Hashtags provide a way for users to search for topics and have virtual conversations with others surrounding those topics (Sauers & Richardson, 2015).

With no shortage of specific chat topics, teachers have a wide range of learning opportunities available to them. The following comment reflects an example of an idea a survey respondent learned about as a result of participating in a moderated chat: “#kinderchat discussed the negative impact of clip charts as a behavior management tool and I stopped using them. This was a transformational moment in my classroom.” It is unclear exactly what was discussed during the moderated #kinderchat that led the survey respondent to change their use of clip charts. Further research could query the respondent to find out how no longer using clip charts was truly transformational in her classroom, and what specific details of her online chat session convinced her to change her thinking.

In addition to having the ability to access content in all subject areas, teachers have access to subject experts in almost every field. For example, the hashtag, #actuallivingscientist, has been used to introduce real scientists on Twitter, as a few participants had mentioned using to connect their students. There are other scientists willing to mentor students and teachers throughout the school year, such as PlantingScience.com and Skype a Scientist, both of which can be found on Twitter. By outsourcing information to experts on Twitter, teachers demonstrate that they are not the sole sources of information in their classrooms, which is a shift from traditional expectations for the role of the teacher. Further, older students may learn to rely less upon their teachers for answers. Instead, these students may learn to view online social networking as a means to making connections with top experts in all different fields.

With regard to embracing information gained from Twitter, there may be potential downsides. Teachers may be making their own decisions about the changes they are bringing about in their teaching that are not necessarily linked to what is known about student learning. Although it seems as though teachers should know how the information they are getting from Twitter will fit with their classroom teaching, Hennessy (2014) would argue, “Teaching is full of unanticipated, diverse and unique situations that require professional judgment and ongoing change” (p. xxii). Therefore, teachers who are adopting information from Twitter seem to be doing just that, using their own professional judgment when making decisions about which ideas and resources to bring into their classrooms.

Further, due to the availability of a large amount of content covering all areas, teachers may be overwhelmed. Some teachers may prefer to have someone guide them to what is most useful and pertinent to their teaching (Davis & Krajcik, 2005), which may be found in more traditional professional development opportunities.

**2. Incorporates active learning utilizing adult learning theory.** Darling-Hammond et al. (2017) define active learning as “models that engage teachers directly in the practices they are learning, and preferably, are connected to teachers’ classrooms and students” (p. 7). For example, in one study, teachers engaged in a learning activity that used the actual science kits students would be using. In another study, teachers had to opportunity to role-play with their colleagues how they would teach lessons, thereby simulating students’ perspectives (Darling-Hammond et al., 2017).

As an online tool, Twitter is limited in its ability to incorporate tangible learning experiences. However, it may be best to view Twitter as a bridge connecting teachers who are able to share authentic learning experiences with others through dialogue in chats, or via posted videos or photos of demonstrations. Another possibility is arranging live group calls via Google Hangout or Skype. These scenarios could feature real-time collaboration and discussions involving demonstrations and role-playing.



**3. Supports collaboration, typically in job-embedded contexts.** According to Darling-Hammond et al. (2017), “collaboration can span a host of configurations—from one-on-one or small group interactions to school-wide collaboration to exchanges with other professionals beyond the school” (p. 9). Zepeda (2014) remarks, “The ways teachers assemble to work are boundless, limited only by imagination” (p. 80). As this study has found, many teachers are using Twitter to collaborate with other teachers. Some of the ways in which they are collaborating include forming collegial networks around similar topics, and collaborating on projects that their students can engage in together.

Twitter enables teachers to form their own connected groups, or networks, related to common interests. Teachers described feeling less alone, as was the case with some teachers in rural areas, as well as with teachers whose progressive beliefs may have made them feel somewhat isolated in their own schools. Some interview participants also reported feeling less apprehensive about connecting with others through Twitter because they do not work at the same schools. One interviewee, Holly, described how some teachers may feel “judged” when trying something new at their schools, whereas the support network on Twitter does not make them feel that way. This finding concurs with Hur and Brush (2009), who found that “teachers were concerned that they might be seen as incapable teachers if they shared problems or asked questions in their local schools” (p. 293). Ironically, some teachers felt more supported by people they did not necessarily know very well on Twitter than by colleagues teaching in the same school.

With Twitter, teachers reported having a safe space to share ideas, challenges, and successes. Davis (2015) found a similar result in that teachers reported a “sense of belonging” (p. 1555) as a result of their interactions during moderated chat discussions.

Sauers and Richardson (2015) found that certain characteristics of online networks, including Twitter, were found to be beneficial because they “enable lifelong learning, evolve over time, enable collaboration and reflection, facilitate learning skills

development and connect both formal and informal learning” (p. 132). They also described how school leaders who ask questions and share their knowledge “open the entire community to professional learning” (p. 132). Furthermore, Macià and Garcia (2017) found that the greater number of networks teachers connected with had an impact on the amount of information they received, thereby increasing their potential for learning. However, as previously mentioned, the amount of information could also prove to be overwhelming for some teachers.

**4. Uses models and modeling of effective practice.** Teachers need to know how to implement curriculum effectively. Modeling provides teachers with a vision for how to teach lessons using appropriate models of instruction and can include videos, demonstration lessons, lesson plans, peer observations, and viewing samples of assessments and student work (Darling-Hammond et al., 2017). With Twitter, examples of specific instructional techniques can be found in links to teachers’ blogs, searches for relevant hashtags, and Twitter chats. Teachers are willing to share their experiences, lesson plans, assessments, and even how they keep grades, as a participant in the #2ndchat Twitter discussion shared her grade book with another teacher who was interested in starting a similar type of grading system.

**5. Provide coaching and expert support.** Coaching usually occurs in a teacher’s classroom where the coach has the opportunity to observe a teacher teach and then provide feedback. In addition, the coach is able to model teaching practices for the teacher (Zepeda, 2014). With Twitter, the physical presence of a coach in a teacher’s classroom would be limited; however, the ability to create a video of the lesson or broadcast it in real-time exists. Zepeda discusses the increasing trend toward virtual coaching whereby videos of teachers in the act of teaching are reviewed and discussed with coaches.

According to Merriam and Bierema (2014), “the access to online resources and relationships is challenging our conceptions of education and educators, and requires us

to revisit how we facilitate sense-making, coaching, and credentialing” (p. 205). It is possible to broaden the recommendation Darling-Hammond et al. (2017) made to policymakers that they “identify and develop expert teachers as mentors and coaches to support learning in their particular area(s) of expertise” (p. 24). Instead of trying to cultivate new leaders to be mentors and coaches at every school or within districts, teachers could conceivably tap into Twitter chats and engage with authors and experts on specific educational topics that address their particular needs. As previously discussed in regard to how teachers make decisions about the ideas they ultimately adopt, potential online mentors, experts, and coaches would need to undergo a similar vetting process whereby their expertise and qualifications would need to be determined and verified. As the article in the *New York Times* made clear, some teachers may be motivated to promote classroom technology in exchange for incentives from corporations (Singer, 2017).

**6. Offers opportunities for feedback and reflection.** According to Merriam and Bierema (2014), “learning is rooted in practice/experience ... and for learning to occur, we need to reflect on or in the experience” (p. 117). During moderated Twitter chats, questions may be asked of teachers to reflect on and share examples of their own teaching experiences. Not only does this opportunity allow teachers to reflect and share, it allows them to “decide to do something similar or different in [their] future” (p. 115). By being reflective, and sharing personal teaching experiences, teachers are opening themselves up to give and receive feedback from others.

**7. Is of sustained duration.** According to the literature, there are discrepancies regarding the amount of time needed for professional development to be effective (Darling-Hammond et al., 2009; Desimone, 2009; Guskey & Yoon, 2009; Wei et al., 2010; Yoon et al., 2007). However, it appears that there is no denying that “offering multiple opportunities for teachers to engage in learning around a single set of concepts or practices, has a greater chance of transforming teaching practices and student learning”

(Darling-Hammond et al., 2017, p. 15). With Twitter, the opportunity to engage in sustained learning over periods of time is readily available to teachers. In one example, Sauers and Richardson (2015) discussed how a principal used social media “to extend professional development beyond the one-off workshop or conference” (p. 128).

Darling-Hammond et al. (2017) concede that teachers may be able to partake in continuous learning “by less formal means” (p. 16) after having an initial formal learning session. Establishing how to structure and sustain online learning opportunities via Twitter and determining the contributions of those opportunities would need further investigation. One possibility is for school districts to allow teachers to participate in moderated chats organized by the district, or other moderated chats designated by hashtags that meet their specific learning needs.

Despite the ability to connect whenever and wherever with Twitter, an online presence cannot replace personal connections. Putnam and Borko (2000) suggest that a combination of learning settings may, in fact, be “the best promise for fostering powerful, multidimensional changes in teachers’ thinking and practices” (p. 7).

### **Prospective Advantages of Using Twitter**

**Cost savings to school districts.** Darling-Hammond et al. (2017) made the following recommendations to policymakers: “Adopt standards for professional development to guide the design, evaluation, and funding of professional learning provided to educators” (p. 23). One research study estimated that an average of \$18,000 per year was spent, per teacher, on professional development (TNTP, 2015). By contrast, Twitter, a resource with thousands of teachers already taking advantage of its multitude of learning opportunities, is free. As one participant exclaimed in her interview, “If you're going to tell an administrator that Twitter is where teachers are going to learn, they are going to be offended because they are spending a fortune for PD.”

Davis (2015) made the following recommendation: “Social networks sites [including Twitter] may be a cost effective way for school leaders to support life-long learning for teachers” (p. 1557). This may, in fact, be a worthy idea, but there are important issues to work out. Some of the most important considerations include: (a) determining what teachers need to learn, (b) deciding which Twitter users are most likely to provide them with that information, (c) establishing how students’ learning will benefit, and (d) discussing how ongoing support can be provided.

**Documentation of student and teacher learning.** With regard to evaluating professional development, Guskey recommends “searching for and documenting evidence, even if the evidence is only based on anecdotes” (as cited in Gaytan & McEwen, 2010, p. 81). This research study has gathered many examples, including anecdotal evidence, whereby teachers describe their learning as a result of using Twitter. For instance, one survey respondent said that “Twitter shows that I am constantly wanting to improve my role in this profession and that I am seeking new ways to engage my students.” In many cases, this evidence is documented in some of their tweets.

Several teachers have tweeted about the impact their Twitter use has had on their students. For example, in her interview, Roxanna, a fifth grade teacher, read an email sent to her from a parent commending how she exposed students to the world beyond the classroom with the use of Twitter:

Very cool ... the inspiration you’ve provided by encouraging these kids to write and express themselves is amazing. To show them that that they can reach out to authors, publishers, astronauts with their thoughts and questions and get responses is a true gift that will stay with them forever and to show them they can do whatever they want in life.

In another example of the impact Twitter has on students, Courtney, a technology specialist, told how a student wanted to thank a vendor for adding games to an online assessment system used by the school:

They added games recently and a kid wanted to tell them thank you and he just like wrote a thank you note. I took a picture and we tweeted it at them and they tweet back and he just like feels like a different ... when adults outside of our immediate community interact with our kids and take them seriously like they ... they love school when that happens.

By connecting their students to the outside world with the help of Twitter, teachers are bridging the in-school and out-of school worlds (Cuban, 2013). However, these exchanges would need to be carefully monitored to insure the safety of K-12 students.

**Digital résumé.** In addition to tweeting examples of student learning, several interview participants reported that Twitter was like a digital résumé. By tweeting regularly about their own learning as well as their students' learning, they documented their willingness to learn new skills and apply them in their teaching. As Samantha, a second grade teacher noted, "I think if you're an educator and it's a school that's sort of a 21st century school, [a Twitter presence is] one of the first things they're going to look at." Likewise, a survey respondent also viewed having a Twitter presence as important for her teaching career: "If I was interviewing at another school, I see how being a Twitter user could be valuable."

**A Twitter presence for administrators.** As a place for teachers to document their learning and develop their digital resumes, the same argument could be made for school leaders such as superintendents and principals to have an established Twitter presence. For example, Jessica, an elementary reading coach, mentioned a scenario in which a teacher friend of hers decided which school she wanted to work at based upon the Twitter presence of the school administrator: "It's a principal she's super thrilled about. And the cool thing about it, he followed her for quite some time as well, so he knows her passions, her heart."

Sauers and Richardson (2015) found evidence of school leaders such as principals using Twitter to transform "how they learn, whom they learn from, and whom they influence" (p. 141). The ways in which school leaders use Twitter may ultimately influence other school leaders and teachers when faced with making decisions about

which schools or districts to apply to work. Teachers, especially those for whom Twitter is part of their routine, may take into consideration the social media presence of school leaders, as well as district policies toward social media. Therefore, if school leaders are interested in recruiting teachers with 21<sup>st</sup> century skills, such as making global connections, collaborating with other classes, and integrating technology effectively, they may want to consider not only having a presence on Twitter, but also consider what type of support they will provide teachers who are inclined to use Twitter to help them learn. As previously discussed, teachers left the teaching profession mainly in response to the lack of supportive administrators (Sutcher et al., 2016). Thus, this is a potential opportunity for administrators to provide that support.

Given that many teachers have found Twitter to be beneficial, convincing school districts that Twitter should be used as a learning tool may present a challenge. One teacher expressed her district's belief about Twitter: "In my district, people don't really see Twitter as a valid resource for teachers. It's a toy for kids to use."

### **Potential Limits to Twitter for Professional Learning**

There are limits to what Twitter can provide in terms of learning for teachers. Given that Twitter is an open forum, figuring out how to standardize its use for professional development would pose several challenges. First and foremost, with respect to online forums, teachers may "disregard the contribution of theoretical considerations to the enacting of their profession" (Ben-Peretz & Kupferberg, 2007, p. 138). In other words, teachers may view Twitter as a resource for quick solutions and ideas to implement in their classroom without knowing whether those ideas are evidence-based educational practice. Already, many teachers tend to perceive academic research as "too idealistic, general, partial, time-limited ... self-interested and irrelevant to their personal concerns, professional experiences and the complex practical realities of classroom life" (Hennessy, 2014, p. xxiii). The downside with Twitter is that it may actually be helping

perpetuate teachers' perceptions that evidence-based research is not needed because educators are promoting quick, practical, and in many cases, anecdotal solutions based on what has worked in their classrooms. Furthermore, Wood's (2007) research on teachers' learning communities found that "teachers shared untested, common-sense analyses of instructional problems that actually cried out for more background study and critical analysis" (p. 728).

Another potential limitation to using Twitter is the isolated decision-making on the part of the teacher. Lawless and Pellegrino (2007) argue that "decisions about when to use technology, what technology to use, and for what purposes cannot be made in isolation of theories and research on learning, instruction, and assessment" (p. 581). Hence, Ben-Peretz and Kupferberg (2007) argue that "teachers need guidance and support to create possible links between these two worlds [educational practice and theory]" (p. 140). Other researchers would agree that there are times such as "encountering a new area of learning" (Merriam & Bierema, 2014, p. 48) in which teachers would need another teacher, or guide, to help them learn (Davis & Krajcik, 2005). Despite having access to a means of learning, as social networks such as Twitter provide, Laurillard (2013) stresses that this is not the same as educational support for teachers in which pedagogy guides students toward what is important for them to know.

Despite the appearance of access to knowledgeable teachers, experts, and others on Twitter, there may be a lot of misinformation available as well. As Merriam and Bierema (2014) point out, even though technology has facilitated access to information, "it can also be overwhelming, inaccurate, and misguided" (p. 191). On the surface, viewing innovative uses of technology in the classroom from other teachers' tweets may appear worthwhile and beneficial to students. However, teachers would need to thoughtfully consider underlying theories of learning in support of that technology use. This would not be an easy task considering the number of challenges teachers encounter on a daily basis. Some teachers may not have time to think critically before adopting new ideas they



learned from Twitter. As this study found, teachers reported relying on Twitter users they deemed to be highly reputable professionals in the field, those who have provided useful information to them in the past, and those who were affiliated with highly reputable users. Thus, teachers have enacted their own system of vetting and curating information, which may or may not reflect other perspectives on effective teaching.

## **Conclusions**

The following conclusions are drawn based on the four findings that emerged from this research study. These conclusions represent what the researcher now holds to be true.

### **Conclusion 1**

*Twitter can now be seen and understood as a source of support and motivation for teachers, and therefore can be viewed as another means of professional development.*

At the beginning of this chapter, a contextual framework for the teaching profession revealed that there are many challenges to being a teacher. This study found that teachers are using Twitter to get support from each other as they face those challenges. While teachers have found support and motivation on Twitter, they have also reported that Twitter is helping them to learn. With professional development, teachers want to learn “specific, concrete and practical ideas that directly relate to the day-to-day operation of their classrooms” (Fullan & Miles, 1992, as cited in Guskey, 2002). Indeed, teachers have said that they are learning new ideas from Twitter that they can apply immediately in their classrooms.

### **Conclusion 2**

*Teachers are learning to use technology in self-directed ways with Twitter.*

With the ubiquitous presence of technology in most schools, knowing how to incorporate it seamlessly into classroom learning is not something all teachers know how

to do, or feel comfortable doing. Hennessy (2014) notes that informal communities that have formed online are places where teachers seek to learn not only what digital tools may be available, but “how to introduce [them] to students and to create differentiated exercises; what teaching style to use; how to manage technology failure” (p. 216). Thus, Twitter is providing the means whereby teachers are being introduced to new ideas, especially with technology, that they are then able to implement in their teaching.

With numerous research studies investigating ways to help teachers learn to integrate technology (Brown & Warschauer, 2006; Darling-Hammond et al., 2005; Mishra & Koehler, 2006; Nadolny, 2011; Pierson & Cozart, 2005), few studies have specifically explored the use of Twitter as a tool for this purpose (Sauers & Richardson, 2015). In this study, teachers reported that they learned technology integration techniques through Twitter; consequently, it is worth considering how Twitter could be used effectively as a means of learning technology integration techniques for other teachers.

### **Conclusion 3**

*Twitter has the capacity to impact teaching methods. In addition, Twitter holds the potential to introduce teachers to new ideas, resources, and opportunities they would not have known about without it.*

With Twitter, teachers have been able to publicize their teaching methods by posting images from the classrooms, videos of their lessons, and links to blog posts detailing some of their lessons. Hennessy (2014) claims that an online learning community:

deconstructs teaching practice, makes it public and critical, including problematizing the learning environment and taking the risks necessary to change.... Teachers are engaging in reflective dialogue that leads to extensive and continuing conversations about curriculum, teaching and pupil development. (p. 217)

Teachers have described changing their teaching practices as a result of participating in online discussions in Twitter. For example, Margot, a second grade teacher and interviewee, explained how she changed her teaching methods:

When I first started teaching, I thought of a traditional way of like ... the kids are going to be sitting at their desks, they're going to be listening to me. And then they will fill out a worksheet, very traditional ... and Twitter really has helped me understand ... I need to be more flexible and the students really should be part of the teaching process too in a more collaborative environment.

Similarly, other teachers also reported adopting practices that give their students more opportunities to collaborate with each other and to connect with authors and experts to expand their learning beyond the classroom.

The exposure to other educational opportunities was another area in which teachers expressed finding value in Twitter. Jessica, an interviewee, remarked that without Twitter, she would have missed some "really great learning opportunities that Twitter has provided." The sharing of ideas, resources, and opportunities has opened the wider world to teachers, which would otherwise have remained unknown to them.

#### **Conclusion 4**

*Teachers need more support from administrators and policymakers if they are to continue to explore the effective use of Twitter.*

Teachers with supportive school leaders and policymakers feel valued. With regard to their online learning with Twitter, participants with supportive administrators felt even more encouraged to continue their learning. As one participant noted why it is important for school leaders to understand what teachers are learning on Twitter:

I just think that until they actually see the benefit of us chatting with other leaders on Saturday, #satchat or #leadupchat or become part of like a book club and like really get the support of other superintendents and principals, I don't think they're going to be able to tell teachers here's where this resource is.

Jessica, an interviewee, summed up what many other teachers also said with regard to Twitter as professional development: “I get to choose and grow in areas that I'm interested in that I know I'm weak in ... that, in and of itself, is so much more valuable than any PD you require me to go to.” With Twitter as a resource for teachers to differentiate their learning, it becomes inherent upon school leaders to adjust their own thinking and follow Jessica’s recommendation when planning in-service professional development days. As Webster-Wright (2009) points out, “Constructive strategies need to be developed to enable change from the current practice of delivering PD to that of supporting authentic professional learning” (p. 727). Instead of requiring all teachers to be physically present in school for professional development days, teachers could have an option to participate in moderated chats on topics related to their needs. Instead of having a single workshop with an expert who may or may not follow up at a later date, teachers could be given time to attend a conference virtually by following tweets with hashtags from the conference. In this way, Twitter could be an online resource that is “an embedded part of teachers’ everyday practice and provide[s] greater opportunities for and from learning communities” (Prestridge, 2017, p. 86).

### **Recommendations**

Teachers reported that there are many different dimensions of Twitter that impact their professional learning and development. This study revealed that teachers have real and present needs that are not being met by traditional professional development opportunities. Therefore, the task of analyzing and synthesizing the findings led to a cohesive portrayal of Twitter’s current role in the professional learning and development of Twitter-using teachers. While many teachers felt Twitter provided them with relevant professional learning experiences that could not be reproduced in traditional forms of professional development, a combination of approaches could arguably satisfy teachers,

as well as those who favor more guided, evidence-based approaches that traditional professional development may provide. As a result of the findings, analysis, and conclusions of this study, the recommendations that follow are for K-12 policymakers, school leaders, and teachers.

### **Recommendations for K-12 Policymakers and School Leaders**

Given the high stakes accountability many schools and districts are faced with, effective professional development is a high priority for teachers. Wood (2007) notes that teachers may be hesitant to adhere to new district policies, since they may have felt “demoralized” by prior change efforts in their schools and districts that did not work (p. 703). The role of professional development should be to enact “pedagogical practice change ostensibly reflecting a deeper change in pedagogical content knowledge” (Lawless & Pellegrino, 2007, p. 597). Getting to this “deeper” change may require adopting many different forms of professional development. Further, as Fullan (2007) remarks, “change will always fail until we find some way of developing infrastructures and processes that engage teachers in developing new knowledge, skills, and understandings” (p. 29). As this study found, teachers are seeking other avenues to support their professional learning, despite the presence or absence of support from their schools or districts. Thus, K-12 policymakers and school leaders are encouraged to adopt the following six recommendations:

1. School leaders should help teachers identify and evaluate information obtained through Twitter that is deemed worthy for implementation into teachers’ practices.
2. Allow teachers to have some input and control regarding their own preferences to learn. Since this study found that teachers consider Twitter to be ongoing professional development, policymakers and school leaders should

acknowledge and support teachers who choose to use Twitter to help them learn.

3. Legitimize the use and support within the institution by communicating the benefits of using Twitter as an informal learning strategy to all teachers.
4. Establish a mentoring program that helps more experienced Twitter-using teachers educate newer teachers to the value of Twitter.
5. At the very minimum, school leaders and policymakers should investigate how teachers are using Twitter by participating in moderated chats geared toward teachers, such as #2ndchat, #tlap (teach like a pirate), or #whatisschool, to learn more about the discussions teachers are having. They should also participate in chats geared toward school leaders, such as #leadupchat, #cpchat (connected principals), #satchat, and #suptchat. At the same time, school leaders should be aware of the practices teachers are adopting and ensure they fit with school policies.
6. Initiate a program of recognition and reward for evidence of teacher learning and the transference of that learning to students. While current teacher contracts and state recertification requirements focus on seat time for evaluating whether teachers received professional development (Darling-Hammond et al., 2017), policymakers could help influence new guidelines that aim for evidence of teachers' learning, including documentation in tweets and teacher learning portfolios.

### **Recommendations for Teachers**

Teachers have been challenged to use technology in ways that build students' higher-order thinking skills. With the trend toward digital learning increasing, many teachers are not receiving the support they need (Merriam & Bierema, 2014). Some teachers have looked for support online and found it through Twitter. Despite some

teachers expressing frustration over the lack of administration support, or the fact that other teachers do not enthusiastically accept Twitter as they do, it may be helpful to keep in mind that there are thousands of teachers and administrators who are participating and supportive. As one interviewee put it, “You know how people say like you can't ever tell another teacher, ‘You must get on Twitter’ . . . . You can lead them there, but if they're not ready, they're not going to use it.” Therefore, the following three recommendations are offered to teachers with the hope that more teachers will have opportunities to experience meaningful learning through Twitter.

1. Teachers should share their experiences and what they have learned from the use of Twitter with their administrators and colleagues. They should make every effort to present at school staff meetings, conferences, and online as a way of publicizing its value.
2. Teachers should regularly assess and monitor information they have adopted from Twitter through a critical lens, and not make any assumptions that it is valuable. Although new ideas, strategies, and resources may appear to hold educational value, it is important for teachers to investigate further whether those ideas are supported by sound research and evidence showing they will help students learn. Likewise, with a large number of teachers reportedly following highly reputable Twitter users, it is important for teachers to determine the credibility of those users before adopting ideas they may promote.
3. Lastly, teachers should support new teachers on Twitter. As this study found, teachers reported feeling supported by educators from the Twitter community. For teachers who are new to using Twitter, current Twitter-using teachers should begin by following them, sharing links, and introducing them to other Twitter users in order to help them get established so they, too, can begin to learn and develop its use.

### **Areas for Future Research**

Future research is needed in three main areas: (a) the quality of information teachers are adopting from Twitter; (b) the interactions between Twitter participants with each other, and with the information gained through Twitter; and (c) the characteristics of teachers and administrators that influence their use of Twitter.

With regard to the quality of the information on Twitter, three key areas warrant critical exploration. First, it is still unknown exactly how teachers decide which information to pursue and adopt in their teaching practices. With teachers reporting that they are using information they have learned from Twitter in their classrooms, it is important to investigate whether or not teachers are being exposed to a wide variety of ideas, as opposed to a narrow segment of ideas they might be choosing because, for instance, they might fit with their own pedagogical beliefs. Second, since teachers believed they were gaining trustworthy information as a result of following highly reputable Twitter users, further research is needed into whether or not they verified the quality of the information, as well as the source of the information. Third, future research should consider how teachers evaluate the incorporation of new ideas, strategies, or digital tools into their classrooms. How are teachers evaluating the impact on their students?

The second area of research that is worth exploring involves the way participants in the Twitter environment interact with each other and with the information they are pursuing or exchanging. Two key areas related to how Twitter users interact could benefit from further study. First, it is important to understand the voices of the so-called highly reputable Twitter users that teachers reported following and adopting information from. This study showed that moderated chats have an impact on teachers and their teaching practices. The role of the leader, or moderator, of a network, including moderated Twitter chats, is an important one, especially for fostering participation (Macià & Garcia, 2017).



Consequently, the quality of moderated chats seems to vary based upon the moderator's experience and how well prepared the moderator is to lead the chat. Thus, future research should investigate the characteristics of successful Twitter chat moderators.

Also, since many teachers reported feeling that Twitter provided them with a safe space to share ideas, a study investigating this concept would be important. How, specifically, do teachers relate to their fellow teachers on this social network? The relationship between teachers' comfort in their workplaces and their use of Twitter may provide more information as to why teachers may be seeking support outside of their schools.

The third area of research recommended for future study involves characteristics of teachers and administrators who use Twitter to support their professional learning. For instance, research into the ways in which administrators have become active on Twitter may yield perspectives that influence other administrators to become active on Twitter. With more administrators utilizing Twitter, and understanding its potential benefits, they may be more likely to support teachers who are already using Twitter and those who have yet to discover it. Alternatively, teachers may be less likely to use Twitter, or use it more cautiously, due to the presence of their administrators, which is another area to explore. Also, this study was limited to teachers who actively participate on Twitter. As a result, there may be teachers who have tried using Twitter, but for whatever reason, they decided not to use it. Therefore, a study focused on these teachers may provide information on ways Twitter may not necessarily be helpful to teachers, or whether those teachers decided they did not want to have an online presence. Finally, in Chapter II, the literature discussed self-directed learning and innovative behavior. In some cases, teachers who participated in this study were aware of their own shortcomings, thus motivating their Twitter use to focus on the areas in which they thought they needed to grow. In other cases, teachers maintained a sense that their professional responsibility is to learn and improve continuously. Future research should attempt to understand why

some teachers might be more likely than others to engage in self-directed learning and adopt innovative behaviors.

### **Summary**

This research study sought to understand how teachers are using Twitter to support their professional learning and development. The findings from this study suggest that teachers are challenging themselves by engaging with other teachers, professionals, experts, and authors through Twitter. It also appears that teachers who are actively participating on Twitter recognize the benefits of continually learning and modifying their teaching practices as a way to provide their students with learning experiences that are representative of today's digital age, which include connecting with others globally. By being a part of Twitter, teachers have access to new learning opportunities at their fingertips, along with constant support, camaraderie, and enthusiasm, to enable them to transform their teaching practices to meet the needs of all learners in this 21<sup>st</sup> century.

As Twitter continues to expand and gain acceptance as a viable professional development vehicle, major questions remain regarding who curates the ideas that become popular, who links the ideas to evidence-based practices, and how to help teachers and administrators use this avenue thoughtfully to become a resource for improving practice in their classrooms and schools.

## REFERENCES

- Abbott, M. L. (2011). *Understanding educational statistics using Microsoft Excel and SPSS (1)*. Somerset, MA: Wiley. Retrieved from <http://www.ebrary.com>
- Abramo, J. M., & Austin, S. C. (2014). The trumpet metaphor: A narrative of a teacher's mid-career pedagogical change from formal to informal learning practices. *Research Studies in Music Education, 36*(1), 57-73.
- American Association of Colleges for Teacher Education (AACTE). (2013). *The changing teacher preparation profession*. Washington, DC: Author.
- Arnold, S., & Moshchenko, M. (2009). Technology input versus input and output: Does it result in learning differences among elementary school students? In I. Gibson, R. Weber, K. McFerrin, R. Carlsen, & D. Willis (Eds.), *Proceedings of SITE 2009—Society for Information Technology & Teacher Education International Conference* (pp. 1698-1704). Charleston, SC: Association for the Advancement of Computing in Education (AACE).
- Bandura, A. (1971). *Social learning theory*. New York, NY: General Learning Press.
- Bebell, D., Russell, M., & O'Dwyer, L. (2004). Measuring teachers' technology uses: Why multiple-measures are more revealing. *Journal of Research on Technology in Education, 37*(1), 45-63.
- Beetham, H. (2013). Designing for active learning in technology-rich contexts. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age: Designing for 21st century learning* (2nd ed., pp. 31-48). New York, NY: Routledge.
- Beetham, H., & Sharpe, R. (Eds.). (2013). *Rethinking pedagogy for a digital age: Designing for 21st century learning* (2nd ed.). New York, NY: Routledge.
- Ben-Peretz, M., & Kupferberg, I. (2007). Does teachers' negotiation of personal cases in an interactive cyber forum contribute to their professional learning? *Teachers and Teaching, 13*(2), 125-143.
- Birman, B., Le Floch, K. C., Klekotka, A., Ludwig, M., Taylor, J., Walters, K., et al. (2007). *State and local implementation of the No Child Left Behind Act: Vol. 2. Teacher quality under NCLB: Interim report*. Washington, DC: U.S. Department of Education; Office of Planning, Evaluation and Policy Development; Policy and Program Studies Service.
- Bloomberg, L. D., & Volpe, M. (2008). *Completing your qualitative dissertation: A roadmap from beginning to end*. Thousand Oaks, CA: Sage.

- Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2), 27-40.
- Bransford, J., Brown, A., & Cocking, R. (Eds.). (2000). *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academy Press.
- Bransford, J., Derry, S., Berliner, D., Hammerness, K., & Beckett, K. L. (2005). Theories of learning and their roles in teaching. In L. Darling-Hammond & J. Bransford (Eds.) *Preparing teachers for a changing world* (pp. 40-87). San Francisco, CA: Jossey-Bass.
- Brause, R. S. (1999). *Writing your doctoral dissertation: Invisible rules for success (1)*. Florence, SC: Routledge. Retrieved from <http://www.ebrary.com>
- Brewer, G. (2015). Introduction to art, games, and student partners. In G. Brewer & R. Hogarth (Eds.), *Creative education, teaching and learning: Creativity, engagement and the student experience* (pp. 193-202). Basingstoke, England: Palgrave Macmillan.
- Broad, M. L. (1997). Overview of transfer of training: From learning to performance. *Performance Improvement Quarterly*, 10(2), 7-21.
- Brookfield, S. D. (2013). *Powerful techniques for teaching adults (1)*. Somerset, MA: Jossey-Bass. Retrieved from <http://www.ebrary.com>
- Brown, D., & Warschauer, M. (2006). From the university to the elementary classroom: Students' experiences in learning to integrate technology in instruction. *Journal of Technology and Teacher Education*, 14(3), 599-621.
- Council for the Accreditation of Educator Preparation (CAEP). *Standard 1: Content and pedagogical knowledge*. Retrieved from: <http://caepnet.org/standards/standard-1/components>
- Carlson, S. (2002, October-December). The missing link in educational technology: Trained teachers. *TechKnowLogia*. Retrieved from [www.TechKnowLogia.org](http://www.TechKnowLogia.org)
- Carpenter, J. P., & Krutka, D. G. (2015). Engagement through microblogging: Educator professional development via Twitter. *Professional Development in Education*, 41(4), 707-728.
- Carter, J. H., & Lochte, H. A. (2016). Teacher blame and corporate gain: edTPA and the takeover of teacher education. In J. H. Carter & H. A. Lochte (Eds.), *Teacher performance assessment and accountability reforms: The impacts of edTPA on teaching and schools* (pp. 7-23). New York, NY: Palgrave Macmillan.
- Clarke-Midura, J., & Dede, C. (2010). Assessment, technology, and change. *Journal of Research on Technology in Education*, 42(3), 309-328.

- Collins, A., & Halverson, R. (2010). The second educational revolution: Rethinking education in the age of technology. *Journal of Computer Assisted Learning*, 26, 18-27.
- Corbeil, J. R., & Corbeil, M. E. (2011). The birth of a social networking phenomenon. In C. Wankel (Ed.), *Cutting-edge technologies in higher education, 1: Educating educators with social media* (pp. 13-22). Bradford, England: Emerald Group. Retrieved from <http://www.ebrary.com>
- Cordova, D. I., & Lepper, M. R. (1996). Intrinsic motivation and the process of learning: Beneficial effects of contextualization, personalization and choice. *Journal of Educational Psychology*, 88, 715-730.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, CA: Sage.
- Cuban, L. (2008). The perennial reform: Fixing school time. *Phi Delta Kappan*. 240-250.
- Cuban, L. (2013). Why so many structural changes in schools and so little reform in teaching practice? *Journal of Educational Administration*, 51(2), 109-125.
- Culp, K. M., Honey, M., & Mandinach, E. (2005). A retrospective on twenty years of education technology policy. *Journal of Computing Research*, 32(3), 279-307.
- Darling-Hammond, L., Banks, J., Zumwalt, K., Gomez, L., Sherin, M. G., Griesdorn, J., & Finn, L. (2005). Educational goals and purposes: Developing a curricular vision for teaching. In L. Darling-Hammond & J. Bransford (Eds.), *Preparing teachers for a changing world* (pp. 169-200). San Francisco, CA: Jossey-Bass.
- Darling-Hammond, L., Hyster, M. E., Gardner, M. (2017). *Effective teacher professional development*. Palo Alto, CA: Learning Policy Institute.
- Darling-Hammond, L. Wei, R. C., Andree, A., Richardson, N., & Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the United States and abroad*. Stanford, CA: National Staff Development Council, Stanford University. Retrieved from <https://learningforward.org/docs/pdf/nsdcstudy2009.pdf>
- Davis, K. (2015). Teachers' perceptions of Twitter for professional development. *Disability and Rehabilitation*. 37(17), 1551-1558.
- Day, M., & Harbour, C. (2013). The philosopher and the lecturer: John Dewey, Everett Dean Martin, and reflective thinking. *Education and Culture*, 29(1), 105-124.
- Dede, C. (2008). Theoretical perspectives influencing the use of information technology in teaching and learning. In J. Voogt & G. Knezek (Eds.), *International handbook of information technology in primary and secondary education* (pp. 43-62). New York, NY: Springer.

- DeMonte, J. (2013, July). *High quality professional development for teachers*. Washington, DC: Center for American Progress.
- Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher*, 38(3), 181-199.
- Edwards, G., & Mosley, B. F. (2011). Technology integration can be delicious: Social bookmarking as a technology integration tool. In C. Wankel (Ed.), *Cutting-edge technologies in higher education, 1: Educating educators with social media* (pp. 207-225). Bradford, England: Emerald Group. Retrieved from <http://www.ebrary.com>
- Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*, 53(4), 25-39.
- Ertmer, P. A., & Newby, T. J. (1993): Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Quarterly*, 6(4), 50-72.
- Ertmer, P. A., Ottenbreit-Leftwich, A., & York, C. S. (2007). Exemplary technology-using teachers: Perceptions of factors influencing success. *Journal of Computing in Teacher Education*, 23(2), 55-61.
- Every Student Succeeds Act (ESSA) of 2015, Pub. L. No. 114-95 § 114 Stat. 1177 (2015-2016).
- Fabrigar, L. R., & Wegener, D. T. (2011). *Understanding statistics: Exploratory factor analysis*. Cary, NC: Oxford University Press. Retrieved from <http://www.ebrary.com>
- Farmer, L. (2008). *Teen girls and technology*. New York, NY: Teachers College Press.
- Fleming, L., Motamedi, V., & May, L. (2007). Predicting preservice teacher competence in computer technology: Modeling and application in training environments. *Journal of Technology and Teacher Education*, 15(2), 207-231.
- Foley, J. M., & Kaiser, L. M. R. (2013). Learning transfer and its intentionality in adult and continuing education. In L. M. R. Kaiser, K. Kaminski, & J. M. Foley (Eds.), *J-B ACE Single Issue Adult & Continuing Education: Learning transfer in adult education* (New Directions for Adult and Continuing Education) (pp. 5-15). New York, NY: Jossey-Bass.

- Forte, A., Humphreys, M., & Park, T. (2012) Grassroots professional development: How teachers use Twitter. *Proceedings of the Sixth International AAAI (Association for the Advancement of Artificial Intelligence) Conference on Weblogs and Social Media, June 4–7 2012*, Trinity College, Dublin, Ireland. Association for the Advancement of Artificial Intelligence ([www.aaai.org](http://www.aaai.org)).
- Franklin, C. (2007). Factors that influence elementary teachers use of computers. *Journal of Technology and Teacher Education*, 15(2), 267-293.
- Fullan, M. (2007). *The new meaning of educational change*. New York, NY: Teachers College Press.
- Gaur, A. S., & Gaur, S. S. (2009). *Response books: Statistical methods for practice and research: A guide to data analysis using SPSS (2)*. New Delhi, India: Sage.
- Gaytan, J. A., & McEwen, B. C. (2006). Instructional technology professional development evaluation: Developing a high quality model. *Delta Pi Epsilon Journal*, 52(2), 77-94.
- Gray, L., Thomas, N., & Lewis, L. (2010a). *Teachers' use of educational technology in U.S. public schools: 2009* (NCES 2010-040). Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.
- Gray, L., Thomas, N., & Lewis, L. (2010b). *Educational technology in U.S. public schools: Fall 2008* (NCES 2010-034). Washington, DC: U.S. Department of Education, National Center for Education Statistics; U.S. Government Printing Office.
- Greenhalgh, S. P., Rosenberg, J. M., & Wolf, L. G. (2016). For all intents and purposes: Twitter as a foundational technology for teachers. *E-Learning and Digital Media*, 13(1-2), 81-98.
- Guskey, T. R. (2000). *Evaluating professional development*. Thousand Oaks, CA: Corwin Press.
- Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching*, 8(3), 381-391.
- Guskey, T. R. (2003). *What makes professional development effective?* Paper presented at the American Educational Research Association.
- Guskey, T. R., & Yoon, K. S. (2009). What works in professional development? *Phi Delta Kappan*, 90(7), 495-500.
- Hancké, B. (2009). *Intelligent research design*. New York, NY: Oxford University Press.

- Hannafin, R. D., & Foshay, W. R. (2006). Computer-based instruction's (CBI) rediscovered role in K-12: An evaluation case study of one high school's use of CBI to improve pass rates on high stakes tests. *Educational Technology Research and Development*, 56, 147-160.
- Hennessy, S. (2014). *Bridging between research and practice: Supporting professional development through collaborative studies of classroom teaching with technology*. Retrieved from <http://ebookcentral.proquest.com>
- Henry, G. (2011). *Malcolm Shepherd Knowles*. Hauppauge, NY: Nova.
- Herrington, J., & Kervin, L. (2007). Authentic learning supported by technology: 10 suggestions and cases of integration in classrooms. *Educational Media International*, 44(3), 219-236.
- Hesse-Biber, S. N. (2010). *Mixed methods research: Merging theory with practice*. New York, NY: Guilford Press.
- Hitlin, P., & Rainie, L. (2005). *Teens, technology, and school* [Data memo]. Washington, DC: Pew Internet and American Life Project.
- Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review*, 16(3), 235-266.
- Hollstein, B. (2014). Mixed methods social networks research. In S. Domínguez & B. Hollstein (Eds.), *Mixed methods social networks research: Design and applications* (pp. 3-34). New York, NY: Cambridge University Press.
- Hur, J. W., & Brush, T. A. (2009). Teacher participation in online communities: Why do teachers want to participate in self-generated online communities of K-12 teachers? *Journal of Research on Technology in Education*, 41(3), 279-303.
- Iarossi, G. (2006). *Power of survey design: A user's guide for managing surveys, interpreting results, and influencing respondents*. Herndon, VA: World Bank.
- Internet Live Stats. (n.d.). Retrieved from: <http://www.internetlivestats.com/twitter-statistics/>
- ISTE. *The ISTE National Educational Technology Standards (NETS-T) and performance indicators for teachers*. Retrieved December 10, 2015.
- Jenkins, H. (2009). *Confronting the challenges of participatory culture: Media education for the 21<sup>st</sup> century*. Cambridge, MA: MIT Press.
- John, P. (2005). The sacred and the profane: Subject sub-culture, pedagogical practice and teachers' perceptions of the classroom uses of ICT. *Educational Review*, 57(4), 471-490.



- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33(7), 14-26.
- Jones, W., & Dexter, S. (2014). How teachers learn: The roles of formal, informal, and independent learning. *Educational Technology Research and Development*, 62(3), 367-384.
- Keefe, J. W. (2007). What is personalization? *Phi Delta Kappan*, 89(3), 217-223.
- Kennedy, M. M. (2016). How does professional development improve teaching? *Review of Educational Research*, 86(4), 945-980.
- Kim, C., Kim, M. K., Lee, C., Spector, J. M., & DeMeester, K. (2013). Teacher beliefs and technology integration. *Teaching and Teacher Education*, 29, 76-85.
- King, F. J., Goodson, L., & Rohani, F. (1998). *Higher order thinking skills: Definition, teaching strategies, and assessment*. Center for Advancement of Learning and Assessment. Available at: [www.cala.fsu.edu/files/higher\\_order\\_thinking\\_skills.pdf](http://www.cala.fsu.edu/files/higher_order_thinking_skills.pdf)
- Kmitta, D., & Davis, J. (2004). Why PT3? An analysis of the impact of educational technology. *Contemporary Issues in Technology and Teacher Education*, 4(3), 323-344.
- Koehler, M. J., & Mishra, P. (2005). Teachers learning technology by design. *Journal of Computing in Teacher Education*, 21(3), 94-102.
- Kolb, D. A. (1984). *Experiential learning: Experiences as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall.
- Korthagen, F. A. J., Kim, Y. M., & Greene, W. L. (Eds.). (2012). *Teaching and learning from within: A core reflection approach to quality and inspiration in education*. Florence, England: Routledge.
- Kyndt, E., Gijbels, D., Grosemans, I., & Donche, V. (2016). Teachers' everyday professional development: Mapping informal learning activities, antecedents, and learning outcomes. *Review of Educational Research*, 86(4), 1111-1150.
- Laurillard, D. (2013). Forward. In H. Beetham & R. Sharpe, R. (Eds.), *Rethinking pedagogy for a digital age* (pp. 25-30). Florence, England: Routledge.
- Lawless, K. A. & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of Educational Research*, 77(4), 575-614.
- Lee, J., & Spires, H. (2009). What students think about technology and academic engagement in school: Implications for middle grades teaching and learning. *AACE Journal*, 17(2), 61-81.

- Lei, J. (2010). Quantity versus quality: A new approach to examine the relationship between technology use and student outcomes. *British Journal of Educational Technology*, 41(3), 455-472.
- Levenberg, A., & Caspi, A. (2010). Comparing perceived formal and informal learning in face-to-face versus online environments. *Interdisciplinary Journal of E-Learning and Learning Objects*, 6, 323-333.
- Levin, D., & Arafah, S. (2002). *The digital disconnect: The widening gap between Internet-savvy students and their schools* (The Pew Internet and American Life Project). Washington, DC: Pew Research Center. Available at: <http://www.pewinternet.org/Reports/2002/The-Digital-Disconnect-The-widening-gap-between-Internetsavvy-students-and-their-schools.aspx>
- Liu, Y., & Szabo, Z. (2009). Teachers' attitudes toward technology integration in schools: A four-year study. *Teachers and Teaching: Theory and Practice*, 15(1), 5-23.
- Macià, M., & Garcia, I. (2017). Properties of teacher networks in Twitter: Are they related to community-based peer production? *International Review of Research in Open and Distributed Learning*, 18(1), 110-141.
- Maddux, C., & Cummings, R. (2004). Fad, fashion, and the weak role of theory and research in information technology in education. *Journal of Technology and Teacher Education*, 12(4), 511-533.
- Magliaro, S. G., Lockee, B. B., & Burton, J. K. (2005). Direct instruction revisited: A key model for instructional technology. *Educational Technology Research and Development*, 53(4), 41-55.
- Malcolm, J., Hodkinson, P., & Colley, H. (2003). The interrelationships between informal and formal learning. *Journal of Workplace Learning*, 15(7/8), 313-318.
- Marcinkiewicz, H. R. (1993). Computers and teachers: Factors influencing computer use in the classroom. *Journal of Research on Computing in Education*, 26(2), 220.
- Marsick, V. (2009). Toward a unifying framework to support informal learning theory, research and practice. *Journal of Workplace Learning*, 21(4), 265-275.
- Masterman, L. (2013). The challenge of teachers' design practice. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age* (pp. 64-77). Florence, England: Routledge.
- Mayes, T. & de Freitas, S. (2013). Technology-enhanced learning: The role of theory. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital age* (pp. 67-93). Florence, England: Routledge.

- McCombs, B. L., Daniels, D. H., & Perry, K. E. (2008). Children's and teachers' perceptions of learner-centered practices, and student motivation: Implications for early schooling. *Elementary School Journal*, 109(1), 16-35.
- McDonald, R., & Danino, N. (2015). Social media in education and the community. In G. Brewer & R. Hogarth (Eds.), *Creative education, teaching and learning: Creativity, engagement and the student experience* (pp. 193-202). Basingstoke, England: Palgrave Macmillan.
- McMillan, J. H. (2008). *Educational research: Fundamentals for the consumer*. Boston, MA: Pearson.
- Means, B. (2010). Technology and education change: Focus on student learning. *Journal of Research on Technology in Education*, 42(3), 285-307.
- Means, B., Haertel, G. D., & Moses, L. (2003). Evaluating the effects of learning technologies. In G. Haertel & B. Means (Eds.), *Evaluating educational technology: Effective research designs for improving learning* (pp. 1-13). New York, NY: Teachers College Press.
- Merriam, S. B. (1998). *Qualitative research and case study applications in education*. San Francisco, CA: Wiley.
- Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation* (3rd ed.). San Francisco, CA: Jossey-Bass.
- Merriam, S. B., & Bierema, L. L. (2014). *Adult learning: Linking theory and practice*. San Francisco, CA: Jossey-Bass. Retrieved from <http://ebookcentral.proquest.com>
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). San Francisco, CA: Wiley.
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook*. Thousand Oaks, CA: Sage.
- Miranda, H., & Russell, M. (2011). Predictors of teacher-directed student use of technology in elementary classrooms: A multilevel SEM approach using data from the USEIT study. *Journal of Research on Technology in Education*, 43(4), 301-323.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017-1054.
- Mueller, J., Wood, E., Willoughby, T., Ross, C., & Specht, J. (2008). Identifying discriminating variables between teachers who fully integrate computers and teachers with limited integration. *Computers and Education*, 51, 1523-1537.

- Mumtaz, S. (2000). Factors affecting teachers' use of information and communication technology: A review of the literature. *Journal of Information Technology for Teacher Education*, 9(3), 319-342.
- Nadolny, L. (2011). Connecting future teachers with the teachers of today. In C. Wankel (Ed.), *Cutting-edge technologies in higher education, 1: Educating educators with social media* (pp. 173-188). Bradford, England: Emerald Group. Retrieved from <http://www.ebrary.com>
- Neuman, D. (2014). Qualitative research in educational communications and technology: A brief introduction to principles and procedures. *Journal of Computing in Higher Education*, 26, 69-86.
- No Child Left Behind Act of 2001, 20 U.S.C. § 6319 (2001).
- Novak, G. M., & Beatty, B. J. (2016). Designing Just-in-Time instruction. In C. M. Reigeluth, B. J. Beatty, & R. D. Myers (Eds.), *Instructional-design theories and models, Vol. 4: The learner-centered paradigm of education* (pp. 414-448). Florence, SC: Routledge. Retrieved from <http://www.ebrary.com>
- Onwuegbuzie, A. J., & Collins, K. M. (2007). A typology of mixed methods sampling designs in social science research. *The Qualitative Report*, 12(2), 281-316. Retrieved from <http://nsuworks.nova.edu/tqr/vol12/iss2/9>
- Onwuegbuzie, A. J., & Teddlie, C. (2003). A framework for analyzing data. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 351-384). Thousand Oaks, CA: Sage.
- Opfer, V. D., & Pedder, D. (2011). Conceptualizing teacher professional learning. *Review of Educational Research*, 81(3), 376-407.
- Ottenbreit-Leftwich, A. T, Glazewski, K. D, Newby, T. J, & Ertmer, P. A. (2010). Teacher value beliefs associated with using technology: Addressing professional and student needs. *Computers and Education*, 55, 1321-1335.
- Palak, D. & Walls, R. (2009). Teachers' beliefs and technology practices: A mixed-methods approach. *Journal of Research on Technology in Education*, 41(4), 417-441.
- Penuel, W. R., Fishman, B. J., Yamaguchi, R., & Gallagher, L. P. (2007). What makes professional development effective? Strategies that foster curriculum implementation. *American Educational Research Journal*, 44(4), 921-958.
- Penuel, W. R., Riel, M., Frank, K. A., & Krause, A. (2009). Analyzing teachers' professional interactions in a school as social capital: A social network approach. *Teachers College Record*, 111(1), 124-163.

- Pierson, M. E., & Cozart, A. (2005). Case studies of future teachers: Learning to teach with technology. *Journal of Computing in Teacher Education*, 21(2), 59-63.
- Plair, S. K. (2008). Revamping professional development for technology integration and fluency. *The Clearing House*, 82(2), 70-74.
- Polly, D. (2011). Developing students' higher-order thinking skills (HOTS) through technology-rich tasks: The influence of technological pedagogical and content knowledge (TPACK). *Educational Technology*, 20-26.
- Popham, W. J. (2001). Teaching to the test? *Educational Leadership*, 58(6), 16-20.
- Prensky, M. (2006). Listen to the natives. *Educational Leadership*, 63(4), 8-13.
- Prestridge, S. (2017). Conceptualising self-generating online teacher professional development. *Technology, Pedagogy and Education*, 26(1), 85-104.
- Project Tomorrow. (2017, June). *Trends in digital learning: Building teachers' capacity and competency to create new learning experiences for students*. Irvine, CA. Retrieved from <http://www.tomorrow.org/speakup/speak-up-2016-trends-digital-learning-june-2017.html>
- Punch, K. F. (2003). *Essential resource books for social research: Survey research: The basics*. London, England: Sage. Retrieved from <http://www.ebrary.com>
- Putnam, R., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher*, 29(1), 4-15.
- Reese, W. J. (2013). In search of American progressives and teachers. *History of Education*, 42(3), 320-334.
- Reiser, R. A., & Dempsey, J. V. (Eds.). (2011). *Trends and issues in instructional design and technology* (3rd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- Resnick, L. (2010). Nested learning systems for the thinking curriculum. *Educational Researcher*, 39(3), 183-197.
- Ridenour, C. S., & Newman, I. (2008). *Mixed methods research: Exploring the interactive continuum*. Carbondale: Southern Illinois University Press.
- Riel, M., & Becker, H. (2000). Characteristics of teacher leaders for information and communication technology. In J. Voogt & G. Knezek (Eds.), *International handbook of information technology in primary and secondary education* (pp. 397-417). New York, NY: Springer.
- Roller, M. R., & Lavrakas, P. J. (2015). *Applied qualitative research design: A total quality framework approach*. New York, NY: Guilford Press. Retrieved from <http://www.ebrary.com>

- Rossmann, G. B., & Wilson, B. L. (1985). Numbers and words: Combining quantitative and qualitative methods in a single large-scale evaluation study. *Evaluation Review*, 9(5), 627-643.
- Rotermund, S., DeRoche, J. & Ottem, R. (2017). *Teacher professional development by selected teacher and school characteristics: 2011-12* (Stats in Brief. NCES 2017-200). National Center for Education Statistics.
- Sauers, N. J., & Richardson, J. W. (2015). Leading by following: An analysis of how K-12 school leaders use Twitter. *National Association of Secondary School Principals Bulletin*, 99(2), 127-146.
- Scardamalia, M. (2001). Getting real about 21st century education. *Journal of Educational Change*, 2, 171-176.
- Scardamalia, M., & Bereiter, C. (1999). Schools as knowledge building organizations. In D. Keating & C. Hertzman (Eds.), *Today's children, tomorrow's society: The developmental health and wealth of nations* (pp. 274-289). New York, NY: Guilford Press.
- Scardamalia, M., & Bereiter, C. (2006). Knowledge building: Theory, pedagogy and technology. In R. K. Sawyer (Ed.), *Cambridge handbook of the learning sciences, part 1* (pp. 97-118). New York, NY: Cambridge University Press.
- Schifter, C. C., & Stewart, C. M. (2010). Technologies in the classroom come to age after century of growth. In C. M. Stewart, C. C. Schifter, & M. E. M. Selverian (Eds.), *Routledge Research in Education: Teaching and learning with technology: Beyond constructivism (1)*. Florence, SC: Routledge.
- Schroeder, A., Minocha, S., & Schneider, C. (2010). The strengths, weaknesses, opportunities and threats of using social software in higher and further education teaching and learning. *Journal of Computer Assisted Learning*, 26, 159-174.
- Schrum, L., Galizio, L. M., & Ledesma, P. (2011). Educational leadership and technology integration: An investigation into preparation, experiences, and roles. *Journal of School Leadership*, 21(2), 241-261.
- Senge, P. M. (2006). *The fifth discipline: The art & practice of the learning organization* (rev. ed.). New York, NY: Doubleday.
- Sergiovanni, T. (2001). *The principalship: A reflective practice perspective*. Boston, MA: Allyn and Bacon.
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.

- Singer, N. (2017, September 2). Silicon Valley courts brand-name teachers, raising ethics issues. *New York Times*. Retrieved from: <https://www.nytimes.com/2017/09/02/technology/silicon-valley-teachers-tech.html>
- Slavin, R. (2007). *Educational research in an age of accountability*. Boston, MA: Pearson.
- Sloep, P. B. (2013). Networked professional learning. In A. Littlejohn & A. Margaryan (Eds.), *Technology-enhanced professional learning* (pp. 97-108). New York, NY: Routledge.
- Solmon, L. C., & Chirra, K. R. (2006). *The last silver bullet? Technology for America's public schools*. Greenwich, CT: Information Age.
- Solomon, G., Allen, N. J., & Resta, P. (Eds.). (2003). *Toward digital equity: Bridging the divide in education*. Boston, MA: Allyn and Bacon.
- Spillane, J. P., Halverson, R., & Diamond, J. B. (2001). Investigating school leadership practice: A distributed perspective. *Educational Researcher*, 30(3), 23-28.
- Spillane, J. P., & Seashore Louis, K. (2002). School improvement processes and practices: Professional learning for building instructional capacity. *Yearbook of the National Society for the Study of Education*, 101(1), 83-104.
- Stobaugh, R. R., & Tassell, J. L. (2011). Analyzing the degree of technology use occurring in pre-service teacher education. *Educational Assessment, Evaluation and Accountability*, 23, 143-157.
- Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Palo Alto, CA: Learning Policy Institute.
- Tadros, M. (2011). A social media approach to higher education. In C. Wankel (Ed.), *Cutting-edge technologies in higher education, 1: Educating educators with social media* (pp. 83-105). Bradford, England: Emerald Group. Retrieved from <http://www.ebrary.com>
- Taylor, S. J., Bogdan, R., & DeVault, M. L. (2015). *Introduction to qualitative research methods*. Hoboken, NJ: Wiley.
- Thissen-Roe, A., Hunt, E. & Minstrell, J. (2004). The DIAGNOSER project: Combining assessment and learning. *Behavior Research Methods*, 36(2), 234-240.
- Thurlings, M., Evers, A. T., & Vermeulen, M. (2015). Toward a model of explaining teachers' innovative behavior: A literature review. *Review of Educational Research*, 85(3), 430-471.

- The New Teacher Project (TNTP). (2015). *The mirage: Confronting the hard truth about our quest for teacher development*. Washington, DC: Author.
- Tondeur, J., Coopert, M., & Newhouse, C.P. (2010). From ICT coordination to ICT integration: A longitudinal case study. *Journal of Computer Assisted Learning*, 26(4), 296-306.
- U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP). (2014). *Technology and engineering literacy*. Washington, DC: Author.
- U.S. Department of Education, Office of Educational Technology. (2010). *Transforming American education: Learning powered by technology*. Washington, DC: Author.
- U.S. Department of Education, Office of Educational Technology. (2016). *Future ready learning: Reimagining the role of technology in education*. Washington, DC: Author.
- Visser, R. D., Evering, L. C., & Barrett, D. E. (2014). #Twitterforteachers: The implications of Twitter as a self-directed professional development tool. *Journal of Research on Technology in Education*, 46(4), 396-413.
- Wagner, T. (2008). *The global achievement gap*. New York, NY: Basic Books.
- Warschauer, M., & Matuchniak, T. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Review of Research in Education*, 34(1), 179-225.
- Webster-Wright, A. (2009). Reframing professional development through understanding authentic professional learning. *Review of Educational Research*, 79(2), 702-739.
- Wei, R. C., Darling-Hammond, L., & Adamson, F. (2010). *Professional development in the United States: Trends and challenges*. Dallas, TX. National Staff Development Council.
- Wenger, E. (2011). *Communities of practice: A brief introduction*. Washington, DC: National Science Foundation. Retrieved from: <https://scholarsbank.uoregon.edu/xmlui/handle/1794/11736?show=full>
- Wesely, P. M. (2013). Investigating the community of practice of world language educators on Twitter. *Journal of Teacher Education*, 64(4), 305-318.
- Wiggins, G., & McTighe, J. (2005). *Understanding by design* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.
- Wood, D. (2007). Teachers' learning communities: Catalyst for change or a new infrastructure for the status quo? *Teachers College Record*, 109(3), 699-739.



- Wright, N. (2010). Twittering in teacher education: Reflecting on practicum experiences. *Open Learning, 25*, 259-265.
- Wright, V. H., & Wilson, E. K. (2006). From preservice to inservice teaching: A study of technology integration. *Journal of Computing in Teacher Education, 22*(2), 49-55.
- Yoon, K. S., Duncan, T., Lee, S. W.-Y., Scarloss, B., & Shapley, K. (2007). *Reviewing the evidence on how teacher professional development affects student achievement* (Issues & Answers Report, REL 2007–No. 033). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southwest. Retrieved from <http://ies.ed.gov/ncee/edlabs>
- Zepeda, S. J. (2014). *Job-embedded professional development: Support, collaboration, and learning in schools*. Florence, SC: Routledge.
- Zohrabi, M. (2013). Mixed method research: Instruments, validity, reliability and reporting findings. *Theory and Practice in Language Studies, 3*(2), 254-262.

## Appendix A

## Survey: Twitter as a Professional Learning Tool for Teachers

**Q51 Hello! Thanks for clicking the link to this survey. Your time and responses are greatly appreciated. It should take about 10 minutes. Thank you so much! Talia**

***PS. Enter your email address at the end if you would like to enter a drawing for a \$50 Amazon gift card.***

**Type of school**

Q26 In what type of school do you currently teach?

- Public (1)
  - Private (2)
  - Charter (3)
  - Online (4)
  - Other (please specify) (5)
- 

Q37 In which country do you currently reside?

Q38 In which state do you currently reside?

Q45 Which of the following best describes the number of students in the school in which you work?

- 0-100 (1)
- 101-500 (2)
- 501-1000 (3)
- 1001-1500 (4)
- 1501-2000 (5)
- 2001-2500 (6)
- Greater than 2500 (7)

Q31 What percent of your students receive free or reduced lunch?

- 0 (1)
- 1% - 10% (2)
- 11% - 20% (3)
- 21% - 30% (4)
- 31% - 40% (5)
- 41% - 50% (6)
- 51% - 60% (7)
- 61% -70% (8)
- 71% - 80% (9)
- 81% -90% (10)
- 90%-100% (11)

Q32 How many years have you been teaching at this school?

- First year (1)
- 1 - 2 years (2)
- 3 - 5 years (3)
- 6 -10 years (4)
- 11 -15 years (5)
- 16 -20 years (6)
- 21 -25 years (7)
- More than 25 years (8)

Q34 Please indicate your highest degree earned.

- Bachelors (1)
- Masters (2)
- PhD. (3)
- Doctoral (4)
- Other (5) \_\_\_\_\_

Q35 What grade level do you currently teach? (Please select more than one if you work with multiple grades).

- Kindergarten (1)
- First Grade (2)
- Second Grade (3)
- Third Grade (4)
- Fourth Grade (5)
- Fifth Grade (6)
- Other (please specify) (7)  
\_\_\_\_\_

Q36 Of the following subjects, which one are you most comfortable teaching?

- Math (1)
- Reading (2)
- Writing (3)
- Science (4)
- Social Studies (5)

- Art (6)
  - Music (7)
  - Physical Education (8)
  - Technology (9)
  - Drama (10)
  - World Languages (11)
  - Library/Research skills (12)
  - Other (please specify) (13)
- 

- ESL (14)

Q46 Of the following subjects, which one are you least comfortable teaching?

- Math (1)
- Reading (2)
- Writing (3)
- Science (4)
- Social Studies (5)
- Art (6)
- Music (7)
- Physical Education (8)
- Technology (9)
- Drama (10)
- World Languages (11)

Library/Research skills (12)

Other (please specify) (13)

Q37 Is high-speed Internet accessible at your school?

Yes (1)

No (2)

I do not know. (3)

*Display This Question:*

*If Is high-speed Internet accessible at your school? = No*

Q38 Please give an explanation as to why there may not be high-speed Internet at your school.

Q49 In your opinion, what are key components of professional development?

Q39 How long have you been an active Twitter user?

- Less than 6 months (1)
- 6 months to 1 year (2)
- 1-2 years (3)
- More than 2 years (4)

Q42 What best describes how frequently you use Twitter?

- Daily (1)
- 2-3 times per week (2)
- Once per week (3)
- 2-3 times per month (4)
- Once every 2-3 months (5)
- Once every 6 Months (6)
- Once a year (7)

## Q6 To what extent do you use Twitter to do the following:

	Never (1)	A few times per year (2)	A few times per month (3)	A few times per week (4)	Everyday (5)
Participate in moderated chats with other teachers (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Connect with experts in the field of education (i.e., policy experts, professors) (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Learn about subjects I am less comfortable teaching (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reflect on my own teaching practices (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask for suggestions for classroom strategies (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Follow links to articles about education (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engage with others who challenge my thinking (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use Twitter for personal purposes (i.e. hobbies) (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engage my students in collaborative experiences with other students (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support teachers who are new to Twitter (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Connect with the same teacher on more than one occasion (13)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Search for higher-order thinking activities (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Allow students to post classroom updates (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Q48 To what extent has Twitter helped you do the following in your teaching practice:

	Not at all (1)	Minimally (2)	Some (3)	Quite a bit (4)	Extensively (5)
Design student-centered instruction (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Create authentic learning opportunities (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Engage students in critical thinking tasks (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incorporate technology into curricular objectives (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provide collaborative opportunities for students in the classroom (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enhance your reputation as an educator (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Get motivated to teach lessons (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Expose students to other cultures (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gain confidence in my own teaching abilities (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q48 You are doing a great job! Please keep going with the survey. Your answers are very important!

Q7 How do you decide when you need to learn something new to bring to your teaching practice?

Q8 When you want to learn something new related to your teaching what do you do?

Q9 If you answered that you use a social networking tool such as Twitter, in what way does it help you to learn?

Q11 Have you ever participated in a moderated Twitter chat? (ie., #4thchat, #edchat, #satchat)

- Yes (1)
- No (2)
- I would like to participate in the future. (3)

*Display This Question:*

*If Have you ever participated in a moderated Twitter chat? (ie., #4thchat, #edchat, #satchat) = Yes*

Q12 Please describe your experience as a result of your participation in a moderated Twitter chat.

Q13 If you learned new knowledge or skills from using Twitter, how did you apply your new knowledge and skills to your own teaching practice?

Q14 Do the administrators in your school or district encourage your online learning?

- Yes (1)
- No (2)
- They are not aware of my online learning (3)

*Display This Question:*

*If Do the administrators in your school or district encourage your online learning? = Yes*

Q15 Please describe the ways in which administrators encourage your online learning.

*Display This Question:*

*If Do the administrators in your school or district encourage your online learning? = No*

Q47 In what ways do administrators discourage your online learning?

Q16 Compared with other types of professional learning opportunities that you may have had, what does Twitter provide you with that those did not?

Q17 When using Twitter, how would you generalize about the information that you decide to pursue? (i.e., Do you click links to certain subjects? Do you follow links from users who are highly reputable?)

Q13 Have you engaged a Twitter interaction that resulted in a meaningful experience?

- Yes (1)
- No (2)

*Display This Question:*

*If Have you engaged a Twitter interaction that resulted in a meaningful experience? = Yes*

Q14 Please describe the meaningful experience as a result of your Twitter interaction.

Q15 Have you engaged in a Twitter exchange that was unproductive?

- Yes (1)
- No (2)

*Display This Question:*

*If Have you engaged in a Twitter exchange that was unproductive? = Yes*

Q16 Please describe how the Twitter exchange was unproductive.

Q19 Have you implemented new teaching methods, ideas or activities that you learned from Twitter in your teaching practice?

- Yes (1)
- No (2)
- I plan to do so in the future. (3)

*Display This Question:*

*If Have you implemented new teaching methods, ideas or activities that you learned from Twitter in y... = Yes*

Q20 How did your students respond to the new teaching methods, ideas or activities that you implemented in your teaching?

Q21 Do you share your students' work via Twitter?

- Yes (1)
- No (2)
- I plan to do so in the future. (3)

*Display This Question:*

*If Do you share your students' work via Twitter? = Yes*

Q22 How does sharing your students' work affect their performance or achievement?

Q23 Do you feel that being an active Twitter user enhances your reputation as a teacher? Please explain.

Q25 Do you feel your classroom teaching has changed as a result of incorporating ideas you have learned from Twitter?

- Yes (1)
- No (2)
- Not sure (3)

*Display This Question:*

*If Do you feel your classroom teaching has changed as a result of incorporating ideas you have learn... = Yes*

Q26 Please give an example of how your teaching has changed as a result of your Twitter use.

Q40 Learning more about how teachers are using Twitter for learning is such an important topic in today's digital world. If you would be willing to give 15 minutes of your time in a follow-up interview via Skype, Google Hangouts or Facetime, I would greatly appreciate it.

Please remember that all information will remain strictly confidential. Is it okay for me to contact you by email to set up an interview? Thank you so much for your time.

- Yes (1)
- No (2)

*Display This Question:*

*If Learning more about how teachers are using Twitter for learning is such an important topic in tod... = Yes*

Q41 Please enter your email if you agree to be contacted for a follow-up interview:

Q50 Please enter your email address if you would like to enter a drawing to win a \$50 Amazon gift card.

## Appendix B

### Interview Questions

#### **RQ1. How are teachers using Twitter for their professional learning?**

- A lot of people have reported changes in their teaching practices. Is this true for you? If so, what is it that you are doing differently now?
- Can you describe some of your most memorable interactions you have had with others on Twitter?

#### **RQ2. What do teachers report learning from their use of Twitter?**

- Many people reported their thinking is challenged. Is this true for you? If so, what does that mean to you?

#### **RQ3. What do teachers say they do with the information they have learned from using Twitter?**

- A large number of teachers reported that Twitter motivates them to teach lessons. Would you say this is true for you? What is it about Twitter that is motivating?

#### **RQ4. What support do teachers have when they want to implement what they have learned from Twitter?**

- A large number of teachers reported that they had admins who supported their online learning. Is that true for you? In what ways were admins most supportive?
- Do you admins support other teacher-led activities? If you wanted to try something new, would they be supportive?
- If admin is not supportive, what is preventing them from showing support?

## Appendix C

## Coding Themes from NVivo

Accountability	Safe space for sharing
Admin support	School-community support
Ask questions	Self-directed
Attend conferences via Twitter	Self-promotion
Challenged thinking	Share classroom learning
Change assumptions	Share resources
Choice	Strategies to implement curricula
Classroom management	Student learning opportunities
Collaborate with other teachers	Support from more experienced teachers
Colleagues beyond school	Teacher goes to work for principal
Concerns with technology	Teacher other teachers about Twitter
Connect with experts	Teacher knowledge
Constant learning	Teaching strategies
Contributions to community	Technology integration
Cutting-edge	Transformation
Digital tools	Teachers adapt learning to fit their needs
District support	Teachers teaching admin
Encouragement	Window into other teachers' classrooms
Face to face	
Formation of a learning community	
Gain ideas	
Global connection	
Hashtags	
Impetus for action	
Intellectual stimulation	
Less alone, sense of camaraderie	
Moderated chat	
Motivation-support	
Online support	
Other opportunities	
Others users interact with students	
Outside perspective	
Principal support	
Professional development	
Reflection	
Reputation	

## Appendix D

### Informed Consent—Interviews

**Protocol Title:** Investigating Elementary School Teachers’ Use of Twitter to Support Their Professional Learning

**Principal Investigator:** Talia Nochumson, Teachers College

#### **INTRODUCTION**

You are being invited to participate in this research study called “Investigating Elementary School Teachers’ Use of Twitter to Support Their Professional Learning.” You may qualify to take part in this research study because you are an elementary school teacher who is an active user of Twitter.

In a separate online survey, you had indicated that you would be willing to take part in a follow up interview with the researcher. Approximately 10-15 people will participate in the interview portion of this study and it will take 10 minutes of your time to complete.

#### **WHY IS THIS STUDY BEING DONE**

In many cases, teachers are finding that traditional professional development opportunities are sometimes insufficient. This study is being done to determine how teachers are using Twitter as an outlet to support their professional learning.

#### **WHAT WILL I BE ASKED TO DO IF I AGREE TO TAKE PART IN THIS STUDY?**

If you decide to participate, you will be interviewed by the principal investigator with Skype, Facetime or Google Hangouts. During the interview you will be asked to discuss your experience using Twitter and if there are ways in which it has impacted your teaching practices. This interview will be audio-recorded. After the audio recording is transcribed the audio recording will be deleted. If you do not wish to be audio-recorded, the researcher will transcribe your responses to the best of her ability. The interview will take approximately ten minutes. You will be given a pseudonym in order to keep your identity confidential.

#### **WHAT POSSIBLE RISKS OR DISCOMFORTS CAN I EXPECT FROM TAKING PART IN THIS STUDY?**

This is a minimal risk study, which means any harm or discomfort that you may experience are not greater than you would ordinarily encounter in daily life while taking routine physical or psychological examinations or tests. You can stop participating in the study at any time. The principal investigator is taking careful precautions to keep your information confidential and prevent anyone from discovering or guessing your identity, such as using a pseudonym instead of your name and keeping all information on a password protected computer at the researcher’s locked home.



You may also be nervous to meet the researcher for the online interview in Skype, Facetime or Google Hangouts. In this case, the use of video may be turned off and we can speak with the audio only. You do not have to answer any questions or divulge anything you don't want to talk about. You can stop participating in the study at any time.

**WHAT POSSIBLE BENEFITS CAN I EXPECT FROM TAKING PART IN THIS STUDY?**

There is no direct benefit to you for participating in this study. Participation may benefit the field of teacher education to better understand how digital tools such as Twitter can be a valuable resource for the professional learning of teachers.

**WILL I BE PAID FOR BEING IN THIS STUDY?**

You will not be paid to participate. There are no costs to you for taking part in this study.

**WHEN IS THE STUDY OVER? CAN I LEAVE THE STUDY BEFORE IT ENDS?**

The study is over when you have completed the interview. However, you can leave the study at any time even if you haven't finished.

**PROTECTION OF YOUR CONFIDENTIALITY**

The investigator will keep all written materials locked in a locked file cabinet in her locked home. Any electronic or digital information (including audio recordings) will be stored on a computer that is password protected. What is on the audio recording will be written down and the audio recording will then be destroyed. There will be no record matching your real name with your pseudonym. Regulations require that research data be kept for at least three years.

**HOW WILL THE RESULTS BE USED?**

The results of this study will be used in the investigator's dissertation research. Your name or any identifying information about you will not be published.

**CONSENT FOR AUDIO AND OR VIDEO RECORDING**

Audio recording (and/or video recording) is part of this research study. You can choose whether to give permission to be recorded. If you decide that you don't wish to be recorded, the researcher will transcribe your responses as accurately as possible during the interview.

I give my consent to be recorded \_\_\_\_\_  
Signature

I **do not** consent to be recorded \_\_\_\_\_  
Signature

**WHO MAY VIEW MY PARTICIPATION IN THIS STUDY**

I consent to allow written, video and/or audio taped materials where all identities have been protected, to be viewed at an educational setting or at a conference outside of Teachers College

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Signature

I **do not** consent to allow written, video and/or audio taped materials where all identities have been protected to be viewed outside of Teachers College Columbia University

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Signature

**WHO CAN ANSWER MY QUESTIONS ABOUT THIS STUDY?**

**If you have any questions about taking part in this research study, you should contact the principal investigator** Talia Nochumson, at [tcn2108@tc.edu](mailto:tcn2108@tc.edu). You can also contact the faculty advisor, Dr. Ellen Meier at [ellen.meier@tc.edu](mailto:ellen.meier@tc.edu).

**If you have questions or concerns about your rights as a research subject, you should contact the Institutional Review Board (IRB) (the human research ethics committee) at 212-678-4105 or email [IRB@tc.edu](mailto:IRB@tc.edu). Or you can write to the IRB at Teachers College, Columbia University, 525 W. 120<sup>th</sup> Street, New York, NY 1002. The IRB is the committee that oversees human research protection for Teachers College, Columbia University.**

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**PARTICIPANT'S RIGHTS**

- I have read and discussed the informed consent with the researcher. I have had ample opportunity to ask questions about the purposes, procedures, risks and benefits regarding this research study.
- I understand that my participation is voluntary. I may refuse to participate or withdraw participation at any time without penalty
- The researcher may withdraw me from the research at his or her professional discretion.
- If, during the course of the study, significant new information that has been developed becomes available which may relate to my willingness to continue my participation, the investigator will provide this information to me.

- Any information derived from the research study that personally identifies me will not be voluntarily released or disclosed without my separate consent, except as specifically required by law.
- I should receive a copy of the Informed Consent document.

**My signature means that I agree to participate in this study**

**Print name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

## Appendix E

### Informed Consent—Online Survey

**Why is this study being done?** In many cases, teachers are finding that traditional professional development opportunities are sometimes insufficient. This study is being done to determine how teachers are using Twitter as an outlet to support their professional learning.

**What will I be asked to do if I participate in this study?**

If you decide to participate, you will be asked to give your consent prior to taking the online survey. The online survey is comprised of questions pertaining to your use of Twitter. It will take 10-15 minutes of your time to complete.

**What possible risks or discomforts can I expect from taking part in this study?**

This is a minimal risk study, which means any harm or discomfort that you may experience are not greater than you would ordinarily encounter in daily life while taking routine physical or psychological examinations or tests. You can stop participating in the study at any time. The principal investigator is taking careful precautions to keep your information confidential and prevent anyone from discovering or guessing your identity, such as using a pseudonym instead of your name and keeping all information on a password protected computer.

**What possible benefits can I expect from taking part in this study?**

There is no direct benefit to you for participating in this study. Participation may benefit the field of teacher education to better understand how digital tools such as Twitter may be a valuable resource for teachers.

**Will I be paid for being in this study?**

You will not be paid to participate. However, you will have the opportunity to enter a drawing for a \$50.00 Amazon gift card at the end of the survey. Chances of winning are 1 in 100.

**When is the study over? Can I leave the study before it ends?**

The study is over when the online survey is complete. However, you can leave the study at any time even if you have not finished.

**Protection of your confidentiality**

Any electronic or digital information will be stored on a computer that is password protected. If you choose to include your email address at the end of the survey so that the researcher may conduct a follow up interview or if you choose to enter the drawing for a gift card, there will be no record matching your real name or your email with your pseudonym if you choose to include it.

**How will the results be used?**

Regulations require that research data be kept for at least three years. The results of this study will be used in the investigator's dissertation research. Your name or any identifying information about you will not be published. Your participation in this research is voluntary. You have the right to withdraw at any point during the study, for any reason, and without any prejudice.

**Consent for future contact**

The investigator may wish to contact you in the future for a follow-up interview. If you agree to participate in this follow-up interview, there will be an opportunity for you to indicate this on the survey. There will be a separate informed consent before proceeding with the interview process.

**Who can answer my questions about this study?**

If you have questions or concerns about your rights as a research subject, you should contact the Institutional Review Board (IRB) (the human research ethics committee) at 212-678-4105 or email [IRB@tc.edu](mailto:IRB@tc.edu). Or you can write to the IRB at Teachers College, Columbia University, 525 W. 120th Street, New York, NY 1002. The IRB is the committee that oversees human research protection for Teachers College, Columbia University.

**PARTICIPANTS' RIGHTS** I have read and discussed the informed consent with the researcher. I have had ample opportunity to ask questions about the purposes, procedures, risks and benefits regarding this research study. I understand that my participation is voluntary. I may refuse to participate or withdraw participation at any time without penalty.

The researcher may withdraw me from the research at his or her professional discretion. If, during the course of the study, significant new information that has been developed becomes available which may relate to my willingness to continue my participation, the investigator will provide this information to me. Any information derived from the research study that personally identifies me will not be voluntarily released or disclosed without my separate consent, except as specifically required by law. I should receive a copy of the Informed Consent document.

If you have any questions about taking part in this research study, you should contact the principal investigator, Talia Nochumson, at 917-861-0875 or at [tcn2108@tc.edu](mailto:tcn2108@tc.edu). By clicking the button below, you acknowledge that your participation in the study is voluntary, you are 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason.

- I consent, begin the study (1)
- I do not consent, I do not wish to participate (2)

## Appendix F

## Modified Informed Consent—Interviews

**Protocol Title:** Investigating Elementary School Teachers’  
Use of Twitter to Support Their Professional Learning

IRB Approval: 17-169 Protocol

**Principal Investigator:** Talia Nochumson, Teachers College

Thank you for your participation in the research study investigating how teachers are using Twitter to support their professional learning. You are being contacted to request your consent for some of your educational tweets to be used as examples in the final written report.

In the informed consent documents you signed in order to participate in the online survey and interview, you were assured that you would remain anonymous. In the final written report, you are given a pseudonym. Recently, it has come to the attention of the researcher, that the advanced search function in Twitter can be used to identify tweets and usernames. This means that any examples or excerpts from tweets could potentially be traced back to you. However, there is a very small chance that your Twitter username could be revealed. A reader of the final written report would have to enter text from your tweets into the advanced Twitter search function.

The tweets that will be used illustrate examples of how teachers are using Twitter to support their professional learning. They are being used to support the findings of this research study. Your tweets are an important source of evidence.

**CONSENT FOR THE USE OF TWEETS**

Analysis of tweets is part of this research study. You can choose whether to give permission to allow your tweets to be used. If you decide that you do not want your tweets to be used, the researcher will remove them.

I give my consent for my tweets to be included.

---

Signature

I **do not** consent to the use of my tweets.

---

Signature

**WHO CAN ANSWER MY QUESTIONS ABOUT THIS STUDY?**

**If you have any questions about taking part in this research study, you should contact the principal investigator** Talia Nochumson, at [tcn2108@tc.edu](mailto:tcn2108@tc.edu). You can also contact the faculty advisor, Dr. Ellen Meier [ellen.meier@tc.edu](mailto:ellen.meier@tc.edu).

**If you have questions or concerns about your rights as a research subject, you should contact the Institutional Review Board (IRB) (the human research ethics committee) at 212-678-4105 or email [IRB@tc.edu](mailto:IRB@tc.edu). Or you can write to the IRB at Teachers College, Columbia University, 525 W. 120<sup>th</sup> Street, New York, NY 1002. The IRB is the committee that oversees human research protection for Teachers College, Columbia University.**

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**PARTICIPANT'S RIGHTS**

- I have read and discussed the informed consent with the researcher. I have had ample opportunity to ask questions about the purposes, procedures, risks and benefits regarding this research study.
- I understand that my participation is voluntary. I may refuse to participate or withdraw participation at any time without penalty
- The researcher may withdraw me from the research at his or her professional discretion.
- If, during the course of the study, significant new information that has been developed becomes available which may relate to my willingness to continue my participation, the investigator will provide this information to me.
- Any information derived from the research study that personally identifies me will not be voluntarily released or disclosed without my separate consent, except as specifically required by law.
- I should receive a copy of the Informed Consent document.

## Appendix G

## Cross-tabs Analysis: Frequencies of Twitter Use for Various Purposes

(n = 107), p &lt; .05

Item (Category)	Frequency	Participation in a moderated Twitter chat	Participation in a moderated Twitter chat	Participation in a moderated Twitter chat	Total
		YES	NO	Plan to do so in the future	
Q6b. Connect with experts in the field of education	Everyday	17 19%	0 0	3 50%	20 19%
	A few times per week	21 24%	2 17%	0 0	23 22%
	A few times per month	26 29%	4 33%	1 17%	31 29%
	A few times per year	20 23%	2 17%	2 33%	24 22%
	Never	5 6%	4 33%	0 0	9 8%
	Total	89 100%	12 100%	6 100%	107 100%
Item (Category)	Frequency	Participation in a moderated Twitter chat	Participation in a moderated Twitter chat	Participation in a moderated Twitter chat	Total
		YES	NO	Plan to do so in the future	
Q6c. Learn about subjects I am less comfortable teaching	Everyday	7 8%	1 8%	2 33%	10 9%
	A few times per week	19 21%	2 17%	0 0	21 20%
	A few times per month	36 40%	0 0	1 17%	37 35%
	A few times per year	17 19%	3 25%	3 50%	23 22%
	Never	10 11%	6 50%	0 0	16 15%
	Total	89 100%	12 100%	6 100%	107 100%



Item (Category)	Frequency	Participation in a moderated Twitter chat	Participation in a moderated Twitter chat	Participation in a moderated Twitter chat	Total
		YES	NO	Plan to do so in the future	
Q6f. Follow links to articles about education	Everyday	37	4	2	43
		42%	33%	33%	40%
	A few times per week	39	2	3	44
		44%	17%	50%	41%
	A few times per month	10	6	0	16
		11%	50%	0	15%
A few times per year	3	0	1	4	
	3%	0	17%	4%	
		89	12	6	107
Total		100%	100%	100%	100%

Item (Category)	Frequency	Participation in a moderated Twitter chat	Participation in a moderated Twitter chat	Participation in a moderated Twitter chat	Total
		YES	NO	Plan to do so in the future	
Q6g. Engage with others who challenge my thinking	Everyday	14	1	0	15
		16%	8%	0	14%
	A few times per week	30	0	1	31
		34%	0	17%	29%
	A few times per month	26	4	1	31
		29%	33%	17%	29%
A few times per year	13	2	1	16	
	15%	17%	17%	15%	
Never	6	5	3	14	
	7%	42%	50%	13%	
		89	12	6	107
Total		100%	100%	100%	100%

Item (Category)	Frequency	Participation in a moderated Twitter chat	Participation in a moderated Twitter chat	Participation in a moderated Twitter chat	Total
		YES	NO	Plan to do so in the future	
Q6j. Support teachers who are new to Twitter	Everyday	4 5%	0 0	1 17%	5 5%
	A few times per week	14 16%	2 17%	1 17%	17 16%
	A few times per month	33 37%	1 8%	0 0	34 32%
	A few times per year	31 35%	5 42%	0 0	36 34%
	Never	7 8%	4 33%	4 67%	15 14%
	Total	89 100%	12 100%	6 100%	107 100%

## Appendix H

## Distribution Chart—Finding #1

RQ1: How Teachers Reported Using Twitter for their Professional Learning (n = 19)

Participants	As a source of motivation and support	To form collegial networks	As an opportunity to reflect on their teaching practice	As a window into other teachers' classrooms	To access curricular resources in a timely manner with hashtags
Aaron	X	X	X		
Allison	X			X	
Courtney	X	X		X	
Derrick	X	X			X
Diana	X	X		X	
Holly	X	X	X	X	X
Jessica	X	X	X	X	X
Justine	X	X	X	X	
Kampbell	X	X	X	X	X
Libby	X	X	X		X
Margot	X	X	X	X	
Nina	X				
Pearl	X		X		X
Roxanna	X	X			X
Simone	X		X		
Sylvie	X	X	X		
Samantha	X	X			X
Stacey	X	X	X		
Wendy	X	X		X	
Total	<b>19</b>	<b>15</b>	<b>11</b>	<b>9</b>	<b>8</b>
%	<b>100%</b>	<b>79%</b>	<b>58%</b>	<b>47%</b>	<b>42%</b>

## Appendix I

## Distribution Chart—Finding #2

RQ2: What Teachers Reported Learning From Their Use of Twitter (n = 19)

Participants	Technology-integration techniques	Strategies to implement curricular resources	Classroom management techniques	Innovative ideas
Aaron	X			
Allison	X		X	
Courtney	X	X		
Derrick	X	X		
Diana	X	X		
Holly		X	X	
Jessica		X		
Justine				X
Kampbell				X
Libby		X	X	
Margot		X	X	X
Nina	X	X	X	
Pearl	X			X
Roxanna	X			
Simone	X			X
Sylvie	X	X	X	
Samantha	X			
Stacey			X	
Wendy	X		X	
Total	<b>12</b>	<b>9</b>	<b>8</b>	<b>5</b>
%	<b>63%</b>	<b>47%</b>	<b>42%</b>	<b>26%</b>

## Appendix J

## Distribution Chart—Finding #3

RQ3: Teachers Reports of What They Did with the Information They Learned (n = 19)

Participants	Transform teaching practices	Identify and act on other opportunities	Teach others about Twitter	Make global connections	Adapt new knowledge to fit teachers' needs
Aaron	X	X		X	
Allison	X	X			X
Courtney				X	
Derrick	X			X	X
Diana	X		X		
Holly	X		X	X	
Jessica		X	X	X	
Justine	X	X	X		X
Kampbell	X	X	X		X
Libby	X	X	X	X	X
Margot	X	X	X		X
Nina	X	X	X	X	X
Pearl	X	X	X	X	
Roxanna	X	X	X	X	
Simone	X	X	X	X	X
Sylvie		X	X		
Samantha		X	X		
Stacey	X	X		X	
Wendy					
Total	<b>14</b>	<b>14</b>	<b>13</b>	<b>11</b>	<b>8</b>
%	<b>74%</b>	<b>74%</b>	<b>68%</b>	<b>58%</b>	<b>42%</b>

## Appendix K

## Distribution Chart—Finding #4

RQ4: The Types of Support Teachers Reported Having When They Wanted to Implement What They Learned From Twitter? (n = 19)

Participants	School environment (district-level-superintendent; school-level-principal)	Twitter community support	No support
Aaron		X	X
Allison	X		
Courtney	X		
Diana	X	X	
Holly	X	X	
Jessica	X	X	
Justine	X	X	
Kampbell	X	X	
Libby	X		
Margot	X		
Nina		X	X
Pearl		X	X
Roxanna			X
Simone		X	
Sylvie		X	
Samantha	X		
Stacey			X
Wendy	X	X	
Total	<b>12</b>	<b>11</b>	<b>5</b>
%	<b>63%</b>	<b>58%</b>	<b>26%</b>

## Appendix L

## Document Analysis—Summary of #2ndchat Tweets

#2ndchat (March 2017)
<a href="#">@mcarlson110</a> Hi Mary!! Good to see you!! #2ndchat
<a href="#">@mollieny72</a> Hi, Mollie! Glad you are here! #2ndchat
<a href="#">#2ndchat</a> I'm Karen from Alabama. Here to learn.
Hi, 2nd-grade parent from Connecticut. Seeing some early Seesaw posts from my child's classroom and curious to see where it goes. <a href="#">#2ndchat</a> <a href="https://twitter.com/missmac100/status/8411337210">twitter.com/missmac100/sta...</a>
<a href="#">@JeremyDBond</a> Welcome! We love parents in our chats! Seesaw is a great way for your child to show their learning with you. #2ndchat
<a href="#">@Seesaw</a> helped w/ child study meetings today. Everyone could see S reading and issues the S has #2ndchat
<b>PB&amp;J Teaches</b> <a href="#">@PBJTeaches</a>
Main purpose ? Benefits? Data collection? #2ndchat
<a href="#">@PBJTeaches</a> Great for a digital portfolio. You can use it for formative assessment, presentations, and much more. #2ndchat
First Question #2ndchat My graphics are having trouble loading Q1: How are you using <a href="#">@Seesaw</a> in your classroom?
<a href="#">@mcarlson110</a> <a href="#">@LannySaretsky</a> You are welcome to use the ones I made. :) <a href="https://goo.gl/QZnwQI">goo.gl/QZnwQI</a> #2ndchat
A2: Can't live without parents seeing right away what their kids are doing! Lots of talking back and 4th with their learning! LOVE #2ndchat
A3: My three favorite apps... <a href="#">@BookCreatorApp</a> , <a href="#">@educrations</a> and iMovie! All great to show understanding #2ndchat
<a href="#">@JeremyDBond</a> <a href="#">@missmac100</a> <a href="#">@Seesaw</a> I started on my own and only T at my school using it but hoping to share w/ other Ts soon #2ndchat
A5: I, honestly, can't imagine NOT using <a href="#">@Seesaw</a> anymore. It has enhanced and amplified my teaching. #2ndchat
My learning never stops as long as I can connect with great Ts such as you all! #2ndchat <a href="#">@Seesaw</a>
A4 #2ndchat <a href="#">@Seesaw</a> We do Friday Feedback and kids comment on classmate's work. I turn on/off the comment feature. Starting slowly!

## Appendix M

## Areas of Agreement Between Data from Survey, Interviews, and Document Analysis

Research question*	Online survey data	Interview data	Document analysis data	Category
RQ1	<p>71% of teachers reported that Twitter is motivational and gets them excited about teaching.</p> <p>Some teachers also spoke of wanting to learn as a result of seeing inspiring ideas on Twitter.</p>	<p>All (100%) participants reported using Twitter as a source of motivation and support with feedback, encouragement and accountability as the most frequently cited reasons.</p> <p>Jessica, a reading teacher with almost twenty years of experience, was joyful as she talked about the encouragement she received from other educators on Twitter.</p>	<p>Stacey used Twitter to provide motivation to other teachers as the following tweet illustrates.</p> <p>Libby has motivational tweets.</p>	Source of motivation and support
RQ1	<p>When asked whether they had engaged in a Twitter interaction that resulted in a meaningful experience, 81% (87 out of 107) reported that they had. In most instances, teachers said that they were able to meet face to face with other educators that they had been in touch with via Twitter.</p> <p>7 participants responded to having a supportive network with moderated chats.</p>	<p>To form collegial networks (15 of 19, 79%)</p> <p>Aaron discussed how educational conferences are beginning to support teachers getting to know each other in real life by hosting Tweetups where educators can meet face-to-face.</p> <p>In many instances, a Twitter relationship led to face-to-face meetings. Jessica related an example of how an initial meeting on Twitter with another teacher can grow into a lasting relationship.</p>	<p>Stacey also talked about the network of people on Twitter who inspired her.</p> <p>Libby also referred to her Twitter network and credits them with helping her learn.</p> <p>Nina contributed frequently to the #4thchat community to which she felt indebted to for her learning.</p>	Form collegial networks



Research question*	Online survey data	Interview data	Document analysis data	Category
RQ1	<p>67% of daily users responding that they use it to reflect “everyday” or “a few times per week.”</p> <p>4 participants responded that they reflected on their teaching through moderated chats.</p>	<p>As an opportunity to reflect on their teaching practice (11 of 19, 58%).</p> <p>Sylvie used her community on Twitter not only as a source of reflection, but as a way to learn more about how other teachers incorporated similar ideas in their classrooms.</p>	<p>In addition, Libby was reflective in some of her tweets such as in the following example.</p> <p>Wendy had one example of a reflective tweet.</p> <p>#2ndchat: Several teachers reflected on their own experiences with grading and assessment.</p>	An opportunity to reflect on their teaching practices
RQ1	Teachers who reported learning from others’ experiences via Twitter claimed that Twitter provided them with a window into their classrooms.	Almost half (47%) of teachers responded that Twitter provides them with a look into other teachers’ classrooms.	Stacey also showcases her own classroom to the world via Twitter. Some of her tweets provide a window into her classroom where students write on tables and read in a ball pit.	A window into other teachers’ classrooms
RQ2	60% of teachers who were categorized in the more frequent Twitter users group said they utilized Twitter to help them incorporate technology into curricular objectives.	<p>Almost two-thirds of participants (63%) reported learning technology-integration techniques from their use of Twitter.</p> <p>Two main categories emerged from participants’ descriptions related to learning technology integration techniques: 1) collaboration with others using technology, and 2) learning about digital tools and how to apply them.</p>	<p>Stacey used Twitter to promote resources and ideas that she found interesting, while at the same time, she acknowledged wanting to learn more about many different technology tools. The following tweets illustrate how she integrates technology in her teaching.</p> <p>Several tweets revealed what Libby was actually learning from her use of Twitter. In some instances, she shared ideas about some digital tools that she would either like to integrate into her teaching or is already using.</p> <p>Nina not only provided an example of how she</p>	Technology integration techniques

Research question*	Online survey data	Interview data	Document analysis data	Category
			<p>integrated technology, she also learned of new ideas for technology integration.</p> <p>One teacher described how she sees enhanced learning in her classroom as a result of using more digital tools for students to demonstrate their learning.</p>	
RQ2	20% of frequent Twitter users (every day and a few times per week) ask for suggestions for classroom strategies, whereas 41% of survey participants do this a few times per month	Almost half of the participants (47%) reported learning strategies to implement curricular resources.	Stacey, Nina and Libby have tweets with examples of how to implement curricular resources.	Strategies to implement curricular resources
RQ2	81% of participants in the frequent Twitter users group follow links to articles about education; 53/99 participants use Twitter to find new information to bring to their Teaching Practices; more than one-quarter (27%) reported gaining “inspiring ideas”; moderated chats introduced participants to new ideas	Five of the participants highlighted the impact Twitter has on their ability to keep ideas fresh.	Stacey’s tweet reveals a new Google tool that could be used in a visual literacy unit.	Innovative ideas
RQ3	94% of teachers reported their teaching practices have changed as a result of incorporating ideas they have learned	Almost three-quarters (74%) of participants reported that they use the information learned from Twitter to transform their teaching practice.	Some of Libby’s tweets revealed what she was doing with the information that she learned from Twitter. As she mentioned in her interview, Libby	Transform teaching practice

Research question*	Online survey data	Interview data	Document analysis data	Category
	<p>from Twitter.</p> <p>More than half of participants (58%) who used Twitter daily reported designing student-centered instruction (defined as less teacher-directed, more individualized choices for students) “extensively” or “quite a bit.”</p>	<p>Libby described the three main areas in which Twitter has helped her change her teaching practices.</p> <p>Derrick echoed the idea of letting students take more control over their own learning.</p>	<p>was trying to have her students lead more, especially when asking them what they would like feedback on in their writing.</p> <p>Nina discussed how Twitter helped change her teaching by allowing her to collaborate with others, and connect her students to the world.</p>	
RQ3	<p>Several respondents reported having other opportunities such as presenting at conferences open to them as a result of their Twitter use.</p>	<p>74% also said they used the information to identify and act on other opportunities.</p>	<p>Libby also acted on an opportunity that she learned about via Twitter.</p> <p>Nina also had some examples in which she mentioned other opportunities that she was pursuing.</p>	Identify and act on other opportunities
RQ3	<p>40% of high frequency Twitter users connect with experts in the field of education</p> <p>5 participants responded that they made global connections as a result of moderated chats.</p>	<p>Make global connections (11 of 19, 58%)</p>	<p>Stacey’s students were connected globally.</p> <p>Nina reached out to other classes on Twitter in search of participants to join a 4<sup>th</sup> grade book chat.</p>	Make global connections
RQ4	<p>In response to the closed-ended question, “Do the administrators in your school or district encourage your online learning?” 68% (73 out of 107) of participants said “yes,” followed by</p>	<p>More than half (63%) of the participants acknowledged having some support from their school environment when they wanted to implement what they have learned from Twitter. Most of these participants had support at the district-level</p>	<p>Libby was one of the few interview participants to use Twitter to comment on the support she received from her administration and school community.</p>	Support for teachers

Research question*	Online survey data	Interview data	Document analysis data	Category
	16% (17 out of 107) who replied, “no,” and another 16% who answered, “They are not aware of my online learning.”	(superintendent) or school-level (principal).		

\* Research Questions:

1. How are teachers using Twitter for their professional learning and development?
2. What do teachers report learning from their use of Twitter?
3. What do teachers say they do with the information they learned from Twitter?
4. What support do teachers have when they want to implement what they have learned from Twitter?