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Teacher Twitter Participation for Reflection on Pedagogical Practices

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Walden University
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Abstract

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Dissertation Submitted in Partial Fulfillment

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Abstract

Classroom teachers' professional isolation can affect their attitude and performance each day. Research has shown that Twitter is a place where teachers connect, collaborate, and engage. However, few studies have explored teacher participation on Twitter in relation to teacher reflection. The purpose of this qualitative case study was to explore how teacher professional participation on Twitter influences teacher reflection on pedagogical practices. The conceptual framework used in the study was a depth of reflection model and Fischer's richer ecologies of participation model. The research questions addressed what professional activities 9 K-12 teachers participated in, and how they used Twitter to reflect on pedagogy. Using the case study approach, data were collected from interviews, teacher tweets, and reflective journal responses. The data were analyzed using two levels of coding; a priori coding and emerging codes. Results showed that on Twitter, teachers participated in a variety of roles, from lurking to meta-designer and used Twitter to feel professionally connected, to build their professional identity, and to exchange ideas. Results also showed that teachers primarily used Twitter in nonreflective ways by sharing comments and posting questions, but also teachers reflected at higher levels when they shared how their pedagogical practice had been informed and changed by their participation on Twitter. The results of this case study may provide insight to school administrators, researchers, and teachers regarding the effectiveness of Twitter as professional development that can be used to connect teachers and encourage reflection about their teaching practice.

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Dedication

I dedicate this dissertation to the memory of my father Francisco Delgado Roldán.

He always saw education as a way to overcome any situation. He motivated many people

to continue their studies. He was proud of me because I followed his path, understanding

that education cannot be taken away; that can become a way to transform and improve

your life and the life of the people around you. Dad, thank you for all your love,

guidance, and care.

Acknowledgments

My family is my blessing. First, I want to acknowledge my husband, James Rivera McFerrin, who believed that it was possible and motivated me to pursue my dreams. My two daughters, Ginamaria and Christina, gave me support, love, and hope to continue this path. My family and friends gave me the words of advice when I needed them. Also, I want to acknowledge my mentor Dr. Darci J. Harland; her motivation, words of advice, help during this journey kept me motivated to pursue my dream. She believed in me and helped me believe in myself. I also want to thank Dr. Asoka Jayasena for her kindness and wisdom that help me along the way.

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Chapter 1: Introduction to the Study

Educators around the world communicate and share information through social media tools like Twitter (Tang & Hew, 2017). Current teachers' professional development (PD) toward digital literacy skills do not provide the expected results (Gulamhussein, 2013) and PD programs are being used to help teachers understand the power of Twitter in their learning networks (Rosenberg, Greenhalgh, Wolf, & Koehler, 2017). However, the effect of Twitter as a tool to develop PD activities that foster communication and self-reflection has not been fully explored (Ross, Maninger, LaPrairie, & Sullivan, 2015; Tang & Hew, 2017). Utilizing Twitter as a PD tool might be a way to improve teaching practices by promoting lifelong learning, global collaboration, and continuous self-reflection, all of which may impact educators in constructive ways.

Rosenberg et al. (2017) explained how teachers' interactions within Twitter created a sense of community by promoting a conversation that went beyond the participants' boundaries and included educators from a global community. Furthermore, the interaction with Twitter promotes a sense of global community because anyone, anywhere, and at any time can see, read, and interact with the public information shared. The relationship between Twitter and learning has been explored and shows a significant learning benefit for the participants (Denker, Manning, Heuett, & Summers, 2018). Collaboration between teachers can bring benefits toward their teaching and PD programs (Akella, 2014). When teachers collaborate, their experience can show an exponential growth on their teaching skills. Learning to collaborate within a Twitter environment provided a platform for teachers to reflect on educational topics. The

process of self-reflection (Benko, Guise, Earl, & Gill, 2016) benefits education in numerous ways. For example, the process helps identify strengths and weaknesses, promote self–awareness, and adds opportunities to transform education. Educators might also be using Twitter as a tool to promote their own learning by reflecting about educational issues and connecting with other professionals and to avoid isolation.

Background

Twitter use by teachers has been researched in a number of ways. Both quantitative and qualitative studies have been used to examine in-service teachers and how they interact on Twitter chats (Britt & Paulus, 2016; Stephansen & Couldry, 2014). Qualitative and quantitative studies have also been used to explain the relationships between teachers' PD and Twitter (Carpenter & Krutka, 2014; Noble, McQuillan, & Littenberg-Tobias, 2016). Carpenter and Krutka (2015), for example, conducted a quantitative study where teachers indicated that Twitter allowed them to connect and innovate with educators outside their schools. Teachers' use of Twitter has also been shown to help them connect and can be used to transform PD programs (Noble et al., 2016). However, few studies have explored how professional participation on Twitter influences teacher reflection on pedagogical practices.

There is not a precedent for examining the levels of participation on Twitter chats. For this study, I chose to classify using low and high from Fischer's ecologies of participation model (EP; 2011). Low participation included studies that talked about consumers, lurkers, observers, contemplators, and contributors. High participation included studies describing teachers on Twitter being collaborators, curators, moderators,

or meta-designers (Fischer, 2011). For example, a curator (Rosell-Aguilar, 2018) organized the Twitter content, and a moderator designed the topics discussed on the Twitter chats (Adjapong, Emdin, & Levy, 2018). Organizing teachers into levels or roles on Twitter, allowed me to determine if and how their level of participation influenced their reflection. Studies about low level participation show that teachers follow other educators, search for information, contribute with links, and communicate about the resources shared (Britt & Paulus, 2016; Carpenter, Kimmons, Short, Clements, & Staples, 2019; Carpenter & Linton, 2018; Edelmann, Krimmer, & Parycek, 2017). Studies related to high level participation indicated that the teachers engage in a significant way, deciding the topics discussed, and collaborating on the Twitter chats (Adjapong et al., 2018; Britt & Paulus, 2016). Some teachers become curators; they collected, shared, and organized information on Twitter, showing a higher level of participation (Trust, 2017; Zhang, 2015). No studies have been done that look at teacher level of Twitter participation related to their depth of reflection (DoR).

Ideally, teacher reflection on pedagogy should be a process where teachers consider their current practice and are open to change their ideas and therefore potentially transformed their practice (De Vries, Van De Grift, & Jansen, 2013; Farrell & Ives, 2015). The teachers' awareness and reflections regarding their own pedagogy have been shown to transform their professional practice (Arslan, Unal, Karataş, & Cengiz, 2018; Tosriadi, Asib, Marmanto, & Azizah, 2018). Reflection on pedagogy has been studied extensively in preservice teachers (Beauchamp, 2015; Körkko, Kyrö-Ammala, & Turunen, 2016), but less so with in-service teachers. Some research shows that in-service

teachers, when reflecting on pedagogy, can communicate and transform their ideas about the classroom curriculum and instruction (Farrell & Ives, 2015). Researchers looking at level of teacher reflection has shown that teachers reflect more at a descriptive, or low, level than they do at a critical thinking level (De Vries et al., 2013). However, it is not clear if the use of Twitter is a place where practicing teachers reflect on pedagogical issues, or if they use Twitter for other reasons, unrelated to reflection. For example, one study showed that Twitter encourages the interchange of resources, lets teachers reflect on their practice, and oversees a variety of new ideas that they might apply in their classroom (Rosell-Aguilar, 2018). Other studies examine how the community of learners on Twitter helps with the isolation teacher often feel (Davidson & Dwyer, 2014; Fischer, Fishman, & Schoenebeck, 2019; Hartman, 2017; Richards, Killian, Kinder, Badshah, & Cushing, 2020). There is a gap in the literature about how professional participation on Twitter influences teachers' reflection on pedagogical practices

Problem Statement

The importance of teacher reflection is well documented in the literature (Aktekin, 2019; Çimer, Çimer, & Vekli, 2013; Wright, 2012), but teachers often struggle with finding time to reflect on their teaching practices (Fernandez Campbell, 2018). Teachers are asked to do a lot in the classroom, and the amount of work and stress influences the time to reflect on their teaching practice (Tickle, 2018). Meierdirk (2016) found that teachers' reflective practices benefitted their ability to problem solve as well as impacted students' academic achievement and suggested that research be done to explore the effectiveness of public reflections on social media. While K-12 teachers may

use Twitter for professional purposes, what is still not understood is whether Twitter helps them to reflect on their pedagogy and whether the type of participation influences how they reflect. For example, Farrell (2017) shared that teacher reflection on Twitter could impact not just their personal experience, but also the student engagement and learning. However, little research has been done into teachers' use of Twitter in regard to reflection.

Professional isolation is another problem teachers face. Teachers' feelings of isolation impact their daily work as shown in a qualitative phenomenological study that found isolation to be a problem for some teachers; however, this study also found that being part of a learning community helped to improve teacher attitudes toward their profession and curriculum (Nehmeh & Kelly, 2018). Davidson and Dwyer's (2014) quantitative study showed how music teachers in Australia experienced and perceived professional isolation. The study results showed that when teachers could communicate with other teachers who shared the same class, there was a positive impact in the student achievement. Hartman's (2017) single case study described how an academic coach in a rural school helped an elementary teacher feel less isolated; they had to trust each other. Hartman found the coach and the teacher built a relationship that helped the teacher acquire confidence and PD. The professional isolation is a problem that affects multiple teachers from different backgrounds and schools (Davidson & Dwyer, 2014; Hartman, 2017). Staudt Willet's (2019) qualitative case study confirmed that professional isolation is an issue for teachers; he also indicated that there is a gap in the literature and need to further explore how teachers connect on Twitter chats. The professional isolation can

lead a teacher to feel less confident in their daily activities. The lack of confidence in a teacher's life can also affect how they perceived their career and professional growth. The literature showed how different strategies could be applied to overcome professional isolation; teamwork, Professional Learning Communities (PLC), coaching among others (Gutierez & Kim, 2017, 2018; Hartman, 2017; Mintrop & Charles, 2017). These activities are designed to have a physical connection with other coaches or teachers' groups. McLean, Dixon, and Verenikina (2014) described how a virtual connection impacted the teachers' professional isolation and that it is one reason why teachers have identified they use Twitter (Staudt Willet, 2019). Although there are studies about how high school teachers use Twitter with students (Hunter & Caraway, 2014; Loomis, 2018) and a few about their interactions on Twitter with other teachers, (Aydin, 2014; Britt & Paulus, 2016; Carpenter & Krutka, 2015; Noble et al., 2016; Staudt Willet, 2019), what is not yet understood is how professional participation on Twitter influences teacher reflection on pedagogical practices.

Purpose of the Study

The purpose of this qualitative case study was to explore how professional participation on Twitter influences teacher reflection on pedagogical practices. To fulfill this purpose I used interviews, reflective journals, and I analyzed tweets to see how teachers participate professionally on Twitter and how they reflected on pedagogy based on these Twitter interactions.

Research Questions

The research questions (RQ) were designed to fully explore how professional participation on Twitter influences K-12 teacher reflection on pedagogical practices.

RQ 1: In what professional activities do teachers participate on Twitter?

RQ 2: How do teachers use Twitter to help them reflect on pedagogical practices?

Conceptual Framework

The conceptual framework on which this study was based includes two models: the DoR model (Kember, McKay, Sinclair, & Wong, 2008) and EP (Fischer, 2011). The DoR model includes four constructs: nonreflection, understanding, reflection and critical reflection (Harland & Wondra, 2011; Kember et al., 2008). These constructs were used to help organize data collection as well as to code the data for analysis. The DoR model was used to help answer the two research questions. Teachers' tweets were coded according to the varying levels of reflection each shows. Teacher interviews were analyzed using a priori codes developed from the constructs of the DoR model.

Fischer's EP model includes levels of engagement in a community of learning. The constructs of this model include five levels: unaware consumers, consumers, contributors, collaborators, and meta-designers. Each level shows an example that could be related to the communications that occurred on social networks. The EP model was used to code interview and journal prompt data. The DoR model and EP model together, was the conceptual framework for this study and is further described in Chapter 2.

Nature of the Study

This research was a single case study. A case study explores "a case in depth and within its real-world context" (Yin, 2018, p.15). The case study approach allowed me to explore how K-12 teacher participation on Twitter influences their reflection on pedagogical practices. The target population was selected from a purposive sampling strategy of K-12 teachers who participated on Twitter regarding the topic of education. The participants were nine K-12 teachers from different states in the United States who participated on Twitter for professional purposes. A purposive sample strategy allowed me to identify the teachers who then described their experience participating on Twitter. I explored the participants' posts by reviewing their public Twitter feeds. The data collected included interviews, reflective journal responses, and teacher tweets. Data collected allowed me to explore how K-12 teachers reflect on their teaching pedagogy practices, providing a broader perspective of the influence of Twitter on their PD.

Definitions

Educhats: are educational #hashtags used to describe the conversations that participants have on Twitter (Rehm & Notten, 2016).

Hashtags: are symbols (#) used with a topic (name, word, phrase) that connect information with other Twitter users (Macià & Garcia, 2017).

Personal Learning Network: is a group of online resources that include people, web pages, videos and social media platforms that help the participant interact, engage and learn about a topic of interest. (Davis, 2013).

Professional Development: is defined as the learning opportunity that teachers had

in their districts or states, flexible, and traditional or nontraditional (Ross et al., 2015).

Self-reflection: is a process that requires introspection; helping the individual reflect on their acts and search for new ideas that could improve their daily tasks (Chabon & Lee-Wilkerson, 2006).

Twitter: is a social network service that allows the users to share content with 140 characters, videos, and images (Omar, Njeru, & Yi, 2017).

Assumptions

The assumptions in the single case study included the expected relationship between teachers that share information online using Twitter as a form of communication. I assumed that if the teacher participated in a learning community, that teacher was willing to communicate and share information about their online experience. I assumed that there were teachers on Twitter chats who would be willing to participate in a case study and share their experiences via interviews and written documents. My assumptions were evaluated during the case study, understanding the paradigm that comes when teachers share and communicate in learning communities.

Scope and Delimitations

This case study's scope and delimitations include the conceptual framework and sample size. Yin (2018) indicated that the scope of a case can be explored from a variety of data collections sources. The aspects that delimit the research were the study sample, the use of Twitter, and the observations recorded from the nine K-12 teachers. The participants were selected through purposive sampling, a strategy that limits the spectrum and participants who can share and describe an experience (Ishak & Bakar, 2014). The

interviews were conducted via email. The participants in the study were K-12 U.S.

teachers that used Twitter as a personal learning platform.

Limitations

The limitations included the number of participants in the case study. The

interviews were held through email, which limited the observations that come from a face

to face interview. The limitations also included the selection of teachers that participate

on Twitter. The selection may not show a broader spectrum of the phenomenon under

study, which adds contractions of a timeframe for a qualitative case study. All the

limitations were minimized by the methodology applied during the data collection and

content analysis.

Significance

Research studies have shown that Twitter educational chats improve

collaboration, allowing teachers to reflect on their teaching (Britt & Paulus, 2016;

Carpenter & Krutka, 2015; Goodyear, Casey, & Kirk, 2014; Ross et al., 2015; Tang &

Hew, 2017). Benko et al., (2016), as well as Noble et al., (2016) explored how teachers

reflected about their teaching practices while they participated in Twitter educational

chats and interacted with educators from different backgrounds and experiences as part of

a global community. The relationship between PD programs and Twitter chats, as a tool

to promote collaboration and self-reflection, should be described in-depth. My case study

made an original contribution to the literature and provided recommendations for future

PD programs that could include Twitter. The research could impact a positive social

change by encouraging schools to reexamine budgets for PD, as well as encourage

administrators to make informed decisions about whether Twitter is a viable option for teachers' PD programs.

Summary

In this single case study, I explored how professional participation on Twitter influenced teacher reflection on pedagogical practices. The communication and engagement that educator develop through Twitter engagement has been researched (Akella, 2014; Gallop, 2014). However, in this case study, the focus was on teachers' reflective practices. The conceptual framework was the DoR model (Harland & Wondra, 2011; Kember et al., 2008) and EP model (Fischer, 2011). The DoR model showed the different levels of reflections that range from a Level 1 (nonreflection) to a Level 4 (critical reflection). Fischer's EP model (2011) described five levels of participation from an unaware consumer to a meta-designer. The conceptual framework was aligned to the research questions and data analysis collection tools. The participants were selected by a purposive sample of K-12 teachers from the United States who participate on Twitter. The second chapter includes a literature search strategy, a more in-depth review of the conceptual framework, and a literature review about teacher's reflection on pedagogy and teachers Twitter reflection on use of Twitter chats.

Chapter 2: Literature Review

Digital technologies and social media influences how teachers engage and communicate online. For example, teachers collaborate, share ideas, and connect with others through social media (Carpenter & Krutka, 2014). The problem in this study was that while K-12 teachers may use Twitter for professional purposes, what is not understood how professional participation on Twitter influences teacher reflection on their pedagogical practices. K-12 teachers often lack opportunities to reflect on pedagogical issues (Fernandez Campbell, 2018) and feel professional isolation (Nehmeh & Kelly, 2018). Even though they participate on social media, teachers' professional isolation still presents an issue that affects the teachers' attitude and performance each day (Davidson & Dwyer, 2014). The purpose of this qualitative case study was to explore how teacher professional participation on Twitter influences teacher reflection on pedagogical practices. The framework combined the models of DoR and EP, which provided a holistic approach to understand the context where teachers expressed their engagement and experience on a Twitter chat. In the literature review, I describe the literature on teacher reflection on pedagogy, and teacher professional participation on Twitter.

Literature Search Strategy

The literature review included articles from multiple Walden University databases and Google Scholar. The Walden University databases included: Thoreau, Academic Search Complete, Business Source Complete, Education Source, ERIC, PsycINFO, and SocINDEX with full text. The information was limited to 6 years, from 2015 -2020. The

topic explored was limited by the participants (in-service teachers), DoR, and levels of participation on Twitter. Words that defined the search included *Twitter, social media, in-service teachers, educators,* and *teachers' reflections*. A librarian at Walden University showcased multiple strategies for me to find information, including the use of asterisk to find the root word of a topic research. Table 1 shows a list of the search terms used to identify studies for the literature review.

Table 1

Research Topics and Keywords

Research Topics	Keywords
Twitter	*twitter, social media, microblogging, #edchats*
In-service teachers	*teachers, educators, instructors*
Reflection	*reflection, self-reflection, metacognition*
Levels of participation	*engagement, curators, collaborators, unaware consumers, consumers, contributors, meta-designer*

Conceptual Framework

The conceptual framework for my study included the models of DoR (Kember et al., 2008) and EP (Fischer, 2011). The DoR model has been applied in studies that evaluate how teachers reflect in written texts (Chaumba, 2015; Harland & Wondra, 2011). The EP model showed how participants interact and the level of engagement that they display in a community of learning (Fischer, 2011; Fischer, 2012).

Depth of Reflection

The first element of the conceptual framework for this study was a DoR model. Reflection is a word that brings different views, perspectives, and assumptions in the academic community (Cheung & Wong, 2017; Kember et al., 2008). DoR is a cognitive

process where a person considers how an experience, they have had might make them reevaluate their past actions, ideas, or learning experiences (Kember et al., 2008). Measuring reflective practices have been studied widely in teacher education (Cherrington, 2018; Wang, Lu, 2014) as well as in practicing teachers (Caudle, Grist, & Watson, 2017; Harland & Wondra, 2011). Kember et al. (2008) developed a four-category model that can be used to assess the DoR in written work of teachers.

The four levels of reflection are: nonreflection, understanding, reflection, and critical reflection. I have summarized the four levels of reflection based on the work of Harland and Wondra (2011) and Kember et al. (2008) to fit the context of this study. See Table 2. The first level of the DoR model is nonreflection or descriptive (Kember et al., 2008). Writing at this first level is when the participant shows a text that represents others work without further interpretation or additional insights (Kember et al., 2008). For the purpose of this study, the nonreflection level referred to when teachers retweet others' posts with no substantial contribution included. The second DoR level is understanding. At this level, the participant shares a text that has a relationship with the topic discussed without being related to their life experiences (Kember et al., 2008). In this study, understanding would be exhibited by a response to a tweet that includes a supporting idea and/or link to a topic being discussed. The third DoR level is reflection. The participant at the reflection level writes a text that shows how the topic is related to their personal experiences, being able to analyze the discussion, and display content knowledge that goes beyond understanding (Kember et al., 2008). For this study, tweets at the reflection level share experiences related to the topic that show an integration of the idea to their

own personal understanding of teaching. The fourth DoR level is critical reflection.

Critical reflection is a level that not many participants reach as it requires a critical

reflection to show how deeply the topic was explored and relates and transforms from

participants experiences (Kember et al., 2008). For the purpose of this study, tweets relay

a message that thinking on a topic has been changed because of personal experiences

and/or interactions with the content being shared.

Table 2

Levels of Reflection

Level 1 Nonreflection/ descriptive	Level 2 Understanding	Level 3 Reflection	Level 4 Critical reflection
The participants copy an idea or text without further explanations.	The participants comprehend the idea without adding any additional reflective arguments that will relate the topic to a personal experience.	The concept is related to the personal experiences and the participants are able to relate the topic to their profession.	The participants changed their idea about the topic discussed and were able to relate in a critical thinking response that showed a higher level of thinking.

The application of the DoR model has been applied in similar teacher's studies.

The DoR has been applied to preservice teachers' written works done on blogs compared

to their reflection in course papers and results showed that students reflected at deeper

levels and in less words (Harland & Wondra, 2011). In a case study, Roux, Mora, and

Tamez (2012) explored the DoR of 15 Mexican teachers that were studying their master's

degree in English. Results showed their use of the English language affected their

responses and opportunities to critical reflect on the subject. They recommended that levels of reflection could be explored in Spanish. Andersen and Matkins (2011) examined the DoR of 10 preservice science teachers reflecting on blogs and found that blogs improved the level of connections and engagement between the participants. In another undergraduate study, Chaumba (2015) applied DoR model to how student social workers reflect on their course when using blogs to interact. Results showed that 30% of the participants were able to critically reflect on the issues discussed.

There were a number of benefits to using the DoR model as part of the conceptual framework for this study. The DoR was the categorical lens through teacher participation and its influence on reflection was examined. First, the levels of reflection that Kember et al. (2008) provided was used to examine the public Twitter posts that teachers make about teaching. This DoR model was used to determine the depth at which teachers reflected on pedagogy using this social media tool, helping to answer research question 1. The DoR model was used to develop data collection tools that were of aide in the data analysis of the teachers' Twitter posts. The DoR model was also used as a priori coding during data analysis of the teacher interview transcripts.

Ecologies of Participation

The second element of the conceptual framework for this case study was the richer EP model (Fischer, 2011). Fischer investigated the connections and interactions between people and technology, users, designers, and computers. He described a culture of participation regarding the relationships of the users from being passive to active collaborators; their challenges and opportunities (Fischer, 1998; Fischer, 2011; Fischer,

2012). In the culture of participation, the EP provide a guideline to describe the diversity and roles that users had in a community (Fischer, 2011). The term *ecologies of participation* is a model that showcases the participants' engagement in a community of learning. Fischer (2011) indicated that there are various reasons users participate in a community and that these reasons ultimately influence the level of activity and actions that could be displayed through the users' interactions. The five levels in the richer EP model include: unaware consumers, consumers, contributors, collaborators, and meta-designers. In Table 3, I have listed the five EP levels and included a description of context for each level related to this study.

Table 3

Richer Ecologies of Participation

Level 0 Unaware Consumers	Level 1 Consumers	Level 2 Contributors	Level 3 Collaborators, facilitators, organizers, curators	Level 4 Meta-Designers
The participants belong to a community without intentions of participation or interactions.	The participants are aware of the content and interactions; they received the information shared.	The participates are actively engaged within the community.	The participants facilitate, organized and collaborate within the community.	The participants can create changes that allowed other users to interact, collaborate and participate in the community.

The EP levels start at Level 0 and is called *unaware consumers*. Unaware consumers are passive consumers, they are in the network, but do not participate or engage in any interactions. For this study, this referred to individuals who have Twitter accounts but were not actively engaged with other teachers on the network. Level 1 is called *consumers*; these individuals recognize the opportunities and take advantage of them (Fischer, 2011). EP applied to Twitter participation, for the purposes of this study, Level 1 EP participators referred to teachers who actively consume content related to teaching and educational topics on Twitter. The second level of contributors are individuals who have similar goals and contribute in the community of learning (Fischer, 2011; Grünewald & Meinel, 2012). In this study, Level 2 referred to teachers who not only consume content related to teaching, but also contribute to the Twitter teaching community, by sharing or forwarding content they read, and engaging the community with questions encouraging interaction. Teachers interacting at a Level 2, respond to content of others, both publicly and by private messaging. The Level 3 were called *collaborators, curators, and facilitators*; they organized the content discussed (Fischer, 2011; Grünewald & Meinel, 2012). For the purpose of this study, teachers at Level 3 were actively engaged on Twitter, posted and responded weekly, were likely to attend Twitter chats, and may have hosted chats on educational topics. Last, Level 4 is *meta-designers*. The meta-designers developed new content; their interest in participation and content creation comes from a personal desire that motivates them to design and create spaces for user engagement (Fischer, 2011; Grünewald & Meinel, 2012). For this study, Level 4 referred to teachers who hosted spaces for teachers to interact about educational

issues. Teachers at this level might have had blogs to which they often refer in their tweets. These teachers were leaders on Twitter, had large numbers of followers, and provided opportunities for teachers to interact both synchronously and asynchronously.

The EP model has been used in a number of educational technology studies. Grünewald and Meinel (2012) evaluated the culture of participation through an e-learning experiences that included a tele-teaching web portal using the Fischer's EP. The study showed how a small group of participants changed from an unaware consumer to other levels of participation (Grünewald & Meinel, 2012). Grünewald, Meinel, Totschnig, and Willems (2013) applied Fischer's EP model to examine student participation in a Massive Open Online Course (MOOC). Grünewald's et al., study included a survey of 2,726 MOOC participants to determine the success of the learning experience and used the EP model to show how gaming techniques impacted relationships between the community of learning.

There are a number of benefits to using the EP model as part of the conceptual framework for this study. First, the EP model provides a descriptive framework that I used to determine the participant engagements levels on social media. To do this, I used the EP model to code teacher interactions on Twitter; showing how teachers interact and code their contributions on Twitter according to these levels. The information helped answer research question 1. The EP model was used to describe the types of participation and roles that the teachers engaged during the Twitter interactions. The EP model was also used to develop interview and reflective journal questions related to how teachers

see themselves in a community of learning; as active consumers, collaborators, or designers.

<div align="center">**Literature Review of Key Concepts**</div>

I have organized the literature review into two areas. The first is related to K-12 teacher reflections on pedagogy. The second is literature exploring teacher professional use of Twitter.

Teachers' Reflection on Pedagogy

Teachers' reflections can be accomplished through their experience in PD, writing reflective journals, or sharing content in social media. From their self-reflection with their perceptions about pedagogy and teaching skills to a macro view about how education can affect their students learning opportunities. Teachers' reflection on pedagogy has been researched from different points of views, stages, and perspectives (Bates, Phalen, & Moran, 2016; Cherrington, 2018; Clarà, 2015; Farrell & Ives, 2015); from preservice teachers' reflections (Beauchamp, 2015; Körkko et al., 2016) to in-service teachers' reflections in the classroom (Ciampa & Gallagher, 2015; Kayapinar, 2016). Reflection in education has been defined as a process where a teacher can rethink their actions and make transformations on their daily work (De Vries et al., 2013; Farrell & Ives, 2015). The reflection process has been studied through the work of Dewey, Schön, and Wertheimer (Clarà, 2015). Clarà (2015) study inferred that Dewey, Schön, and Wertheimer's ideas of reflection described the process that a person experiences trying to find answers to a specific circumstance. Farrell and Ives (2015) described the reflection in practice as a process where a teacher can infer on their ideas and observed how those

ideas transformed their daily classroom experiences. The reflection in practice is a reflection on pedagogy within a teacher daily classroom experience. Teachers' reflections are not a perspective that occurs in isolation.

  Importance of teacher reflection. Teachers' beliefs and personal reflections are interconnected; the reflective process depends on teachers' personal experiences, actions, and opinions but research is widely varied. Vaughn, Parsons, Keyes, Puzio, and Allen's (2017) case study of ten in-service teachers showed how their personal ideas about education were impacted by their reflective practice. The reflective process explored in the case study showed how metacognition impacted the way that teachers reflected and act from their visions to their daily classroom reality. In a literature review of 122 teacher reflection studies on showed that when teachers' personal ideas are confronted with experiences, research, and pedagogy, reflection allowed them to rethink what works and what they should change (Marcos, Sanchez, & Tillema, 2011). Marcos et al., (2011) validated the importance of teachers' reflections; also, the necessity of empirical research that could show a more comprehensive perspective on the teachers' reflections, ideas, and beliefs. The professionalism of teachers can be fostered from the reflective process. Arslan et al., (2018) and Tosriadi et al. (2018) identified how teachers who reflect impact their professionalism. Arslan et al. (2018) in a study of four chemistry teachers and their mentors showed how professionalism could be developed through mentoring and active teachers' reflections. Tosriadi's et al., (2018) study explored how teachers reflected on pedagogical content knowledge. Both studies included activities that shared the PD that teachers can acquire from reflective practices. Lord and Lomicka's study (2014) showed

how teachers' perspective and opinions about the use of Twitter to reflect were positive; also, they recommend further studies on the themes and ideas that teachers shared on Twitter. Šarić and Šteh (2017) described the teachers' critical thinking process as a chance for a holistic transformation that could impact their community of learning. The process where teachers reflect on their activities, ideas, and beliefs can positively affect how they see and act in their profession.

Resistance to teacher reflection. However, in-service teacher participation in reflective activities is not always a priority. De Vries et al. (2013) quantitative study explored teachers' ideas about continuing PD that included updating, reflective and collaborative activities. De Vries et al. (2013) surveyed 260 teachers and the findings showed that teachers preferred updating or collaborative activities rather than reflections. Results showed that reflection was an action that required metacognition; teachers preferred other activities that were less challenging. Cherrington (2018) multiple case study explored 11 experiences of early childhood teachers in three different locations. The findings included that teachers reflected more on their students' actions than in the pedagogy and their teaching practice. Both, De Vries et al. (2013) and Cherrington (2018) found that the more teachers focused on students, the less they were likely to reflect. Bates et al., (2016) explored an online Math learning community that shared PD through video-based learning. The study included the participation of 132 teachers. The data collected included web analytics and teachers' comments; the study showed how teachers preferred videos that shared practical ideas instead of videos that promoted depth in reflection. This corroborates other research (Bates et al., 2016; Cherrington, 2018; De

Vries et al., 2013) showing how teachers were not eager to participate in reflective activities. Even though data showed that the teachers in the studies did have some reflective practices, none were at the highest critical reflective level. Gutierez and Kim's (2017) qualitative study explored how 30 teachers reflected on classroom-based research. While the data collected through the reflective logs and interviews showed various levels of reflection; most reflections were more descriptive than metacognitive, showing that even when teachers are asked to reflect, they often simply report. These studies conveyed the need to find activities that can provide ways to promote higher levels of reflection on their teaching practice.

Teacher reflections and social media. With the digital age some teachers turn to social media as a place to connect and reflect about pedagogy. Teachers have access to multiple new forms of technology; some participate in social media interactions that promote PD (Carpenter & Krutka, 2015; Nicholas, Avram, Chow, & Lupasco, 2018; Rosell-Aguilar, 2018). Nicholas et al. (2018) examined how four teachers shared their stories about how they connected in social media; using Twitter as their platform to communicate and participate in PD. One teacher participant from Nicholas' et al., study shared a reflective example: she thought about how her class was not going as she wants it and decided to find links that will help her (Nicholas et al., 2018). While that study was not about reflection on pedagogy, one of the participants mentioned the importance of personal reflection through social media. Similarly, data collected from Krutka and Carpenter's (2016) qualitative study showed comments related to personal reflections that occurred through the chats and connections developed through Twitter. Teacher

reflections were evident during the engagement in social media (Carpenter & Krutka, 2015) as well as preservice teachers' reflection through social media (Ali, Sukri, Tahir, & Said, 2017). Carpenter and Krutka's (2014) data and interviews showed how teachers reflected and shared ideas on their experiences in Twitter chats. Rosell-Aguilar (2018) in a mixed-method study about Twitter as a teacher's PD activity, showed how ten teachers concurred that their engagement helped them reflect about their practice. The data explored in the studies showed how connections could help teachers reflect on their experiences. The studies showed a limited perspective about how teachers reflect on social media. Collectively, these studies conveyed the necessity of further research empirical studies on the effect of Twitter as a PD.

Another area of research related to teacher reflection about pedagogy includes the use of blogs for reflection. Blogs are interactive webpages that can include a section where people can comment and engage (Ciampa & Gallagher, 2015). A growing number of teachers use blogs as a way to share their instructional experiences (Paccone, 2017). A formative experiment with 26 classroom teachers showed how they transform their critical reflection skills, after they interact with a critical reflective framework applied during research (Hall, 2018). The study showed how teachers at the beginning shared ideas in a descriptive way of using blogs; not going into an in-depth reflection until they were impacted with the critical reflective framework. Hall (2018) indicated that by using blogs; there should not be an assumption that instantaneous reflections will occur; blogs are a platform that if used wisely can promote a writing process that would help teachers reflect on their actions. In Zhou and Chua's (2016) study on blended learning they used

blogs to encourage reflective thinking. Both studies applied blogs as a platform to help teachers reflect, however reflection direction had to be purposeful and the interactions with the mentors were fundamental to the success of the teachers' reflections. Similarly, Kamalodeen, Figaro-Henry, Ramsawak-Jodha, and Dedovets (2017) conducted a mixed method study to apply blogs as a tool for teacher reflections. Data from 86 teachers showed how writing blogs can help teachers reflect better on their learning experiences. These empirical research (Hall, 2018; Kamalodeen et al., 2017; Zhou & Chua, 2016) showed that blogs have been successfully used as a method that can promote teachers' reflections about education and learning but often need to be carefully implemented.

However, not all reflection research using blogs have shown positive results. In a mixed method's study with teachers using blogs for reflection in a professional learning scenario, showed both strengths and weaknesses (Ciampa & Gallagher, 2015). In Ciampa and Gallagher's case study, they collected data from 12 teachers, the majority of the teachers showed elements of reflection on their teaching practice, a minority did not perceive any usefulness in blogging. One participant shared that the sequences of the conversation from a blog was not enough for him to find active interactions (Ciampa & Gallagher, 2015). In a 20-year review of the literature, Lantz-Andersson, Lundin, and Selwyn (2018) found that teachers in online communities stated that the interactions with blogs seemed slower compared with other forms of social media. The dichotomy of the perceptions of the effectiveness of the blogging for reflection may indicate that there is more to learn about how teachers interact in learning community and how reflection in blogs can not only be used for reflection but also how it is perceived by teachers.

Teachers reflecting as professional development. In-service teacher reflection is often studied in association with PD opportunities. For example, in New Zealand, East (2014) compared in-service and preservice teacher reflections about their thinking in pedagogy that included a change in their beliefs from a teacher led to a learner centered pedagogy. The study used written logs to analyze teacher reflections and the results showed that in-service teachers reflected in more depth compared to preservice teachers. This example showed how writing can help teachers reflect on their teaching beliefs. De Vries' et al.'s (2013) quantitative study explored teachers' ideas about teaching and PD; 260 Dutch teachers participated. Teachers preferred to collaborate or update their activities rather than to reflect in PD. Mentoring often includes reflective exercises and can bring improvements to teachers' teaching skills. Farrell and Ives's (2015) case study explored how the reflective process impacted a teachers' beliefs and transform the participant practice. The reflective process was documented via observations, interviews, and journals. Three different examples of empirical data showed how teachers reflected and transformed their beliefs through actively engaging in reflective activities through PD; the reflective process gave them an opportunity to transform their beliefs and actions toward teaching and learning.

In-depth interviews, in a case study of 10 in-service teachers showed how reflective writing in journals associated with mentoring, helped them visualized their teaching and learning beliefs and improved their teaching skills (Zulfikar & Mujiburrahman, 2018). Kayapinar (2016) conducted a mixed methods study where the reflective practitioner development model (RPDM) was applied. Results showed

significant progress in the teachers' reflective skills; giving opportunity to a PD that add value to the teachers' reflections in a PD experience. Both, studies (Kayapinar, 2016; Zulfikar & Mujiburrahman, 2018) showed how with mentoring, writing and reflection; teachers can benefit from the reflective process. There are different ways that reflection has been studied; from a personal reflection to a community of learning.

Another environment where teachers may engage in reflection related to pedagogy are in PLC where there is an environment of communication, sharing and reflection. Kelly and Cherkowski (2015) explored how teachers reflected and collaborated in a PLC. The analysis of PLC postings showed that reflective activities were more of a descriptive nature. They recommended further research about the relationships between PLC's and teachers' PD. Yu (2018) studied Hong Kong teachers using personal reflection from journals and interviews, during a PD workshop. The evidence showed how the reflective process helped teachers understand personal experiences that affected their teaching styles. Nilsson, Blomqvist, and Andersson (2017) explored 21 Swedish teachers sharing collegial reflections; the collaborative reflections were collected in a school through recordings, interviews, and mail surveys. The data collected showed different aspects of a collaborative reflection experience; the teachers' perceptions and comments showed how they want to share about personal topics that connected them; not only about PD. Nilsson's et al., (2017) study described how critical thinking was part of the collegial reflective process. However, the data collected, and analysis shared did not show a depth in reflection process. The evidence brought by these studies showed that reflection is a key component to improving teacher practice, but that

teachers need support in reflective practices and that further research is needed to increase understanding about the levels of reflections that the teachers have about their own pedagogy practices.

Teachers Twitter Reflections on Use of Twitter Chats

The communication that teachers' experiences during Twitter chats can bring opportunities to reflect on the conversations, ideas and resources shared. In-service teachers' perspectives on Twitter chats are found in the literature reviewed fragmented as subtopics or participants descriptions that showed a glimpse of the reflection on the Twitter chats (Britt & Paulus, 2016; Carpenter & Krutka, 2015; Rosell-Aguilar, 2018). Carpenter, Tur, and Marín (2016) indicated that participation in social media discussions could promote reflective practice. Johnson, Bledsoe, Pilgrim, and Lowery-Moore (2019) recommended giving the participants time to reflect in between Twitter chats. Rosell-Aguilar's (2018) interviewed 11 teachers; they indicated that their participation on Twitter help them reflect on their practice. Also, Adjapong's et al., (2018) study showed how Twitter chats let the participants reflect on their teaching. Nicholas' et al., (2018) research showed how Twitter chat (#CdnELTchat) promote a collective reflection between the participants. The literature reviewed showed a limit perspective of the use of Twitter as a tool to promote a reflective practice with in-service teachers. Research has been done with preservice teachers, Twitter, and reflective practices (Benko et al., 2016; Carpenter, 2015; Carpenter, Tur, et al., 2016). There is a gap in the literature about how professional participation on Twitter influences teachers' reflection on pedagogical

practices. Further research should be done about how teachers reflect during the Twitter chats.

Twitter and teacher professional development. Teachers' PD showcase a variety of forms and modalities. Many formal PD for teachers has been perceived inadequate and not sufficient, because of lack of engagement and time to learn the skill or topic presented (Carpenter & Krutka, 2015; Carpenter & MacFarlane, 2018; Kyndt, Gijbels, Grosemans, & Donche, 2016). Effective PD for teachers is important in order to affect how teachers teach, students' academic achievement and promote a school cultural change. The social media interactions that occur daily on Twitter can impact a teachers' preservice and in-service sense of awareness that could change how they learn when they learn, and what social media platform they use to learn (Carpenter, Tur et al., 2016; Johnson et al., 2019).

Twitter is a platform that connects people from different backgrounds, ages, political views, and education (Carpenter et al., 2019). The Twitter platform includes hashtags that let people connect with the information needed (Carpenter, Tur, & Marín, 2016; Carpenter et al., 2020; Greenhalgh, Rosenberg, Willet, Koehler, & Akcaoglu, 2020). This gives participants a chance to create a profile that identifies their likes and dislikes. The identity of the Twitter profile can show where there are from and their point of view (Carpenter et al., 2019; Greenhalgh, Willet, Rosenberg, & Koehler, 2018). A profile on Twitter can be followed by one or many people. The participants can decide who to follow others.

In addition, there is also a Twitter chat conversation that can occur with the help of the hashtags. Teachers followed different hashtags (#edchat, #sschat, #Stem) depending on their interest and expectations. Quantitative and Qualitative research studies showed how teachers perceived Twitter as a PD process that helps them connected with other teachers, gave them access to resources and significant learning opportunities (Carpenter & Krutka, 2015; Wesely, 2013). Trust (2013, p.13) recommended further research on the "levels of participation" that teachers engaged through social networks.

Teachers' ecologies of participation on Twitter. Research on how teachers interact on Twitter has been done in a number of ways. For this study, the level at which teacher participate was explored, so the literature for this section is organized into low participation and high participation, based on Fischer's lower categories of richer EP (2011).

Low participation. The low or introductory levels of participation of teachers on Twitter, in the research, is described using a variety of descriptors, including: consumers, lurkers, observers, contemplators, and contributors. In relation to Fischer's richer EP (2011) low level participation is described as unaware consumers (Level 0), consumers (Level 1), and contributors (Level 2). The low level of participation on Twitter, would be when teachers are simply exploring Twitter feeds. Lurkers and observers can be synonyms that describe the actions that Twitter participants; they observe, read, and use the resources without any kind of contribution (Britt & Paulus, 2016; Edelmann et al., 2017). Individuals participating at these levels, usually follow Twitter profiles and search

for information and resources (Carpenter & Krutka, 2015; Carpenter, Tur, & Marín, 2016; Carpenter et al., 2019; Carpenter & Linton, 2018; Carpenter & Krutka, 2014; Krutka & Carpenter, 2016; Carpenter, Trust, & Krutka, 2016; Krutka, 2017; Lantz, 2018; Rosell-Aguilar, 2018). Trust (2017) uses the term *contemplator* for individuals who read to get information, and the term *curator* for those who accumulate and organize content using digital tools both of which are still low-level participation. Carpenter and MacFarlane (2018), in a mixed methods study, explored how 252 teachers participated in a mandatory EdCamp unconferences where teachers connected via Twitter and Google Docs. These tools were used to help teachers share and connect. Teachers felt it was a positive experience because they were in control of some level of engagement and the topics that were discussed. The search for resources and beginning to connect on Twitter is how many teachers begin the process of inquiry.

When educators decide to share resources, they become contributors. Fischer refers to contributors as individuals who are actively involved with the community (2011). Carpenter et al. (2019) explored 33,184 Twitter teachers' profiles showing how they used the educational hashtag and shared resources. Carpenter et al. (2019) explored the teachers' Twitter accounts and found that their comments were predominantly about professional educational topics of interest, not personal information that could be taken out of context from their political or religious point of views. Similarly, Krutka and Carpenter (2016) found in a qualitative study of 303 social studies teachers, that teachers contributed to Twitter using educational hashtags and used it to share significant

resources to their learning community. Wesely's (2013) case study showed how teachers organized and collected the resources shared in the community.

One theme that came out of the literature is that contributors engaged by sharing content shared on Twitter. Carpenter and Krutka's (2015) study showed how 96% of the participants contributed by collecting and sharing content on Twitter. Teachers contributions in the Twitter chats included the process of sharing content, writing tweets, discussing educational topics and educational activities (Carpenter & Linton, 2018; Carpenter & MacFarlane, 2018; Carpenter, Trust, & Krutka, 2016). Contributors are an essential part of the Twitter community. Trust (2017) described contributors through the level of interaction that can be identified by the writing and comments displayed on Twitter. When teachers comment or respond to a tweet, the text can show a level of participation or engagement. Adjapong et al. (2018) explored how Twitter chats impact teachers PD; they shared the concept of *professional dialogue*. The findings showed how 64% of the K-12 teachers participants valued the contributions and engagement that the active conversations through Twitter brought. The professional dialogue that teachers contribute during their tweets showed how being part of a CoP can impact their conversations, promote new ideas and learning opportunities. The conversations that come from teachers that discussed educational topics become a professional conversation. Okewole and Knokh (2016) indicated that a learner that wants to contribute in a discussion has to reflect and critically read the information. The reflection that a teacher experience through writing can be seen during their conversations in the Twitter chats (Carpenter & Krutka, 2015; Carpenter, Trust, & Krutka, 2016). The Twitter

educational hashtags included topics and links shared by the community that promoted the contribution between teachers.

Teachers acting as contributors that engage in a conversation, sharing ideas, and content, for this study, was classified as a low level of participation. Fischer's (2011) richer EP, an element of the conceptual framework of this study, described contributors as participants who show active engagement. The active engagement (Fischer, 2011; Trust, 2017) is being consider a low level of participation because it describes the initial process of communicating on Twitter. No matter the term used in the literature: lurkers, contributors or contemplators, research shows that teachers often start at this low-level participation of Twitter before engaging in higher levels (Britt & Paulus, 2016; Johnson et al., 2019; Khine, 2017). Teachers often need resources, and Twitter has shown that it brings significant opportunity to add links, videos, pictures with a hashtag that can be easily identified (Carpenter et al., 2019; Higueras-Rodríguez, Medina-García, & Pegalajar-Palomino, 2020). The research shows that teachers read and acquire information, and educational resources through Twitter.

High participation. The high participation of teachers in Twitter are often described using a variety of terms in the literature including *collaborators, curators, moderators* or *meta-designers*. Fischer's richer EP (2011) Level 3 included: collaborators, curators, and moderators. In addition, Fischer's Level 4, highest level of development, showcase the meta-designers. Collaborators are defined as the participants that create or designed activities collaborating within a Twitter chat (Carpenter, Tur, & Marín, 2016; Ross et al., 2015). Curators are the participants that organized resources on

Twitter in different topics or themes (Rosell-Aguilar, 2018; Trust, 2017; Zhang, 2015). Meta-designers were described as moderators. They decided the topics of discussions, questions, and moderates the Twitter chats (Nochumson, 2020). They keep up with the structure and organization of a Twitter chat. The decision process makes them the highest level of participation, showing the meta-designer's abilities to promote a communication and engagement between a Twitter chat (Adjapong et al., 2018; Britt & Paulus, 2016).

Teachers' highest level of participation on Twitter chats may lead them to consider Twitter as PD. For example, Wesely's case study showed how nine teachers connected, learned and collaborated in a Community of Practice (CoP) on Twitter. This case study has been used as the example displayed in multiple references across research that explores Twitter and teachers' PD (Carpenter & Krutka, 2015; Carpenter, Tur, & Marín, 2016; Macià & García, 2016). Teacher participation that goes beyond reading and retweeting, but instead became part of a CoP is an example of higher-level participation. This process showcased how teachers connections on Twitter could develop a sense of community and learning.

Higher-level participation has also shown to influence teacher's classroom practice and their global view of teaching and learning. In a qualitative study of 105 educators participating in a voluntary Edcamp showed that Twitter was an integral part of the experience, promoting a change in the teachers' practice (Carpenter & Linton, 2018). A participant in Carpenter and Linton's study reflected on how Twitter work as a professional learning network, giving the participant a chance to connect and collaborate with other teachers. Connectedness can be described as the engagement that teachers had

during the interactions with Twitter, the communication and friendship (Trust, 2013).

Connectedness can be a way to avoid the feelings of isolation (Carpenter et al., 2019;

Carpenter & Krutka, 2015) that the teachers described. The teachers' connections can be

seen through the Twitter chats (Carpenter & Krutka, 2015); teachers can connect with

educators outside their school, even from other countries (Carpenter, Tur, & Marín,

2016), changing their school isolated lens to a global perspective.

According to the EP, *collaborators* are a Level 3, and can be considered as part of

the high-level of participation (Fischer, 2011). Teachers that interact and collaborate with

others on Twitter showed how the collaboration helped them prevent the feelings of

isolation and shared innovative ideas (Carpenter & Krutka, 2015). Collaboration has been

described as an action that occurred during the Twitter chats, connections, and

engagement (Carpenter, Tur, & Marín, 2016). Collaboration refers to the active

discussions and the activities teachers share and cocreate with teachers they meet on the

Twitter chats. In a mixed methods study, Ross et al., (2015) showed how participants

described the collaborative experience sharing ideas for a classroom project. The process

that helped the participants gain collaborative knowledge was acquired by the

engagement and conversations developed through Twitter. It was the global collaboration

between teachers that occurred through the Twitter chats that allowed teachers to interact

with others from different states in the U.S. and countries around the world (Ross et al.,

2015). This level of participation was higher than that of contributors because teachers

were working together, across the globe to design lessons with other teachers. Khine

(2017) did a critical analysis of 17 dissertation studies that researched Twitter in

education. Khine (2017) shared examples of how #edchats gave opportunities for collective inquiry and collaboration between participants. Also, these researchers recommended further research in the use of Twitter in education. Collaboration comes in many forms: sharing content, sharing ideas, discussions, designing a Twitter chat, PNL or designing a unit of learning. Twitter is a platform that has allowed a significant discussion among teachers through the use of hashtags.

Curators are a Level 3 described in the EP (Fischer, 2011). Curators organized links, find resources, and keep information out there (Okewole & Knokh, 2016; Rosell-Aguilar, 2018; Trust, 2017; Zhang, 2015). In a study that explored a curator's experiences, Carpenter and Krutka (2015) found that the teacher felt that it was easier to find resources on Twitter than in Google. The word curator appears in literature about news and is described as a process where information is organized in an online platform (Lehmann, Castillo, Lalmas, & Zuckerman, 2013; Sembodo, Setiawan, & Baizal, 2017). Fischer (2011) and Trust (2017) described the curators as participants that searched and organized information that could be shared with a CoP. Pelet, Pratt, and Fauvy (2015) shared that curators are not machines or digital devices, are people on the web that engage with the content.

The highest level of participation included the meta-designers. Meta-designers are those who decide the topics to be discussed and become leaders through their comments and hosting of Twitter events. The meta-designers in the literature are also described as the moderators because they create changes in the topics discussed (Fischer, 2011). Moderators are the leaders in the #edchats, or educational Twitter hashtags (Britt &

Paulus, 2016). Britt and Paulus (2016) shared the hard work and commitment that

moderators engaged. They also recommend further research in the job that moderators do

on Twitter chats. The moderators create the questions and help move the conversations

during a Twitter chat (Adjapong et al., 2018). Krutka (2017) explained how a social

studies hashtag evolved during time, describing the roles of the moderators, their

collaborative work, responsibilities, and shared commitment that allowed a weekly

discussion using the #sschat since 2010. Krutka (2017) example can be compared to the

hashtag #edchat; that has been researching in multiple studies (Britt & Paulus, 2016;

Carpenter & Krutka, 2015; Johnson et al., 2019). Both chats showed how educators can

be engaged through the text, multimedia, and connections that bring a collective inquiry

that promotes informal learning through the Twitter platform.

      The research showed that teacher reflections about education showed how they

interact and care about their profession (Arslan et al., 2018; Kayapinar, 2016; Tosriadi et

al., 2018). The reality about the teachers' isolation in the classroom (Davidson & Dwyer,

2014; Hartman, 2017) and the opportunities to learn outside a traditional PD, indicates an

opportunity to explore how Twitter can become a collective learning resource for PD

programs. The uniqueness of a teacher's profession relies on the constant learning path

and PD programs and research shows that teachers can benefit from information and

engagement that a Twitter chat brings (Carpenter, 2015); giving them a chance to learn,

communicate, reflect and share from a community of learning. There was also research

on teacher PD that included reflective practice can help them transform how they teach

(East, 2014; Farrell & Ives, 2015). However, there is a gap in the literature about how

professional participation on Twitter influences teachers' reflection on pedagogical practices. K-12 teachers may use Twitter for professional purposes, what is still not understood is whether Twitter is being used for reflection on pedagogy and whether the type of participation influences how they reflect.

Summary and Conclusions

In this chapter, I included a discussion of the conceptual framework that combined Kember et al. (2008) and Harland and Wondra's (2011) DoR and Fischer's (2011) richer EP. The literature I reviewed described: Teachers' reflections on pedagogy which included, the importance of teacher reflections, resistance to teacher reflection, teacher reflection and social media, and teacher reflecting as PD. I also reviewed the literature related to teacher professional participation of Twitter which included teachers using Twitter for PD, and teachers' EP on Twitter. Teacher reflections on pedagogy have been studied from preservice and in-service teachers' perspectives (Bates et al., 2016; Cherrington, 2018; Kayapinar, 2016). Research shows that a reflective process can change teachers' ideas about school or education (De Vries et al., 2013). However, challenges in PD remain, as some studies indicated that teachers sometimes resisted activities that promote metacognition or critical reflective process (Cherrington, 2018). Evidence of how teacher reflections impact education and PD had been seen through qualitative and quantitative studies, but much fewer have been done in relation to social media. Some teacher studies have shown that social media, including blogs and Twitter can be used as PD (Ciampa & Gallagher, 2015; Kamalodeen et al., 2017; Rosell-Aguilar, 2018). While researchers have examined the reflective process that teachers experience

through social media and how that promotes a sense of community among them (Kelly &

Cherkowski, 2015), and how Twitter chats promote collaboration and discussion of ideas

(Carpenter & Krutka, 2015), no studies have been found that addressed how various

types of participation may influence reflective practices. Therefore, in this study, I

explored a gap in the literature related to how professional participation on Twitter

influences teacher reflection on pedagogical practices.

Chapter 3 includes a description of methodology for this single case study. I

describe the research design and rationale, the role of the researcher, participant selection,

instrumentation, procedures for recruitment, participation, and data collection, data

analysis plan, evidence of trustworthiness, and ethical procedures.

Chapter 3: Research Method

The purpose of this qualitative case study was to explore how professional participation on Twitter influence teacher reflection on pedagogical practices. To accomplish this purpose, I interviewed nine K-12 teachers who participated on Twitter, collected reflective journals, and examined Twitter posts from these teachers. Chapter 3 is organized into the following sections: research design and rationale, research questions, role of the researcher, participant selection, instrumentation, procedures for recruitment, participation, and data collection.

Research Design and Rationale

The research design of this study was a single case study. In this section I include a description of how these methods were used in this study to answer the research questions.

Rationale for Research Design

The central phenomenon I examined in this study was how varying levels of participation on Twitter influence teachers' reflection on pedagogical practices. The research design was created to address two RQs.

RQ 1: In what professional activities do teachers participate on Twitter?

RQ 2: How do teachers use Twitter to help them reflect on pedagogical practices?

The central concepts studied in this case study include teacher's professional participation and reflection on Twitter. A qualitative design was chosen because I am seeking to explored participants' perceptions, reflections, and experiences using Twitter. A qualitative design best helped me explore the participants' opinions, what they felt, or

experience (see Creswell, 2013; Patton, 2015). Those experiences are better recorded from an interview protocol, participant's tweets, and journal prompts. A quantitative design was not chosen because the information collected from a survey or questionnaire would not bring the nuance that could be obtained from a single case study approach.

A single case study design was selected for this study. Yin (2018) defined a case study as "an empirical method that investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident" (p. 15). The case study was selected because it is an empirical method that can fully explore an experience (Yin, 2018). Yin (2018) explained that *how* and *why* questions are a significant part of the case study rationale because it examines a process that can occur in a case. The case study "relies on multiple sources of evidence, with data needing to converge in a triangulating fashion" (Yin, 2018, p. 15). I used the case study to explore how varying levels of participation on Twitter influence teachers' reflection on pedagogical practices.

The case study approach allowed me to examine teacher participation on Twitter at two levels. I used the EP model (Fischer, 2011) to categorize teachers into two groups: those who participate at high levels and those who participate at lower levels. I explored the reflective practices by examining data from interviews, reflective journal responses, and teacher tweets. The data collected showed a variety of information that helped me conduct an in-depth exploration of the case.

The qualitative research process has a variety of inquiry designs that could be an alternative for this single case study: phenomenology, grounded research, narrative

inquiry, and ethnography. First, phenomenology is a qualitative research design that explores how the participants describe an event, an experience that had a profound effect on their life (Creswell, 2013). The data collection in a phenomenological study evolves from what participants describe (Creswell, 2013; Patton, 2015). Merriam and Tisdell (2016) described phenomenology as a process that can explain a powerful personal experience. Because I wanted to gain an understanding of various types of professional experiences, I sought to gather data from various sources and from larger numbers of participation than is common in phenomenological studies. In this single case study, the how and why were more aligned with the design of the study and data collection techniques. Second, grounded theory research is a qualitative design that develops a theory that comes from the data collected (Creswell, 2013; Merriam & Tisdell, 2016). In this case study, the development of a new theory was not the rationale. The rationale was aligned with the teachers' DoR and levels of participation on Twitter. Third, the narrative inquiry design is based in an analysis of the participant story; how they share their reality (Merriam & Tisdell, 2016). The narrative inquiry could describe the participants' experiences. However, the case study could show a more specific view of the problem being studied. Fourth, the ethnography research designed allows researchers to study a holistic view of the culture, patterns, and opinions of a group and describe experiences within that group (Creswell, 2013; Delamont et al., 2008). In this case study, the view of the teachers' DoR and level of participation provided more substantial information to answer the research question than the cultural experiences of the participants; therefore, ethnography was not used for the design.

Role of Researcher

For this qualitative study, I served as the primary investigator. Yin (2018) recommended that a researcher should listen attentively and design questions that will allow data to flow. The researcher also needs to be aware of the ethical aspects that the case study can bring (Yin, 2018). I was responsible for participant recruitment and the development of data collection tools, including interview protocol, participant's tweets, journal prompts, as well as data analysis.

My role as a researcher did not conflict with my present position as a social studies teacher because I did not participate in the Twitter chats that I was evaluating for participants recruitment. I selected participants that were active in Twitter chats about education, education technology, STEM, reading, teaching, or other topics related. I was objective and worked without bias. The participants selected were unknown to me, this limited the development of bias during the research process.

Methodology

In this methodology section, I described participant selection logic, instrumentation, procedures for recruitment and participation and a data analysis plan.

Participant Selection Logic

Participants in this study included nine K-12 teachers who engage and interact professionally on Twitter. The participants were selected using a purposeful sampling strategy, from teachers who professionally participate on Twitter. Creswell (2013) explained how purposeful sampling gives the researcher the chance to select the participants that would describe the case in-depth, showing details and descriptions that

only the participants could provide. Patton (2015) indicated that purposeful sampling had

been widely applied in qualitative research case studies. Sim, Saunders, Waterfield, and

Kingstone (2018) described how a case study could have four to five participants per

case. The numbers of participants selected brings the opportunity to in-depth explore the

single case study. Participants were selected according to specific inclusion criteria. K-12

teachers needed to self-select based on meeting the following inclusion criteria: (a) they

were an inservice K-12 teacher, and (b) they used educational Twitter hashtags

(#ELAChat, #Langchat, # istechat, #nt2t, and #mschat).

Instrumentation

For this study, I designed three types of instruments to collect data from email

interviews, two reflective journals, and individual tweets of participants. A table aligning

each of the data sources to the research questions can be found in Appendix A. The data

collection instruments include an email interview questions (Table 4), two Twitter

Reflective Journals (Appendix B and C), and a Tweet Content Analysis Form (Appendix

D). These instruments are aligned with the research questions, conceptual framework and

literature reviewed. I asked my committee members, each with advanced degrees in

education to review the alignment of these instruments to the research questions.

Email interview protocol. The logistics of the email interview schedule was

based on research that Hawkins (2018) presented about conducting effective email

interviews for qualitative research. In the email interviews, participants responded via

email to interview questions by typing their responses. This was justified for a number of

reasons. First, teachers who consent to participate showed a wide range of technological

proficiency, and have a professional online presence, that indicated a natural proficiency to communication electronically. Second, teachers have a wide range of responsibilities and a time frame for a face-to-face interview could be limited, the email interview gave them the space to answer in the time that is better for them. Asynchronous communication via email benefitted the study, giving the participants the chance to select the day or hour to answer the interview questions (Hawkins, 2018).

Table 4

Alignment of the Research Questions with Email Interview Questions

Research Questions	Email Interview Questions
RQ 1 In what professional activities do teachers participate on Twitter?	IQ#1: How did you first begin participating on Twitter? IQ#2: How has your participation on Twitter evolved over time? IQ#3: Describe your experiences with Twitter chats.
RQ 2 How do teachers use Twitter to help them reflect on pedagogical practices?	IQ#4: How has your participation influenced what you do in the classroom, if at all? Share an example. IQ#5: How has your participation on Twitter made you reflect about your teaching practice if at all? Share an example. IQ#6: Describe a teaching topic that you are passionate about that has been discussed on Twitter. How has your Twitter participation influenced your views on the topic? IQ#7: Describe a time when something you heard about education on Twitter made you rethink the topic.

I developed seven interview questions (IQ). IQs 1-3 align to RQ1 and allowed me to collect data regarding teacher perceptions of their professional participation on Twitter. IQs 4-7 align with RQ2 and allowed me to collect data regarding teacher perceptions of how they use Twitter to reflect on pedagogical practices.

Reflective journals. I designed two reflective journal prompts. The first is aligned to the richer EP model (Fischer, 2011) and helped me collect data on teacher perceptions of their professional participation on Twitter. Teachers were asked to respond to Reflective Journal 1, identify their levels of participation on Twitter, and share an example (Appendix B). The data collected from this journal helped me answer RQ1 and helped to categorize their level of participation. In the Reflective Journal 2 (Appendix C), teachers shared their experiences after attending a self-selected Twitter chat. Data from this journal prompt helped me answer RQ 2, related to DoR model (Kember et al., 2008).

Tweet content analysis form. The final source of data for this study was an examination of tweets of consenting teacher participants. I used a tool I designed called the Tweet Content Analysis Form (Appendix D). I had two purposes in collecting tweets. The first was to use the tweets to confirm the type of professional Twitter participation with which the teacher was involved compared to how the teacher viewed their professional use of Twitter. The second was to determine if the tweets themselves have evidence of the teacher reflecting on teaching pedagogy. The form includes one column for determining the type of participation and another column for evidence of reflection. Therefore, the Tweet Content Analysis Form helped gather data to answer both research questions.

Procedures for Recruitment, Participation, and Data Collection

In relation to recruitment, I searched for teachers to participate in my study by examining those who had posted to Twitter, using five popular educational hashtags;

#ELAChat, #Langchat, #istechat, #nt2t, and #mschat. See Table 5 for descriptions of each hashtag.

Table 5

Educational Twitter Chats

Hashtag	Name	Description	Meeting day and time
#ELAChat	English Language Arts chat	Educational topics, reading, writing and literacy	Wednesdays, 8 pm ET
#istechat	International Society for Technology in Education chat	Educational topics, Educational Technology and ISTE standards	Third Thursday, 8 pm ET
#Langchat	Language Chat	Educational topics for world language teachers	Thursday, 8 pm ET
#mschat	Middle School	Educational topics related to Middle School	Thursday, 8 pm ET
#nt2t	Educators new to Twitter	Educational topics for teachers that are new using Twitter	Saturdays, 9 am ET

I began looking for participants within the hashtags above. However, I found the participants within these four hashtags: #ELAChat, #Nt2T, #Langchat, and #mschat. In Twitter, I searched for the educational hashtags, then identify the teachers who have tweeted using these educational hashtags in the past three months. The hashtag lead me to the public profiles of these teachers. I made a list of potential participants and using their Twitter handles, I followed their profile to be able to contact them via Twitter. I sent a direct message (DM) system, with a brief introduction to the study. That message included a link to the online letter of consent where, if they are interested to learn more about what participation in the study would include. The use of DM as a recruiting and research tool has been successfully used in previous research (Rosell-Aguilar, 2018).

Once potential participations have read the informed consent, if they decided to participate, they clicked on a "I consent" link, which took them to an online demographic questionnaire, where they submitted their Twitter handle and email address. The first 10 teachers who fill out the demographic questionnaire were the participants in my study.

In regards to participation, the consenting participations were asked to participate in three online activities, email interviews, which includes responses to seven questions, two reflective journal prompts via DM, one related to a their level or participation on Twitter (Appendix B) and the other a reflection on a Twitter chat they have attend (Appendix C).

The first step in the data collection process are the IQ. I sent out the seven IQs split into three separate emails over a 3-week time frame, one email per week. The first email had IQs 1-3, the second email included IQs 4-5, and the third email included IQs 6-7. The body of the email included the interview questions, and the participants were prompted to hit reply, and type in their responses. They were asked to return replies to me with 7 days, and I sent a reminder via a Twitter DM four days after the initial email was sent as a reminder. Hawkins (2018) recommended limiting the amount the number of emails to provide a framework that will help the participants understand their commitment to the study, hence only three emails. Email interviews were used to provide a canvas that would show how the themes evolved in the data collected (see Hawkins, 2018); this would allow an in-depth exploration of the single case study explored.

The second step of data collection was collecting data via the reflective journal. Once I received all three email replies from a participant, I moved them to this second

phase. I sent a Google form link via Twitter DM for the first of two journal reflections (Appendix B). When I received a participant's first journal prompt reply, I used Twitter DM to invite them to complete the second journal prompt, using a Google form link regarding an education Twitter chat they have participated in in the past (Appendix C). The use of DM as communication with study participants has precedent in the literature. Rosell-Aguilar (2018) created a Twitter Direct Messaging Interview Protocol. The contact by DM proved to be effective and ethical, the participants shared their points of view and reflects on the topics discussed (Rosell-Aguilar, 2018).

The last phase of data collection was to collect the tweets from each of the participants. I navigated to their public Twitter homepage. Using the Tweet Content Analysis Form (Appendix D), I collected the following information: (a) Teachers' Twitter handle, (b) teacher's homepage URL, (c) date data from profile was downloaded, (d) participant pseudonym, (e) years on Twitter, (f) number of followers the teacher has, (g) the number of people the teacher follows, and (h) the total number of tweets the teacher posted. This information was collected to be help describe their professional participation on Twitter. I collected tweets from each teacher for analysis. I selected one month of previously published tweets from each teachers' home feed. I also downloaded the tweets the participant may have posted on Twitter using the analytics Twitter tool Twitonomy and reflected upon for the reflective Journal Prompt 2. This form allowed me to fully explore the teachers use of Twitter and analyze the tweets using the conceptual framework and literature reviewed. This aided to triangulate data collected in interviews and reflective journals, related to their DoR and types of participation.

Data Analysis Plan

For the interview and reflection data collected from the participants, I conducted data analysis at two levels. Elliott (2018) described coding as a chance to understand the data collected and organize the codes into themes. During the first level of coding, I used theory-driven codes or a priori codes based on my conceptual framework. DeCuir-Gunby, Marshall, and McCulloch (2011) indicated that the process of coding between the first and second level is a way to interrelate and connect the data described. The codes I developed from ecology of participation model (Fischer, 2011), helped me categorize the type of participation the teacher says he/she is engaged in. The DoR model (Harland & Wondra, 2011; Kember et al., 2008) allowed me to code according to the reflective practices of teachers. I used The Tweet Content Analysis Form (Appendix D) to confirm participation levels and reflective practices teachers shared in the interviews and journal reflections.

During the second level of coding of the interview and reflection data, I looked for emergent themes from the data collected during Level 1. These were data-driven codes. DeCuir-Gunby et al. (2011) explained that the data-driven codes come from the primary data that emerge from the data collection instruments. DeCuir-Gunby et al. (2011) further explained that the primary data or raw data were organized in themes, code, and verified for dependability. The process gave a clear path of how data first organized by a priori codes can then be categorized into data driven themes or categories and provide a holistic view of the data analysis process, moving from Level 1 to Level 2

and constant verification between them to find codes that connect and interrelated. These themes helped me answer the two research questions.

I used the Tweet Content Analysis Form (Appendix D) to conduct data analysis of the tweets. First, I examined tweets to determine what types of professional participation the tweets reveal, aligned to the EP model (Kember et al., 2008). Next, I identified level of reflective of each tweet, aligned to the DoR model (Fischer, 2011). This data were compared to teacher perceptions of their Twitter participation and to their perception of reflection on pedagogical practices.

Part of the data analysis plan is knowing how to treat discrepant data. Discrepant data are data that confronts the study results and makes the researcher reflect on their findings, comparing the discrepancy with the conclusions (Maxwell, 2004). If I had discrepant data, I plan to share the data, compare it with the results and analyzed how it affects the study. Fundamentally, the discrepant data can transform the analysis of the study, and this is why it was necessary to take it into account and display the results. My plan for dealing with discrepant data was to report it, determine if it should be included in analysis and share that in my results.

Issues of Trustworthiness

Trustworthiness is important to qualitative research because shows the rigor, integrity and confidence in the study process, results and conclusion (Connelly, 2016; Merriam & Tisdell, 2016). A qualitative research must always be aligned with an ethical and transparent process. Trustworthiness can be ensured by following these guides: credibility, transferability, dependability, and confirmability (Merriam & Tisdell, 2016).

Credibility

For qualitative research, Merriam and Tisdell (2016) defined credibility as how "research findings match reality" (p.242). Merriam also recommended that qualitative researchers use the following strategies to improve the credibility of qualitative research: triangulation, member check, adequate engagement in data collection, searching for discrepant data, and peer examination. For this study, I used the strategy of data triangulation by comparing and contrasting the data collected via email interviews, teachers' Twitter posts and profiles, and journal prompts.

Transferability

For qualitative research, Merriam and Tisdell (2016) defined transferability as the process that "refers to a description of the setting and participants of the study" (p.257). I selected teachers that participate using one of five educationally focused hashtags on Twitter. I provided generalized descriptions of the teachers, descriptions of the types of professional participation each participate, and summarize information from their profile on Twitter in attempt to describe how each participant. I described the history of the hashtag. Also, Merriam and Tisdell (2016) indicated that transferability can be enhanced if the study can be replicated. With the detail in the instruments and data collection process, it is expected that others could replicate the study with additional participants.

Dependability

In qualitative research, dependability is how the results are "consistent and dependable" (Merriam & Tisdell, 2016, p. 251). Merriam and Tisdell (2016) recommended the strategy of audit trail to ensure dependability. "Procedures for

dependability include maintenance of an audit trail of process logs and peer-debriefings with a colleague" (Connelly, 2016, p. 435). Merriam and Tisdell (2016) recommended the strategy of triangulation, peer examination and audit trail. For this study, I documented the data collection process and create an audit trail. Also, I conducted triangulation where the documents allowed for further explored the single case study.

Confirmability

Lincoln and Guba (1985) explained confirmability as a process that let other researchers verified a study from the data collected and through an audit trail. Guba and Lincoln were "concerned with establishing the fact that the data and interpretations of an inquiry were not merely figments of the inquirer's imagination" (1989, p. 243). Connelly (2016) indicated that "confirmability is the neutrality, or the degree findings are consistent and could be repeated" (p. 435). Patton (2015) stated that to acquire confirmability, the researcher should apply an audit trail on the data results. Shenton (2004) recommended triangulation to decrease bias throughout the investigation. For this study, I designed the study so as to triangulate the data sources, and timing of the archived Twitter posts to promote the confirmability of the process. I also kept a researcher journal as a way to create an audit trail from notes created during the data collection and analysis process as recommended by Cutcliffe and McKenna (2004).

Ethical Procedures

The trustworthiness of qualitative research depends on the researcher's ethics and actions. Patton (2015) explained that research ethics and study trustworthiness relies on how the researcher works, collects, and acts toward the evidence collected throughout the

study. Merriam and Tisdell (2016) indicated that credibility is internally correlated to ethical procedures that guided the data collection process. My ethical proceedings were conducted by rigor and credibility. I applied to the Institutional Review Board (IRB) at Walden University to obtain an approval (# 01-13-20-0378076) that ensured an ethical plan for data collection. In regard to recruitment, no research partner agreements are necessary for my study. I accessed potential participants using publicly accessible social media posts. I contacted potential participants who use the following hashtags: #ELAChat, #Langchat, #istechat, #nt2t, and #mschat. All recruitment was handled via DM. There was no stigma or benefit related to participants' decision on whether or not to participate, as the invitation was private, and participation was confidential. Participations volunteered to participation with no cohesion. Once participants consented, they may withdraw from the study at any time.

In relation to data collection, this was achieved by protecting the data collected on password protected computers and files. All data were collected digitally, either through the email address they chose to provide as part of the demographic questionnaire, or through the DM feature on Twitter. Data collected via DM or Google forms were downloaded onto a personal computer and prepared to data analysis. To prepare raw data for data analysis, I redacted participants' Twitter handle, and any other identifying information and replace it with a pseudonym or generalized description, to provide confidentiality of the participants. I was the sole researcher for this study and was the only one who knew the participants' real Twitter handles.

In relation to the treatment of data, data were confidential and protected as such. Although participant profiles and comments on Twitter are public, pseudonyms were used to protect both their in-real-life identity as well as their Twitter handle identity (Boellstorff, Nardi, Pearce, & Taylor, 2012). Because participants' tweets, could be easily traced back to their Twitter identity and possibly their in-real-life identity, any reference to the archival (previously published tweets) in the results, the posts were paraphrased, not quoted, as a way to protect participant confidentiality (Roberts, 2015). Coded data will be saved for five years, as is the university's policy. At which time, digital data will be destroyed, and any paper data will be shredded.

Summary

This chapter included the research design and rationale. The research design was a single case study. I explored how varying levels of participation on Twitter influence teachers' reflection on pedagogical issues. I discussed my role as the sole researcher and how I applied ethical principles to guide my research from the procedures of recruitment, participation, and data collection and analysis. The data collection included interviews from 8-10 teachers, reflective journal responses, and teacher tweets. For the data analysis plan, I applied two levels, a priori coding, and emergent themes. I also addressed the issues of trustworthiness, the use of data triangulation showing the relationships between the data collected by comparing themes. I applied ethical procedures for the case study. In Chapter 4, I will describe the setting, demographics, data collection, data analysis, discrepant data, evidence of trustworthiness and results.

Chapter 4: Results

Introduction

The purpose of this qualitative case study was to explore how professional participation on Twitter influences teacher reflection on pedagogical practices. To accomplish this purpose, I collected data from interviews, reflective journals, and teachers' tweets. The research RQs adopted in this study were:

RQ 1: In what professional activities do teachers participate on Twitter?

RQ 2: How do teachers use Twitter to help them reflect on pedagogical practices? In this chapter, I will report the results of this case study. It includes information about the setting and a description of the demographics, data collection, and data analysis details.

Setting

Teachers who participated in this study did not come from the same instructional setting. Instead, what the teachers had in common was that they each had participated in Twitter chats using the same educational hashtags (#ELAChat, #Nt2T, #Langchat, or #mschat). Each hashtag described a different learning community. For example, in #ELAChat, teachers discussed topics related to literacy, reading and writing. Chats using the hashtag #Nt2T is used by new teachers on Twitter to discuss general educational topics. In addition, #Langchat is a learning community for World Language teachers that include classes like Spanish, French, German, and others. Also, #mschat is a community for middle school teachers to discuss educational topics related to them. Twitter becomes the virtual setting of this case study. They were all teachers from the United States.

Demographics

The participants for this study included nine teachers who work in schools in the United States. The participants were teachers that worked in K-12 schools. They participated in Twitter educational chats. All but one teacher had 12 or more years of teaching experience, and all but one was female and taught in a variety of content areas. Table 6 shows the demographic information of the participants, including number of years teaching, gender, grade levels, and content area or specialization.

Table 6

Participant Demographics of Teaching Experience, Gender, and Current Position

Participant	# of Years Teaching	Gender	Grade Levels	Content Area Specialization
P1	17	M	6,7,8	Social Studies, Fabrication Lab/TV Production
P2	17	F	7	Language Arts
P3	12	F	2	Language Arts, Science, Math, Computer Science
P4	13	F	11	Language Arts
P5	5	F	9, 10, 11, 12	World Languages
P6	15	F	6	Language Arts
P7	12	F	11, 12	Spanish
P8	14	F	9, 10, 11, 12	World Languages Spanish
P9	13	F	9, 10, 11	World Languages Spanish

Table 7 shows demographic data from the participants Twitter profile. Three of the teachers had been on Twitter for 10 or more years. Three teachers had been on Twitter for 7-8 years, two had been on 4-5 years, and one teacher was relatively new to Twitter only having been on Twitter for 2 years.

Table 7

Participant Demographics of Twitter Profile Data

Participant	# of years on Twitter	#Tweets	#Followers	#Following
P1	11	> 50,001	15,001-15,500	7,501-8,000
P2	8	8,001- 8,500	1,001-1,500	1,001 – 1,500
P3	7	5,501-6,000	501-1,000	1,001 – 1,500
P4	11	2,001 – 2,500	101-500	101 – 500
P5	5	2,501-3,000	501-1,000	501- 1,000
P6	4	2,501-3,000	101-500	501- 1,000
P7	10	11,501-12,000	1,501-2,000	2,001 – 2,500
P8	2	101 – 500	101-500	< 100
P9	7	2,001 – 2,500	101- 500	501- 1,000

Note. Twitter profile data collected July 2020.

Participant 1 (P1) is an enthusiastic educator who participates actively in Twitter.

He is a middle school teacher with 17 years of experience. He teaches in the content areas

of social studies and technology courses. P1 had participated in multiple educational

chats in different roles, from a lurker to a moderator. His tweets were related to

educational topics among other issues. He was part of a team that organized a state

educational hashtag. Of all the participants in the study, P1 was the most active on

Twitter having the largest number of tweets of over 50,000. He followed between 7,501-

8,000 individuals on Twitter and had between 15,001-15,500 followers.

Participant 2 (P2) is an educator who also had 17 years of experience. She is a

middle school language arts teacher and also works with educational courses in higher

education. P2 is an active participant on educational Twitter chats, even acting as a

moderator on some occasions. P2 had shared around 8,001- 8,500 tweets at the time of

this study. She tweets about books that helps her improve her students' reading skills and also uses Twitter organizer tools to follow other chats.

Participant 3 (P3) fit the inclusion criteria of being a K-12 teacher from the United States who participated in educational Twitter chats and was the only primary teacher to consent to participate in this study. She teaches second grade and had 12 years of experience. She participated in technology conferences that brought Twitter chats to her attention. She has been on Twitter for 7 years. She shared around 5,501-6,000 tweets. P3 enjoys sharing information on Twitter about books and articles that she reads. P3 used Twitter as an opportunity to connect with other teachers and share resources online.

Participant 4 (P4) is a high school educator with 13 years of experience in language arts. She described Twitter as a "professional platform" because she follows teachers that shared content that she considers beneficial. P4 tweets were between 2,001 – 2,500, showing an active Twitter participation. She had around 101 – 500 followers and Twitter profiles that she follows.

Participant 5 (P5) is a high school educator who teaches world language Spanish classes with 5 years of experience. She began to use Twitter as soon as she started as a teacher. She was active on Twitter with 2,501-3,000 tweets. She shared that looking at other teachers' "perfect" classrooms through Twitter can bring her some anxiety because it prompted her to think about other teachers' expectations.

Participant 6 (P6) is a sixth-grade educator with 15 years of experience. She teaches Language Arts. She participated in a conference; the speakers shared their Twitter accounts and shared how Twitter could be used as a PD opportunity. This event

motived her to begin with a Twitter account. She participated actively in Twitter showing around 2,501-3,000 tweets. She uses Twitter as a way to connect professionally with other educators.

Participant 7 (P7) is a high school World Language Spanish educator. She has 12 years of teaching experiences. She began on Twitter as part of a "requirement for a teacher-certification course." She is highly active on Twitter showing around 11,501-12,000. P7 used Twitter organizational tools to keep up with her favorite hashtags. She is a tech-savvy teacher, that shared information about educational technology tools like Quizlet, Skype, and Kahoot among others.

Participant 8 (P8) is an educator with 14 years of teaching experience. She is a World Language Spanish Teacher. She began to use Twitter 2 years ago, motivated by a friend that sent screenshots of Twitter conversations. She has the fewest tweets, between 101 – 500 and followed less than 100 people on Twitter.

Participant 9 (P9) is a World Language Spanish high school educator, with 13 years of teaching experience. She participates in conferences and enjoys learning about professional learning networks. She had around 2,001 – 2,500 tweets. P9's posts on Twitter shows a variety of educational topics always with a positive interaction. P9 participation on Twitter ranges from lurker to a moderator.

Data Collection

For this case study, I followed the data collection process described in Chapter 3. I collected data from multiple sources. One source was interviews, another was journal prompts and, I also collected teachers' tweets.

Interviews

In January 2020, I received IRB approval to conduct this study. I began the participant recruitment process on Twitter as described in Chapter 3. After each gave consent, I began the process of emailing interview questions. Table 8 shows the dates that the participants were contacted, also when the first emails were sent, and the date participants replied.

Table 8

Participants Recruitment Process on Twitter and First Emails

Participant	Participant recruitment from Twitter	Participant accepts to be part of the study	First email Interview Questions (1-3)	Participant answered Interview Questions (1-3)
P1	01/25	01/26	01/26	01/26
P2	01/25	01/30	01/30	01/31
P3	01/27	02/01	02/02	02/02
P4	02/22	02/22	02/22	02/26
P5	03/16	03/16	03/17	03/17
P6	03/18	03/19	03/19	03/19
P7	03/16	03/16	03/16	03/24
P8	03/16	03/20	03/21	03/23
P9	04/19	04/19	04/19	04/20

Note. All data were collected in 2020.

Reflective Journals

Another source of data were reflective journals. I emailed each teacher two reflective journal prompts. The journal prompts were sent in the second and third email (see Table 9). Journal 1 identified the levels of participation on Twitter (Appendix B). Journal 2 showed how teachers reflect upon their participation on a Twitter chat

(Appendix C). I prepared the reflective journal data for analysis when the journal prompts

were downloaded from Google docs to a word document and uploaded for coding into

Dedoose. Table 9 shows the dates participants responded to second and third emails with

interview questions and journal prompts.

Table 9

Participants Responded to the Second and Third Email and Journal Prompts

Participant	Second email Interview Questions (4-5) and Journal #1	Participants answered Interview Questions (4-5) and Journal #1	Third email Interview Questions (6-7) and Journal #2	Participants answered Interview Questions (6-7) and Journal #2
P1	02/02	02/02	02/09	02/09
P2	02/06	02/07	02/15	02/23
P3	02/09	02/15	02/22	02/22
P4	02/29	03/06	03/09	03/12
P5	03/21	03/23	03/28	04/02
P6	03/21	03/24	04/11	04/14
P7	03/28=	03/30	04/04	04/13
P8	03/28	04/02	04/04	04/10
P9	04/25	04/27	05/02	05/04

Note. All data were collected in 2020.

Twitter Tweets

Another source of data was publicly posted Twitter tweets. I chose to use tweets

participants posted in the month of September of 2019. September was a good month to

choose because it is during the Fall and showcased a variety of education Twitter chats

with educational content that in other months could be affected by school breaks. The

participants' tweets were downloaded from Twitonomy (a Twitter analytics tool that

allows collecting tweets from the Internet) and organized by dates in an Excel document. In the Excel document I selected the tweets from September and organized them in a table using a document in Word. Next, I uploaded the Twitter tweets into Dedoose in preparation for coding. Each participant had their own file of tweets download, organized in Word and uploaded in Dedoose.

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Data Analysis

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I used data analysis at two coding levels, Level 1 a priori codes (see Elliott, 2018) and Level 2 data-driven codes, or emergent codes (see DeCuir-Gunby et al., 2011) recommended for qualitative research. I conducted two levels of coding, all of which was organized in Dedoose, a qualitative data management software program.

Process of Coding

To address the types of professional activities teachers participate in on Twitter, I began coding for the high and low levels of participation from the ecology of participation model (Fischer, 2011). I used a priori coding based on my codebook aligned with the ecology of participation model. I used the levels of participation as a way to describe the role that the participant showed during Twitter chats. The high participators included meta designers, curators, and collaborators. The low participators included unaware consumers, consumers, and contributors. The data code for levels of participation included interviews and journal prompts. The codes in the high and low levels of participation showed the descriptions that the teachers shared during the interview questions and journal prompts. The tweets collected were not coded for levels of participation.

The levels of participation reflect the role that the teacher had on Twitter chats (meta designers, curators, collaborators, contributors, consumers, and unaware consumers). The content displayed on the tweets did not show a specific role, instead showed topics discussed and DoR. I also looked for emergent codes to identify what professional topics teachers were participating in. After the a priori code was applied in the high and low level of participation, the data collected from the interviews and journal prompts showed patters and descriptions that were applied in professional activities. Then professional activities were divided into four categories: building professional identity, exchange of ideas, learn new skills, and professional connectedness. To address how teachers use Twitter to reflect on pedagogical practices, I used a priori codes which I described in my codebook, based on the DoR model (Harland & Wondra, 2011; Kember et al., 2008). I coded interviews first into the four categories, then I coded journals and last 877 tweets. Later, I found commonalities within the code and developed categories that described more specifically how they were reflecting.

Development of Codes and Categories

Professional activities. High level of participation was coded as collaborator, curator, or meta-designer. Collaborator was applied to text excerpts that showed teachers creating and designing activities within a Twitter chat, were they felt connected and engaged with other teachers (see Carpenter, Tur, & Marín, 2016; Ross et al., 2015). The curator code was applied to excerpt that show Twitter organizational tools that allowed the teachers to keep up with their participation on Twitter chats and organized resources on Twitter in different topics (see Rosell-Aguilar, 2018; Trust, 2017; Zhang, 2015). And

meta-designer was applied to excerpts that showed a teacher that host Twitter chats and

organized the content discussed as a moderator (Britt & Paulus, 2016; Fischer, 2011).

The data sources coded included interviews and journal prompts. The excerpts described

their high levels of participation. Table 10 shows the frequency and percent of high-level

participation that includes collaborators, curators, and meta-designers.

Table 10

High Levels of Teachers Participation on Twitter

High Level of Participation	Frequency	Percent
Collaborator	21	55%
Curator	6	16%
Meta-Designers	11	29%
Total	38	100%

Low level of participation was coded as consumer, contributor, and unaware

consumer. The contributor code was applied to excerpt that shared content Twitter,

comment with other teachers, answer questions without a further discussion on the topic.

An example is P8 who in the interview shared that "I've been posting tweets and sharing

ideas." In another contributor excerpt, P2 indicated in the interview that "Twitter

contributors are full of good ideas." Consumer was applied to text excerpts that showed

how teachers recognize the opportunities and took advantage of them (Fischer, 2011). For

example, P6 shared in the interview that "I would post here and there and followed a few

people." Also, P8 shared in her consumer behavior when she shared in the interview "I

lurked for a long time, reading other people's comments, then slowly started commenting

and finally, just in the past few months, I've been posting tweets and sharing ideas." The

consumers "like" or retweet a comment. And unaware consumer was applied to excerpts

that show passive consumers, they are in the Twitter chats, but do not participate or

engage in any interactions (Fischer, 2011). They may follow and attend a Twitter chat;

however, they do not participate on them. P9 described in the interview that "I started by

stalking the chat and reading what people had to say about the questions posed by the

moderators." The data coded included interviews and journals prompts. The excerpts

showed the low levels of participation described. Table 11 shows the frequency and

percent of low levels of participation that includes unaware consumers, consumers, and

contributors.

Table 11

Low Levels of Teachers Participation on Twitter

Low Level of Participation	Frequency	Total Percent
Unaware Consumer	47	48%
Consumers	28	29%
Contributors	22	23%
Total	97	100%

In addition to a priori coding, I also used emergent coding. I coded interviews and

journal prompts for the types professional activities teachers were engaging in. I ended up

with 14 emergent codes that I collapsed into four categories (see Table 12). The category

building professional identity was related to the teachers' personal growth for example

gaining professional visibility, PD, building confidence and sharing topics they are

passionate about. The category exchange of ideas referred to discussions of educational

topics and sharing resources and ideas among them. The category learn new skills were

related to the way they acquire ideas and learn from Twitter chats. The category

professional connectedness showed how teachers shared friendship, connected to

educators globally and followed Twitter educational hashtags. Table 12 shows Level 2

codes described as professional activities showing the emergent codes by category.

Table 12

Level 2 Codes – Professional Activities

Category	Emergent Theme	Frequency	Total (percent)
Building professional identity		40	40/154 (26%)
	Build confidence	6	
	Gain professional visibility	7	
	Professional development	7	
	Teaching topics there are passionate	4	
	Want a voice	9	
	When they start to use Twitter	7	
Exchange of ideas		37	37/154 (24%)
	Discuss educational topics	23	
	Share resources	5	
	Share ideas	9	
Learn new skills		23	23/154 (15%)
	Gaining new ideas	14	
	Learning new things	9	
Professional connectedness		54	54/154 (35%)
	Connect with educators globally	15	
	Follow hashtags	26	
	Make friends -same ed interest	13	

Depth of reflection. I then coded the tweets, journals, and interview questions for

the DoR. A total of 787 excerpts were coded (see Table 13). The excerpts that described

how the teachers changed their ideas about the topic discussed and were able to relate in a

critical thinking response showing a higher level of thinking were coded as critical

reflection. For example, P3 shared in Journal 2, "This chat has posed thoughtful questions

in the past that help me reflect on my own teaching practices. The main reason I tend to

join Twitter chats is for self-reflection."

Table 13

Depth of Reflection Codes from Interviews, Journals, and Tweets

Codes		Frequency	Total (Percent)
DoR- Critical		85	11%
DoR - Reflection		182	23%
DoR - Understanding		235	30%
DoR – Non reflection/ Descriptive		285	36%
	Total	787	100%

The excerpts that related to the teachers' personal experiences and how they were

able to relate the topic to their profession were coded at the reflection level. For example,

P9 shared in the interview, "My participation in Twitter has made me a more

compassionate teacher as I read about the work other teachers do to ensure student

success."

Tweets that described how the teachers comprehend the idea without adding any

additional reflective arguments that will relate the topic to a personal experience were

coded at the understanding level; For example, P2 in a tweet using the chat's hashtag,

shared gratitude to the other participants for being part on the Twitter chat and sharing

ideas with her. Tweets that teachers retweet or make comments without further

explanations were coded as Nonreflective/descriptive level. For example, P5 retweeted

another person's idea on the topic of student's learning, with no added comment. P5 was

simply passing ideas along to those who followed her. These were coded as

nonreflective/descriptive level. Table 13 shows the codes for DoR from the data collected that includes, critical, reflection, understanding, and nonreflection/descriptive. These codes described shows an increase in the frequency and percent of the codes from DoR critical to DoR non reflection/descriptive.

After I assigned a priori DoR codes, during Level 2 coding, I assigned category themes that described the Level 2 emergent codes according to patterns I saw among the data. The themes listed in Table 14 show the higher the DoR, the more variety in themes emerged. The category DoR – Critical, showed themes related to the teaching practice, subject teachers teach, students learning, and connections, connectedness, and educational technology seen through a personal experience. For example, P3 shared in Journal 2 that "I was able to reflect on my literacy instruction. Additionally, at least one of the responses to my chat made me rethink, or at least think deeper about my literacy instruction." The category DoR – Reflection described themes related to general perspective of the teachers' relationship with their practice, school culture, Twitter chats, and connectedness, among others. Reflection was coded for this text segment from P1 in Journal 2, "It has been fun reflecting on my Twitter use ... doesn't seem like I have been doing this for as long as I have" because showed how P1 saw the reflective process that occurred on Twitter chat. The themes showed in the category DoR – Understanding included how teachers shared about their subject, educational technology, Twitter chats, students' learning, and connectedness. For example, P3 described in the interview that "Twitter participation influenced me to think about teaching and what I do in my classroom. I think it's the little reminders to build relationships with my students that

have the biggest impact." The category – DoR Nonreflective/Descriptive showed

teachers that shared and retweet comments. For example, P7 shared a tweet with a

comment that share a positive feedback about the conversation.

Table 14

Levels 2 Codes Depth of Reflection

Category	Emergent Theme	Frequency	Total (percent)
DoR - Critical		85	85/787 (11%)
	Teaching practice and role of educators - personal	34	
	Subject they teach and school culture - personal	16	
	Students learning and connections - personal	12	
	Twitter chats - personal	11	
	Connectedness among educators - personal	7	
	Educational Technology - personal	5	
DoR - Reflection		182	182/787 (23%)
	Teaching practice and role of educators - general	67	
	Students learning and connections - general	37	
	Subject they teach and school culture - general	34	
	Twitter chats - general	19	
	Educational technology - general	16	
	Connectedness among educators - general	9	
DoR – Understanding		235	235/787 (30%)
	Share about their subject and technology	86	
	Personal and work experiences	79	
	Students learning activities and resources	40	
	Twitter chats – general	20	
	Connectedness	10	
DoR – NonReflective/ Descriptive		285	285/787 (36%)
	Shared comments, questions, and mention teachers (@name)	222	
	Retweet content, ideas, and resources	63	

Discrepant Data

Discrepant data are data that confront the study results and makes the researcher reflect on their findings, comparing the discrepancy with the conclusions (Maxwell, 2004). For this study, I identified discrepant data in the teachers tweets. I considered these discrepant cases because they were tweets nonrelated to educational topics, but were personal comments about their daily experiences, things they did during the day, topics about weather, sports or politics. There was a total of 945 tweets, 158 (17%) were tweets nonrelated to educational topics. As recommended by Maxwell (2004), I compared the topics discussed in the discrepancy data with the tweets analyzed for DoR. The 787 tweets related to educational topics in the different levels of reflections were 83% of the total data collected. The discrepancy data showed that Twitter was part of the participants daily routing including topics related to education and topics related to their daily lives. For example, P9 shared a tweet about how Google form was applied in her classroom. In contrast, a discrepancy tweet from a nonrelated topic, showed how P1 discussed about their political preferences.

There was also discrepancy data in the interview questions for example P1 shared: "Chats are about sharing information and experiences. Sometimes they turn into echo chambers, but that does not mean they are ineffective." One interview question was regarding the discussions of educational topics on Twitter chats and how the process could made them rethink about it: the discrepancy data showed from P4 was "It rarely shifts my thinking." The discrepant data are presented and compared to the data collected that showed Teachers' DoR and levels of participation.

Evidence of Trustworthiness

I upheld issues of trustworthiness in a number of ways. In this section I will describe how I ensured credibility, transferability, dependability, and confirmability.

Credibility

First, I ensured credibility by comparing and contrasting the data collected via email interviews, journals and Teachers' tweets following the strategies suggested by Merriam and Tisdell (2016) that I described in Chapter 3. I organized it by data and coded in Dedoose. Merriam and Tisdell (2016) recommended triangulation as a way to improve the credibility, and through my case study was able to collect data from three sources.

Transferability

Next, transferability was ensured by providing a general description of the setting and teachers in the study as recommended by Merriam and Tisdell (2016). Teachers participated in a demographic survey. Also, information from the Twitter profiles and Teachers' tweets were taken in account.

Dependability

Merriam and Tisdell (2016) described dependability as a procedure were data was collected from different sources and then the results were triangulate. Connelly (2016) indicated that an audit trail process and peer debrief would display dependability in the research study. Dependability was established in the case study by data triangulation that included the analysis of interviews, journals, and teachers' tweets. Also, peer

examination and audit trail that included dates from the participants selection and email interview process.

Confirmability

Confirmability can be described as a process that applies an audit trail (Lincoln & Guba, 1985) to provide a clear view that allowed other researchers to verify the data collected. Cutcliffe and McKenna (2004) recommended the use of a researcher journal to ascertain confirmability in a qualitative study. In this study, I prepared an online and password protected research journal and an audit trail. The process displayed provides confirmability to the case study.

<div align="center">

Results

</div>

In this section, I have organized the results by research questions. The a priori and emergent codes were displayed with examples from the data collected.

Research Question 1

Research Question 1 was, in what professional activities do teachers participate on Twitter? Data from journals and interview questions (1-3) were coded using a priori codes in order to categorize participants as high or low participator. However, I also used emergent codes to determine the types of professional activities teacher participate on Twitter.

High level participator. The data from journals and interview questions (1-3) showed a total of 135 excerpts. There were 38/135 excerpts (28%) were coded as high levels of participation. A total of five teachers ended up being categorized as high participators. All of them had moderated chats and therefore coded as meta-designers.

From the code meta-designer, the teachers were identified as high participators (see Table 10). Even though the data in Table 15 showed how they described professional activities that include low levels of participation, the meta-designer code was seen clearly in their professional role given them the high level of participation description. The interview questions (1-3) (Appendix A) were aligned with the RQ 1, allowing data about high and low levels of participation to be described. Table 15 shows the teachers professional activities that the participants described in the interview questions (1-3) including the high (HP) and low (LP) level of participation.

Table 15

*Teacher's Professional Activities Described in Interview Questions and the High or Low
Participation*

Participant	Professional Activities	High (HP) or Low participators (LP)
P1	Contributor – shared and interact Meta-designer- hosted (moderator)	HP
P2	Unaware Consumer – Follow teachers Consumer – sharing Contributor – read and write tweets Meta-designer- hosted (moderator)	HP
P3	Consumer – sharing ideas, post tweets Contributors – connect with other teachers	LP
P4	Unaware Consumer – Follow other teachers Consumer – sharing ideas, post tweets Meta-designer – hosted (moderator)	HP
P5	Consumer – sharing ideas, post tweets Contributors – friendship and connections	LP
P6	Unaware Consumer – Follow other teachers Consumer – sharing ideas, post tweets Contributors – connect with other teachers and share about classes	LP
P7	Consumer – sharing ideas, post tweets Contributors – connecting with teachers across the globe	HP
P8	Unaware consumer – Follow other teachers Consumer – Sharing ideas, commenting Contributor -sharing, writing	LP
P9	Unaware Consumer – Follow other teachers Consumer – sharing ideas, post tweets Contributor – connect with other teachers Meta-designer – hosted (moderator)	HP

In Journal 1 (Appendix B), the participants self-identified their level of participation and
gave examples to describe their experience. The "X's" in Table 16 represent the self-
identified participant role, and the written-out roles represent the finalized participant role
after reviewing the examples each provided. Their descriptions were compared with the
codebook. For example, P7 self-identified as collaborator, however the written

description described a moderator code. The data in Journal 1 gave the participant an opportunity to share how active or passive their participation was on Twitter chats. For example, P2 shared in Journal 1: "It has become increasingly odder and odder to me that we post so much but hesitate to respond to tweets." P9 indicated in Journal 1 that she was an active participant during her state Twitter chats. Table 16 shows the results of the participants' Twitter roles described on the Journal 1. Table 16 also shows that all participants in the study participated on Twitter in the collaborator role a few at the curator role, and one at the meta-designer or moderator role.

Table 16

Journal 1: Twitter Roles Results Compared with Descriptions

Pseudonym	Lurker	Passive Participant	Active Participant	Collaborator	Curator	Meta-designer or Moderator
P1	X	X	X	X Contributor	X	X
P2	X	X	X	X	X Contributor	X Contributor
P3					X Contributor	
P4	X	X	X	X	X Contributor	
P5		X	X	X Contributor		
P6	X	X	X	X Contributor		
P7	X	X	X	X Moderator	X	X
P8	X			X Contributor		
P9	X	X	X	X	X Consumer	

Note. The "X's" represent the participant self-identified role, and the written-out roles represent the role the data showed.

In Journal 2, the Questions 1-4 gave the teachers opportunity to share the professional activities and levels of participation.

Collaborator. There were 21/38 (55%) excerpts from eight teachers coded as collaborator in interview questions and journal prompts. Collaborator is described as a high participator level. EP (2011) has collaborators as a Level 3, were the participants collaborate within the community (see Table 3). P1 described, in an interview, the collaboration as sharing information and experience on Twitter chats. Also, in the interview he shared: "Twitter is not about consumption… it is about collaboration." P5 shared in Journal 2: "It can become a forum of inspiration and collaboration. I now see Twitter as an opportunity to collaborate rather than compare myself to others." P7 indicated in the interview that "My Twitter participation has influenced how I think about teaching and what I do in my classroom immensely mainly because I am a "department of one, but also because I have always longed for collaboration and camaraderie." Collaborators regularly sought opportunities to connect, share, and be part of the conversation in the Twitter chats. For example, in the interview, P3 shared how the questions on Twitter chats create relationships among educators; "First, is the importance of building relationships."

Curator. There were from 6/38 (16%) excerpts that helped identified 3 teachers as curators. Curator was identified in the conceptual framework as a Level 3 (Fischer, 2011). Curators are identified as teachers that organized content, following Twitter chats or hashtags. Curators is a high level of participation. There were 3 teachers that described the use of organizational tools to organized tweets. For example, in Journal 1, P7 shared "I also save interesting Twitter chats in my Wakelet file or retweet with gifs or keep screen shots to remember ideas and takeaways for myself, my colleagues, and my

students in the classroom." In the interview P9 indicated "I went back to tweets I had saved." The process of organizing Twitter content online described the actions of the teachers that take the role of content curators.

Meta-designer. Meta -designer was described as a Level 4 in Fischer's EP (2011). The key elements of meta-designer included the process that allows a direction, design, and questions in a Twitter chat, they take the role as a moderator. In the data collected 11/38 excerpts were coded meta-designer for 29% and therefore associated with five of the teachers. These five teachers were moderators and designed activities for Twitter chats. P1 shared in the interview that he moderated a state educational Twitter chat; "I moderate it for a few years." P2 explained in the interview "I have also hosted a Twitter chat. That involved preplanning questions and then engaging with everyone who joined the conversation."

Low level participator. The codes included 97/135 excerpts for a 72%. Fischer's (2011) EP in the low level of participators showed Levels 0, 1, and 2. The low level of participation codes, were divided into unaware consumers, consumers, and contributors. Characteristics that identify the low level of participators included being interested in a Twitter community without the intension of actively engaging in the conversations. Low participators look through the tweets without sharing comments or ideas. The participants are passive consumers becoming lurkers, others are consumers they like or retweet a comment. They answered questions with a simple text, without a further discussion of the subject. All the teachers shared in the interview questions (1-3) and Journal 1, codes that reflect a low level of participation (see Table 15 and Table 16). The interviews questions

and Journal 1 gave the participants opportunities to share the different levels of participation that their experiences on Twitter chats. The codes showed how the teachers' levels of participation transformed along time on the Twitter chats. The teachers described how they began as lurkers, then followed others until they started sharing ideas and resources. For example, P8 indicated in the interview that "I lurked for a long time, reading other people's comments, then slowly started commenting and finally, just in the past few months, I've been posting tweets and sharing ideas." P6 shared in Journal 1 "When I started on Twitter, this [being a lurker] was my goal. All I did was seek out people to follow but did not want people to follow me because at the time I thought I had nothing to add."

Unaware Consumer. There were 47/97 excerpts that described unaware consumers for a 48%. An unaware consumer is a participant identified in Fischer's EP (2011) has a level (0). A participant that becomes a lurker might read Twitter chats, resources, ideas, and comments without any interaction. In Table 15, there were five teachers who identified with the code unaware consumer from the interview questions (1-3). For example, P8 shared in the interview "I lurked for a long time, I've been following the conversation closely. I love Twitter as a 'peek' into [other's] classroom." Also, P9 indicated in Journal 1 "When I started following other educators, I fell into this category. Reading and learning, but not engaging. I still 'lurk' on authors and other 'famous' educators." She also, shared in the interview "I started by "stalking" the chat and reading what people had to say about the questions posed by the moderators." There were comments about following other teachers that share similar educational topics. Table 16

showed information about Journal 1, in the data collected seven teachers selected the role

lurker as a description of their experience on Twitter. For example, P8 indicated in

Journal 1 that "Gosh...all my participation for the first few months was this [lurking],

before I understood how to respond!"

Consumer. There were 28/97 (29%) excerpts that described the code consumer.

Fischer (2011) identified consumers as a Level 1, the teacher recognized the

opportunities and took advantage of them. A consumer is a teacher that may follow an

active Twitter chat, however, do not participate on them. They "like" or retweet a

comment. A consumer is participant that may see Twitter as a way to find resources and

ideas to complement their classroom. They want to be part of the conversation in a low

profile. There were eight teachers that self-identified to the code consumers (see Table

15). They comment about their participation on Twitter, sharing ideas, and posting

tweets. P2 shared in Journal 1 "I wanted to share and retweeted others posts that captured

what I missed." She also shared in the interview, "We are a group that reads and

discusses (slow chats) books about educating English learners." Also, in the interview, P8

indicated that "I've been posting tweets and sharing ideas." P9 shared in Journal 1 an

example of her experience as a consumer:

> This morning I read a blog post from Quizlet, stating that they have made updates
>
> to Quizlet Live, allowing students to play individually, rather than on teams. I
>
> thought it was cool, and I wanted a quick way to share it with other teachers, so I
>
> tweeted it this morning.

Contributor. There were 22/97 (23%) excerpts coded as contributor. A contributor is a participant that shared content online, resources and participate in a Twitter chat. They share similar goals and share in a community of learning (Fischer, 2011; Grünewald & Meinel, 2012). Fischer's EP (2011) identified the contributor as a level (2). P8 shared in the interview about how they "slow comment" in a Twitter chat and look into other teachers' classroom through Twitter. P6 described in the interview their interaction with resources on Twitter, "I have gathered SO many ideas and resources from Twitter." Also, in the interview she continued, "I follow some educators who teach very similarly to how I teach, and I can always rely on them to give me new ideas from their posts." Teachers in the contributing role benefited from the articles, resources, links, shared on the Twitter chats. P6 also described her experience on Twitter chats with this example in Journal 1:

> Some people (…) are famous or well known in education, but I don't feel I have a connection with them. I may retweet, but do not feel comfortable commenting on it. Also, I often just want to find learnings, but don't necessarily want to share with others.

P5 shared in the interview, how important Twitter was for gathering ideas and resources. For example:

> I am passionate about incorporating authentic resources and technology into my world language classroom. I have been able to find some great authentic resources posted by other teachers and have also seen how teachers use the same tech tool in different ways.

P5 also indicated in the interview that "I think that Twitter chats have the ability to offer quick, useful ideas or easy access to shared resources." The contributors in Twitter chats benefit from the exchanging of ideas, comments, and resources.

Professional activities. The professional activities Level 2 code had 154 excerpts divided in four categories; building professional identity, exchange of ideas, learn new skills, and professional connectedness (see Table 12). The Level 2 codes emerged from the interview questions and journal prompts. The professional activities are ways that the teachers use Twitter chats to communicate, learn and connect with others. Professional activities showcase elements that help identify the roles and experiences that teachers had in Twitter chats.

Building professional identity. There were 40/154 (26%) excerpts for building professional identity. Building a professional identity referred to the process a teacher had that brought, confidence, visibility, PD, a voice on Twitter among others. The professional identity is about how the teacher perceive their character on Twitter. Seven teachers shared about when they started to use Twitter. For example, in the interview, P7 shared that opening a Twitter account was a requirement for a teachers' certification course that she took. In addition, they shared that they began to use Twitter for personal use, participations on conferences, following friends' advice to create a Twitter account and then following the conversation. P5 shared in the interview that "I began participating on Twitter right before I started teaching."

Another theme was building confidence, there were six excerpts about how teachers build confidence while being part of a Twitter chat. For example, P2 shared in

Journal 2 "I felt recognized and respected for my contributions." Also, P7 gave her description in the interview about how she felt confidence, "which makes me believe that if someone else is doing it, so can I." In building confidence, P5 shared in Journal 2 "I feel that Twitter in general often solidifies and validates my methods."

In addition, there were nine excerpts that showed the theme want a voice. The excerpts described how Twitter become a platform for all teachers. P4 indicated in Journal 2 "That I like sharing my expertise." P2 also shared in Journal 2 how their participation on Twitter chat allowed educators from her state to follow her Twitter profile and visit her webpage.

Gaining visibility was a theme in level two codes with seven excerpts. P9 shared in the interview that "It's just another step in holding myself to the higher standard I project on social media." P2 also shared in the interview, how she was gaining visibility through the Twitter chat, connections in state conferences and writing in blogs, all connected through the Twitter chat, fostering conversations and engagement.

The professional development theme had 7 excerpts. P5 explained in the interview "I felt that Twitter could provide some easily-accessible, free professional development, which was of special importance to me as a first-year teacher." P4 indicated in the interview how Twitter chats become a professional PD for her. P2 shared in journal 2, how Twitter chats were moderated by the state educational associations, and P6 described in the interview how on Twitter she found PD that help her improve as a teacher. P7 indicated in Journal 1 how she read educators Twitter tweets to improve her personal learning network.

Another theme that emerge was teaching topics there are passionate, there were 4 excerpts from the data collected in the category building professional identity. The topics teachers are passionate about showed examples of educational topics, best practices, and content they like. For example, in the interview, P7 shared "I am passionate about CI (Comprehensive Input)". Being passionate on a topic, motivates their participation on Twitter chats and helps build professional identity.

Exchange of ideas. There were 37/154 (24%) excerpts that described the Level 2 exchange of ideas. The themes in this category are the way teachers discuss educational topics, share resources, and share ideas. The exchange of ideas is a key element of the Twitter chat process. There were 23 excerpts about the theme that discussed educational topics. The educational topics discussed were distance learning, Language Arts, student choice, autonomy in learning, equity, reading, literacy instruction, social emotional learning, curriculum, technology, comprehensible input, charter schools, English learners, and systemic racism. P2 shared in Journal 2"We have been discussing the new Texas English language arts and reading standards." P9 shared in Journal 2"I contributed to the conversation by answering the moderator's questions and engaging in conversation with other participants by responding to their tweets." P3 in Journal 2, described how the discussion in the Twitter chats showed her that literacy was a key component to empower students. P1 shared in the interview regarding their discussion on systemic racism and how the use of technology has been discussed on Twitter chats over time.

There were 9 excerpts about the theme share ideas. P6 shared in Journal 1 "I do this when I feel that what I am doing in my classroom is worth sharing and others could

benefit from it." P1 stated in the interview that Twitter chats were about sharing experience and content. P3 described in the interview that in Twitter chats she could share experience about her teaching practice. Also, in the Journal 2, P5 shared "I felt I could offer and receive some new ideas."

There were 5 excerpts about sharing resources. Sharing resources is typical action in Twitter chats, is part of the conversation. P7 described in Journal 2 that she shared about technology and how it works for her classes. P1 wrote in the email interview about how Twitter chats was about sharing resources and teaching experiences. P2 shared in Journal 1 "I tend to share information from my own reading that I think might interest others." Also, in Journal 1, she explained how the share resources in Twitter chats to connect with other teachers.

Learn new skills. There were 23/154 (15%) excerpts about the category learn new skills. Learning new skills included two themes gaining new ideas and learning new things. Learning new things is a process that can occur by reading and sharing content. There were 14 excerpts about gaining new ideas. In Journal 2, P7 shared "It is so laid back that you don't really seek out the ideas, they just kind of jump out and find you once people start posting." P7 also explained in Journal 2 that Twitter chat process, that included comments and ideas shared by others help them gain new ideas. P3 described in Journal 2 how Twitter let her gain about teaching. P1 shared in Journal 2 "The side conversations that are triggers by a Twitter question is really the best because it is when real ideas are being exchanged." In the interview, P5 described that gaining new ideas through Twitter chats help her opportunities to reflect about the topics discussed. P6

mention in the interview how Twitter chats let her gain new ideas for example technology tools to apply in education. P2 shared in the interview about how the ideas gained in Twitter chats help her organized the content in her classroom library, reflecting about how diverse her library was.

Another theme presented was learning new things with 9 excerpts. P6 shared in the interview that "I have seen article postings on Twitter from reputable sources that I have read and learned." Also, she expressed in the interview that she learned about middle school students' needs that help her improve her teaching. P5 mention in the interview that she learned about technology educational tools available for her to use. Additionally, in the interview, P9 shared "I also learned about a game platform that my students absolutely love to play in class now." P8 gave a detailed example in the interview from her learning new things:

> I've been following the conversation closely about White Privilege and the messages that we propagate in our materials to our students. These perspectives are new to me, as I work in a very homogeneous district. All my students look like me. These conversations have really make me thoughtful and working to represent people who look different from us, in slideshows, pictures, novels, etc.

Professional connectedness. There were 54/154 (35%) excerpts about professional connectedness. The professional connectedness category included the following themes: follow hashtags, connect with educators globally, and make friends with same educational interest. The theme follows hashtags had 26 excerpts. When teachers followed an educational hashtag, they are looking for specific teachers and ideas

to connect. The educational hashtag becomes a way to further the connectedness. The use of the hashtag in the conversation helps to keep the topic aligned in a discussion. Seven teachers shared educational hashtags that they like, admired, and participated. For example, in journal 2, P3 shared: "I tend to really like #LeadUPChat." Also, in the interview, a teacher shared that "The big changing point in my Twitter use was due to a slow chat from #ellchat_bkclub." T8 shared "I use the hashtag #langchat, just because I see it liked a lot on tweets related to language teaching."

The theme, connects with educators globally, had 15 excerpts. For example, P5 stated in Journal 2 that she shared ideas with many teachers that had similar interest like her. P9 shared in Journal 2 that "Overall, I felt satisfaction in engaging with other educators on an interesting and slightly controversial topic." P7 shared in the interview multiple examples about how she enjoyed connecting with educators globally and see how they with their tweets influence education. For example, in the interview, she explained, "There are so many amazing hashtags that have left me inspired and excited about connecting with educators across the globe!" P9 wrote in the email interview, "I relied on Twitter to keep me connected to see what other educators are doing." Also, in Journal 1, P2 also related to Twitter chats to have an opportunity to connect with other educators.

The category professional connectedness also includes the theme make friend with same educational interest with a total of 13 excerpts. P3 shared in Journal 2 "I find people who think like me on these Twitter chats." Also, in Journal 2, she commented that she felt that the educators in the Twitter chat became her friends. In addition, in the

interview, she described how she met in an educational conference some of her some Twitter friends. P7 shared in the interview that:

> Participating in Twitter chats and just on the platform in general puts me in the environment of thinkers and learners - creatives, like me, who want to enhance their craft and see their students benefit from all their learning as well.

P1 indicated in the interview that during the Twitter chats, he felt that the teachers became his friends by sharing tweets weekly. P2 shared in Journal 1 "In my opinion, we post to share and connect with others."

Based on the data, I concluded that the key findings for RQ 1 is that on Twitter, teachers participate in a variety of roles, from lurking to meta-designer and use Twitter to feel professionally connected, to build their professional identity, and to exchange ideas. Teachers participated at both high and low levels, and those who participated at high levels, participated concurrently in the lower level activities. Teachers felt that their Twitter activity helped to build their confidence, gave them a voice and visibility, and helped them to learn new skills, connect with others, and exchange ideas.

Research Question 2

Research Question 2 was How do teachers use Twitter to help them reflect on pedagogical practices? All the data collected, interview questions, journals, and teachers' tweets were coded for DoR. Data were categorized into four levels of reflection: critical reflection, reflection, understanding, nonreflective/ descriptive (see Table 13). There were 14 Level 2 emergent codes (see Table 14). Also, Table 17 shows the DoR code frequency of teachers' tweets. P4 and P8 each had less than 10 tweets to code and were

the only two who did not reach critical depth of reflection. Most of the tweets from the participants (32%) were coded at the nonreflective/descriptive level. The understanding level was coded with for 26% (224/877) of the tweets.

Table 17

Level 1 Depth of Reflection Code Frequency Teachers Tweets (Percentages in Parenthesis)

Participant	DoR Critical Reflection	DoR Reflection	DoR Understanding	DoR NonReflective/ Descriptive	Non related Tweet	Total Tweets
P1	30 (7%)	111 (24%)	103 (23%)	105 (23%)	103 (23%)	452
P2	1 (2%)	7 (15%)	18 (38%)	18 (37%)	4 (8%)	48
P3	5 (11%)	6 (13%)	11 (24%)	21 (46%)	3 (6%)	46
P4	0	0	3 (75%)	1 (25%)	0	4
P5	2 (5%)	2 (5%)	8 (20%)	28 (70%)	0	40
P6	4 (5%)	9 (11%)	16 (20%)	50 (63%)	0	79
P7	6 (3%)	18 (10%)	54 (31%)	53 (30%)	45 (26%)	176
P8	0	1(14%)	1(14%)	2 (29%)	3 (43%)	7
P9	6 (24%)	5 (20%)	10 (40%)	4 (16%)	0	25
Total	54 (6%)	159 (18%)	224 (26%)	282 (32%)	158 (18%)	877

Critical Reflection. There were 85/787 (11%) excerpts from interview questions, journals, and Teachers' tweets (see Table 13). Also, from the category critical reflection there were 6 themes Level 2 codes (see Table 18). Table 18 shows the DoR critical reflection categories and percent.

Table 18

Codes for Depth of Reflection – Critical Thinking Level

Themes	Interviews	Journals	Tweets	Total	Total Percent
Teaching practice and role of educators -personal	4	5	25	34	(34/85) 40%
Subject they teach and school culture - personal	4	2	10	16	(16/85) 19%
Students learning and connections - personal	0	1	11	12	(12/85) 14%
Twitter chats - Personal	7	2	2	11	(11/85) 13%
Connectedness among educators – personal	5	1	1	7	(7/85) 8%
Educational Technology - personal	0	0	5	5	(5/85) 6%
				85	100%

Critical reflection referred to the chance teachers had to change their idea about

the topic discussed and were able to relate in a critical thinking response that showed a

higher level of thinking (Harland & Wondra, 2011; Kember et al., 2008). The teachers'

tweets relay a message that thinking on a topic has been changed because of personal

experiences and interactions with the content being shared. The participants described

that Twitter participation has changed their belief and behaviors on certain educational

topics. For example, P5 shared in Journal 2 that "Twitter, like any social media tool,

gives a platform to all. It can become a forum of inspiration and collaboration, or one of

competitiveness, judgmental, extreme viewpoints."

The most mentioned code under critical thinking was "teaching practice and role

of educators -personal." I used this code for excerpts that described how teachers

critically reflect about their role as educators on a personal level. P1 showed critical

reflection on Twitter chats when discussing how new teachers need help from other educators in school, and how he was one of the teachers that took time to give help and guidance about the school culture. Also, he critically reflected by tweeting about how teachers tried to change education without making an effort, and how he was an agent of change because his students were motivated and inspired in his classroom. P3 shared in Journal 2 "This chat has posed thoughtful questions in the past that help me reflect on my own teaching practices. The main reason I tend to join twitter chats is for self-reflection." P9 in a tweet shared about how she wondered if the way that she teaches now will affect her students' readiness for college. P5 reflected in Journal 2 about her discussions on Twitter chats that "While I've exchanged ideas with many like-minded educators and believe I am still giving my students the best education I possibly can." In the interview, P5 also added:

> I am a reflective teacher overall. As a participant in Twitter chats, our book studies allow for a great deal of reflection. I have been working with English learners for over a decade, and every time I read something new, I am able to determine what I have fully incorporated into my practice as well as areas for continued improvement.

P9 in the interview, critically reflected about how her participation on Twitter chats made her a better teacher by the resources that she found and compassionated by learning from other teachers that each day shared about their classroom on Twitter chats. In Table 13, P9 showed that 24% of her tweets were coded as DoR critical reflection.

The next theme, subject they teach and school culture – personal, had 16 excerpts. The theme showed teachers personal reflections about the class they taught and school culture. P3 shared in Journal 2 "This had me thinking deeply, about: our district's focus on equity the past couple of years." Also, in Journal 2, she critically reflected about literacy and her participation on Twitter chats made her change her perspective about the topic. P8 in the interview critically reflected about how tweets related to the class she teaches that made her rethink her strategies in her Spanish class. Also, shared in the interview that "These conversations have really make me thoughtful and working to represent people who look different from us, in slideshows, pictures, novels, etc." P1 shared tweets about how school culture change and affected students and teachers. He self-reflected about the changes in curriculum along time. P7 shared a tweet about how there were days that she planned the class one way, but the results were not there, making her rethink the strategies. There were 12 excerpts about student learning and personal connections – personal. P1 shared 7 tweets about the theme. For example, he shared about how educators made assumptions about shy students, and about sharing personal experiences to change the students' perspective about bullying. In his tweets, he showed a personal interested in the emotional well-being of his students. P9 shared in Journal 2:

> A common theme in the conversation was that of student choice and autonomy in learning. It made me wonder how much effort a 15 year old would put into school when left to their own devices in learning. A common practice in charter and magnet type schools is the idea of allowing students to explore their own interests and thrive through their autonomy. Previously, I held to the idea that students

need structure over anything else. Now, I'm beginning to wonder if high schoolers are better at managing their choice in learning better than I previously believed.

Twitter chats – personal was a theme with 11 excerpts. P7 shared in Journal 2 "It's interesting to see what people gather from chats compared to my own takeaway." In the interview, P6 described her experience on Twitter chats with a critical reflection:

Because of what I have seen on Twitter, I have become more reflective. For example, someone who is influential in education may post a statement or research, and I will read it and then think how am I implementing this in my classroom? Do I agree with this? Why or why not? What changes might I need to make as a result of these learnings?

P6 also critically reflected about how Twitter chats has transformed her teaching practice. For example, in the interview she shared: "It really opened me up to new ideas." P1 was the only teacher that critically reflected on a tweet about how the conversations that teachers had on Twitter chats transformed education and impacted him in a personal way.

Connectedness among educators – personal code was a theme with 7 excerpts in critical thinking DoR. Five teachers critically reflected on the connectedness among educators; the connectedness refers to the relationships developed between educators that shared similar interest. For example, P2 shared a tweet about how @Teacher and her had many things in common, that even the ideas shared felt connected. P3 shared in Journal 2:

Regarding life, I think it's hard to meet friends, especially as an adult, maybe it's due to the profession of teaching, or maybe it's just the way our society works now. Ironically, I see one of my roles as a teacher is to help students make friendship with one another and to connect families. I find people who think like me on these twitter chats.

P7 shared in the interview about the number of educational hashtags available that inspired to connect with educators from other countries. She also described in the interview that:

Participating in Twitter chats and just on the platform in general puts me in the environment of thinkers and learners - creatives, like me, who want to enhance their craft and see their students benefit from all their learning as well.

P9 described in the interview how the connectedness among educators gave her an opportunity to interact with teachers from other backgrounds and race.

There were five excerpts of the theme educational technology – personal codes. There were two teachers that shared tweets about educational technology. For example, they shared about Google sheets, Screencast, Flipgrid, Microsoft Teams, and OneNote. P9 shared only one tweet about how Google sheets help look back on her lesson plans and critical reflected in what changes she need it to make. P7 wrote four tweets that showed how enthusiastic she was with the technology used, how it helped her transform her class.

Reflection. There were 182/787 (23%) excerpts from interview questions, journals, and teachers' tweets (see Table 13). Table 19 shows six themes related to the

category reflection. The category reflection was related to the personal experiences and

the participants were able to relate the topic to their profession (Harland & Wondra,

2011; Kember et al., 2008). In this category, the participants could identify how Twitter

participation made them think deeper about their teaching practices. Showing how the

topic was related to the teachers' personal experiences, with evidence of thinking,

mulling over, and possibly applying ideas they have learned on Twitter chats.

Table 19

Codes for Depth of Reflection -Frequency of Reflection Level

Themes	Interviews	Journals	Tweets	Total	Total Percent
Teaching practice and role of educators - general	4	0	63	67	(67/182) 37%
Students learning and connections – general	1	0	37	38	(37/182) 21%
Subject they teach and school culture - general	1	0	33	34	(34/182) 19%
Twitter chats - general	6	8	5	19	(19/182) 10%
Educational Technology - general	1	0	15	16	(16/182) 9%
Connectedness among educators – general	2	0	6	8	(9/182) 4%
				182	

There were 67/182 excerpts about teaching practice and role of educators –

general. This theme relates to how teachers reflect on their role and practice on Twitter

viewed from a general perspective. The general perspective described the participants

connection with the topic that allowed the teachers to reflect. However, their reflection

for this code did not show a deep personal connection that would allow them to critically

reflect on the topic discussed. For example, in the interview, P3 responded that "I use the questions posed on Twitter chats to reflect on my teaching practices."

P5 explained in the interview that:

> I caught wind of the hashtag right away and started to explore it in greater detail. I felt that Twitter could provide some easily-accessible, free professional development, which was of special importance to me as a first-year teacher.

P6 stated in the interview that:

> I have seen article postings on Twitter from reputable sources that I have read and learned. It has definitely changed my perspective. For example, recently I was being too hard on myself (before COVID-19) and I read an article about expectations.

P1 shared 47 tweets reflecting about teachers practice and role of an educator. For example, he reflected about his own teaching experience. He identified how students related to his class and his perspective about testing and data. The tweets showed how he reflects in a general perspective about his teaching practice. P7 shared in a tweet how she followed Twitter chats as way to improve her teaching skills.

There were 37/182 excerpts about students learning and connections – general views. Five teachers tweeted about students learning and connections. For example, in a tweet, P1 shared that about the focus that students have on testing and how it could create stress levels on students. He also reflected in other tweets about the importance of students and teachers' connections, and how this promotes a motivation to the students to be in his class. P7 reflected in a tweet about activities done in the class and how the

students learning was more than the curriculum taught. P9 shared in a tweet about the importance of building connections with the students.

There were 34/182 excerpts for the subject they teach and school culture – general views. I used the "general view" to code excerpts that showed a connection with the topics discussed without a personal or deep application that allowed them to critically rethink the subject discussed. For example, P2 explained in the interview that:

> One of my favorite teaching strategies is Roving Paragraph Frames. I first read
> about it in the book Boosting Achievement by Carol Salva and Ana Matis. I
> immediately fell in love with it because it's a strategy suitable for different levels
> of learners. I have written a blog about it and present the strategy at conferences
> in Texas. Since Carol also presents it as part of her Boosting Achievement
> training, it comes up often on Twitter. Other teachers who are just learning the
> strategy tend to post the same excited reaction I initially had. Carol often refers
> them to my blog post, and from there further conversations develop. This has
> helped maintain my own excitement and willingness to use the strategy in my
> classroom.

Four teachers shared about the topic on 33 tweets. P1 shared on tweets about the school culture, school pride, STEM and Makerspaces. For example, he talked about how challenging finding resources for his class was. P3 reflected in a tweet about how an initiative about equity would make her speak the truth and be ready for the discussions. P7 shared on Twitter about her Spanish class and how the students worked in teams, but the activity was a not successful.

I coded 19/182 excerpts from six teachers about reflecting on Twitter chats from a general perspective. There were examples from interview questions, journals, and tweets. P1 described in Journal 1 how Twitter chats inspired and made him reflected about the topics discussed. P1 stated in Journal 2 that "the side conversations that are triggers [sic] by a Twitter question is really the best because it is when real ideas are being exchanged." He shared in the interview that "There is a lot I hear when I am on Twitter that makes me rethink what is happening in my classroom."

Sometimes the reflection related to changes teachers then made in the classroom. P3 explained in the interview that "Twitter allows me to reflect and share some things about my teaching practice. For example, we have 'Thankful Thursday' class meetings where students must share something for which they are thankful and may share problems and solutions." Other times, the reflection was related to more abstract ideas that teachers could implement in the classroom. P5 described in the interview how a Twitter chat she participated in expanded her view of bias in the classroom, and how that made her reflect and reconsider the reading material she assigned to students.

There were 16/182 excerpts about educational technology in a general perspective. P7 showed an interest in technology, in eight tweets. For example, she shared how the use of technology in her classroom promoted active learning and connections among them. P1 stated in the interview that "That is, I like to chat about how the technology can be used to create new learning products or how it can be used to open up new learning areas. The chats creates … redefines what is available." Also, he reflected

in a tweet if the educational games online promoted learning or the students were just playing games.

There were 8/182 excerpts about connectedness among educators from a general perspective. In this theme, only P1 shared about connectedness among educators. For example, he shared in the interview questions:

Being able to see what other people are doing expands your horizons and empowers your thoughts. It is hard to share a specific example because it is more a transformative process … when you finally know what you didn't previously know a sense of liberation happens.

Also, P1 tweeted about how 2 teachers were part of his daily connections on Twitter. He stated in the interview that "Twitter is reflective in nature. You are seeing so much information and sharing from others and when you get into a conversation it is all about reflection."

Understanding. There were 235/787 (30%) excerpts from interview questions, journals, and teachers' tweets coded as understanding (see Table 13). There were 5 themes that explored how teachers share about their subject and technology, personal and work experiences, students learning activities and resources, Twitter chats – general, and connectedness (see Table 20). The category understanding was related to the teacher chance to comprehend the idea without adding any additional reflective arguments that will relate the topic to a personal experience (Harland & Wondra, 2011; Kember et al., 2008). They showed they understood the idea as presented in a tweet but add no additional reflective comments that will relate the topic to a personal experience. The

teachers shared tweets that has a relationship with the topic discussed but not related to the participants' own life experiences.

Table 20

Depth of Reflection - Frequency of Understanding Level Codes

Themes	Interviews	Journals	Tweets	Total	Total Percent
Share about their subject and technology	0	0	86	86	(86/235) 46%
Personal and work experiences	2	0	77	79	(79/235) 29%
Students learning activities and resources	0	0	40	40	(40/235) 14%
Twitter chats - general	6	2	12	20	(20/235) 7%
Connectedness	0	1	9	10	(10/235) 4%
				235	100%

The most prominent theme, share about their subject and technology, was coded for 86 out of 235 of the tweets coded at the understanding level. This theme related to the teachers use of technology and comments about their classes. This theme only had coded excerpts from tweets, not interviews or journals. P4 was the only teacher that did not comment on this theme. P1 shared tweets about his class and the use of technology. In one tweet, he shared about the application of technology in the students' work. Also, about the transformations that schools had with electives, for example vocational classes, that change in his school as a Fabrication Lab. He also shared tweets about standards and the use of apps in the classroom. P6 shared tweets about her language arts class, and the use of technology like, Quizizz. For example, she shared on Twitter that she was working with narrative writing, and two students work in collaboration with a story showcasing a

personal experience she shared in her class. P5 and P2 shared tweets about how they use the interactive technology "Pear Deck" adding engagement in their class. P9 explained in a tweet about how she loved Google form, and was going to apply the forms in her classroom. P3 described in a tweet that she wished to add Class Dojo to her course. P7 shared 42/86 tweets about her Spanish class and the use of technology. For example, she tweeted about GooseChase, Kahoot, Edpuzzle, Flipgrid, Skype, Nearpod, PearDeck, Microsoft Teams, Quizlet, and ClassDojo. Also, P7 shared in a tweet about how she was working with Skype for more than a year and about the resources that Microsoft Edu had for teachers.

The theme, personal and work experiences, was coded for 79/235 tweets. This theme was related to the teachers' comments about their personal activities or work. P1 tweeted about how to change the relationships between teachers, when they talked about other topics that are not work related. He also shared about ways to raising funds for his class, and how he gets inspiration for his classroom. He also described books and activities that promote family connections in the school. P4 shared in the interview "There are certain teachers I follow that inspire me to change. For example, (…) inspired me to radically reevaluate the texts that I teach." Also, she shared in the interview about her work, "Equity in teaching. It has given me multiple layers to consider." P5 in five Tweets shared comments about personal experiences such as reading a book or being proud of her students. P2 shared four tweets about her learning experiences as a graduate student. Also, P3 shared a tweet about her master on education. P3, P7, and P9 shared

tweets about the amount of time that they spent working outside school hours for their classes.

The theme, students learning activities and resources, had 40/235 excerpts. Six teachers shared tweets about how students participated in their classroom, and the engagement that the students showed during their learning. Also, the resources that teachers shared to improve their class. P1 shared tweets about the noise students made in his classroom when they were participating in discussions, the stress student had on testing, and connections with the cross curricular content. P9 shared a tweet with an example about the bell ringer activities that the students did. She shared in another tweet about the importance of classroom structure and norms. P3 described in a tweet, how her students learning activities in her class had improved.

The theme, Twitter chats – general, had 20/235 excerpts. This theme relates to times that the teachers described how Twitter chats impacted them. From the topics, conversations and educational hashtag that led them understand and connect with their experiences. For example, P3 shared in the interview the following quotes: "Twitter participation influenced me to think about teaching and what I do in my classroom. I think it's the little reminders to build relationships with my students that have the biggest impact." She also described: "I tend to really like #LeadUpChat the best because they tend to ask questions that make me reflect." In addition, P3 shared in the interview: "I really like the questions posed in the Innovators Compass because they are reflective and can help someone move forward if they are stuck." P2 shared in Journal 2 "This particular chat often confirms that I am correctly interpreting the new standards and

incorporating them in a manner that benefits my students." In a tweet, P1 shared a comment on how a Twitter chat may create a conflict or discussion. P7 shared a tweet about how her participation on Twitter chats allowed her to find resources for her class.

The theme, connectedness, had 10/235 excerpts. Connectedness referred to the relationships that participants had during their engagement or connections with other teachers on Twitter chats. The connectedness showed a level of relationship and friendship that evolved during their Twitter chat participation. P3 shared in Journal 2 "I felt connected to others during the chat, happy and content, like I was conversing with friends." Also, she shared in a tweet how they build relationships among their participation on the Twitter chats. P1 shared in a tweet about the connections that teachers made through Twitter chats by sharing ideas and content. He also shared a tweet about how a Twitter chat that made him feel like sharing coffee with friends. P7 shared about the connectedness that developed in a Twitter chat.

Nonreflective/descriptive. There were 285/787 (36%) excerpts from interview questions, journals, and teachers' tweets that I coded at the nonreflective/descriptive level of reflection (see Table 13). Of the four levels of reflection, this lowest level, the nonreflective/descriptive had the most excerpts. I put the codes into two themes one related to how teachers, shared comments, questions, and mention teachers (@name) and the other were simply retweets of content, ideas, or resources (see Table 21).

Table 21

Depth of Reflection - Frequency of Nonreflective Level Codes

Themes	Interviews	Journals	Tweets	Total	Total Percent
Shared comments, questions, and mention teachers (@name)	2	1	199	222	(222/285) 78%
Retweet content, ideas, and resources	0	0	63	63	(63/285) 22%
				285	100 %

The category nonreflective/descriptive was related to the teachers' participation on Twitter when the participants copy ideas or text without further explanations (Harland & Wondra, 2011; Kember et al., 2008). The teachers overtly admit that ideas shared on Twitter do not make them think about teaching. They retweet posts with no substantial contribution included.

General sharing in tweets by participants often included shared comments, questions, and mentioned teachers. For example, P1 shared tweets about different topics including the weather, school, students, teachers, and technology there were short descriptive tweets. P1 tweeted about the class size and the number of hours working at home and planning his class. P6 shared tweets mention teachers and sharing links. P5 tweeted short sentences replying to others and mentioning them (@name). P2 shared tweets praising other teachers with words like greatest and proud. Also, she shared tweets with short questions. P7 shared tweets replying about technology and giving thanks to others with comments with words like "awesome," "congrats," and "thank you." P3 tweets also had tweets about the school garden and school staff.

Other tweets in this nonreflective/descriptive level were retweet content, ideas, and resources (63/285; 22%). The retweet comments were from topics related to the participants' interests, for example technology or their teaching content area. P1 retweeted resources and comments about student learning. For example, P1 shared a tweet about a student that used LED lights for an art project, as a way to share about his student's creativity. He also had tweets about the changes in learning managing systems that his school applied. P7 and P2 retweeted content about technology and resources. For example, P7 shared a tweet about two Flipgrid videos that she created. P3 shared 3 retweets about school and classroom management.

The key finding for RQ 2 is that teachers primarily use Twitter in nonreflective ways by sharing comments and posting questions, but also reflect at higher levels when they share how their pedagogical practice had been informed and changed by their participation on Twitter. Participants often reflected on topics related to such as their teaching role, students learning, subject taught, and educational technology. Data from tweets, interviews, and journals showed that teachers who participate on Twitter reflect at various levels on their pedagogical practices. Twitter participation showed that teachers reflect on their personal and work experiences, on conversations they had on Twitter, and about the connectedness among those they meet on Twitter. The teachers reflected on a wide range of educational issues, and also reflected on personal and teaching experiences that had an impacted their pedagogy.

Summary

The key findings of this study were based on two research questions, the conceptual framework, and from data of nine teachers' tweets, email interviews replies, and journal responses. RQ1 showed that on Twitter, teachers participate in a variety of roles, from lurking to meta-designer and use Twitter to feel professionally connected, to build their professional identity, and to exchange ideas. The RQ1 showed the different levels of participation that teachers had from a high level that included meta-designers, curators and collaborators, and also low level that included contributors, consumers, and unaware consumers. Their professional activities showcased their personal preferences related to Twitter chats, an opportunity to build their professional identity, learn new things, and the connectedness develops through the interactions on Twitter chats. The key finding for RQ 2 is that teachers primarily use Twitter in nonreflective ways by sharing comments and posting questions, but also reflect at higher levels when they share how their pedagogical practice had been informed and changed by their participation on Twitter. Teachers participated on Twitter to reflect on pedagogical practices such as their teaching role, students learning, subject taught, and educational technology. Teachers shared content on Twitter that showed various levels of reflection. The data collected revealed an increase of percentages from the DoR levels: critical reflection, reflection, understanding and nonreflective/descriptive; showing evidence of the different levels of DoR that the participants experienced. In Chapter 5, I will discuss the interpretation of the findings, limitations of the study, recommendations, and implications.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this qualitative case study was to explore how professional participation on Twitter influences teacher reflection on pedagogical practices. The single case study approach allowed me to explore in-depth the levels of participation and the depth of reflection of nine K-12 teachers that participated on Twitter educational chats. I conducted this study because there is a gap in the literature about how professional participation on Twitter influenced teachers' reflection on pedagogical practices. Teachers' participation on Twitter and the opportunity for interactive engagement on Twitter could improve PD and limit the feelings of isolation that teachers may experience during their professional careers. One key finding was that, on Twitter, teachers participate on a variety of roles and professionally connect with other teachers. Another key finding was that teachers primarily use Twitter in nonreflective ways, but then also reflected at higher levels when they shared in interviews how their pedagogical practice had been informed and changed by their participation on Twitter.

Interpretation of the Findings

The K-12 teachers' levels of participation and DoR was explored through Fischer's EP Model (2011) and Kember's DoR model (Harland & Wondra, 2011; Kember et al., 2008). Some of the findings from the current study confirm, disconfirm, or extend the findings from the literature. I interpreted these results in relation to the literature reviewed and organized the interpretation by research question.

Research Question 1

RQ 1 was: In what professional activities do teachers participate on Twitter? The key findings for RQ 1 are that, on Twitter, teachers (a) participate in a variety of roles, from lurking to meta-designer and (b) use Twitter to feel professionally connected, to build their professional identity, and to exchange ideas. The results of the study confirmed the different levels of participations shown on the variety of roles that teachers engage on Twitter chats. The conceptual framework by Fischer's EP model (2011) showed the different levels of engagement from an unaware consumer (lurker) to a meta-designer (moderator), which confirms findings in other teacher studies (Adjapong et al., 2018; Carpenter & Linton, 2018; Carpenter et al., 2019; Trust, 2017). The data showed how each level of participation was presented in the different roles that the teachers exhibit. The data confirmed the findings in other studies that showed both high and low levels of participation (Britt & Paulus, 2016; Carpenter, Tur, & Marín, 2016; Fischer, 2011; Rosell-Aguilar, 2018; Ross et al., 2015; Trust, 2017; Zhang, 2015).

A previous finding that aligns with the findings from this research was that teachers use Twitter to feel professionally connected. Teachers collaborated by sharing information that allowed them to break the isolation that can be exhibited in the teachers' professional life by connecting with others in a conversation to find resources, develop a professional identity, and exchange ideas. Data from my study confirm findings from a study by Richards et al. (2020). In their study, they found that physical education teachers participated on Twitter to feel connected and to limit their feelings of isolation. Using Twitter chats for professional connectedness purposes confirms findings from Singh

(2020) who described how Twitter allowed academics to be connected in ways that improved their PD through connectedness and collaboration but extends this to classroom teachers. The results showed how the participants connected with teachers outside their school districts, learning from each other, looking into another teacher classroom, feeling empowered by commenting with educator from different parts of the world. The feeling of connecting globally helped them feel empowered and inspired, a finding that was similar to a study by Tang and Hew (2017) who found that teachers from other parts of the world communicate and share information through social media tools like Twitter. The data showed that connectedness and feeling professionally connected were a part of their Twitter engagement and learning process.

Another conclusion was that teachers could build a professional identity through their participation on Twitter chats which confirmed results from Carpenter et al.'s (2019) study related to perspectives about teachers' professional identity on Twitter. The data showed how the professional identity was developed by the content they shared, and connections they made with followers, along with the conversations and resources exchanged. Some teachers showed leadership skills by becoming meta-designers, organizing discussions, and managing educational Twitter chat as a moderator similar to other studies (Adjapong et al., 2018; Britt & Paulus, 2016; Krutka, 2017; Nochumson, 2020). My study also showed that teachers build confidence in their pedagogical practices because of their conversations on Twitter chats, confirming other teacher studies on Twitter use (Britt & Paulus, 2016; Carpenter & Linton, 2018; Fischer et al., 2019).

Research Question 2

Research Question 2 was: How do teachers use Twitter to help them reflect on pedagogical practices? The key findings for RQ2 are that teachers primarily use Twitter in nonreflective ways by sharing comments and posting questions, but also reflect at higher levels when they share how their pedagogical practice had been informed and changed by their participation on Twitter. The results of the study confirmed that teachers on Twitter chats engage and collaborate, allowing them to reflect on pedagogical practices. My study results confirm and extend Britt and Paulus' (2016) data that showed how teachers that participated in educational Twitter chats discussed educational topics. Carpenter and Krutka's (2015) study showed how Twitter chats allowed participants to reflected, discussed, and shared ideas that impacted their PD experience. Rosell-Aguilar (2018) described how Twitter helped teachers reflect in their teaching practice. Both studies (Carpenter & Krutka, 2015; Rosell-Aguilar, 2018) showed evidence about teacher reflections which my study confirms, but it also extends what is understood by using levels of reflections that teachers experience during Twitter chats. Other studies showed how teachers interacted on Twitter chats and reflect on their teaching practice (Adjapong et al., 2018; Benko et al., 2016; Noble et al., 2016; Nicholas et al., 2018). The triangulated data in my study confirmed and expanded understanding on how teachers experience engagement on Twitter chats. The teachers' tweets, interviews, and journals showed evidence about the DoR. Also, the discrepant data showed how teachers communicate daily noneducational tweets that were not coded as DoR. DoR in Twitter chats was not explored from a teachers' experiences.

One key finding was that teachers showed levels of DoR that include understanding and nonreflective/descriptive. The study confirmed and expanded both DoR categories. Like other studies, teachers shared tweets and ideas that showed both categories; they shared resources, communicated, engaged, retweeted, and replied to other educators on Twitter chats (Carpenter & Linton, 2018; Carpenter et al., 2019; Edelmann et al., 2017; Rosenberg et al., 2017). The DoR results in my study confirmed opportunities to further develop PD that engage teachers on Twitter chats, allowing them to reflect, learn, connect in social media environment that allowed them to create or improve their professional identity.

Another conclusion was that teachers critically reflected on Twitter chats. The literature reviewed showed limited results about teachers' critical reflection on Twitter chats. Critical reflection referred to the chance teachers had to change their idea about the topic discussed and were able to relate in a critical thinking response that showed a higher level of thinking (Harland & Wondra, 2011; Kember et al., 2008). My study showed evidence of critical reflection among teachers that engaged on Twitter chats. Therefore, this study expands the evidence about how teachers reflect on different topics such as teaching practice, curriculum, students learning, Twitter chats, connectedness among educators, and educational technology. The results showed that teachers felt their perceptions changed because of the reflection on their experiences that Twitter chats provided. They reflected about how Twitter was a platform that can convey different perspectives that help them critically reflect and find new meaning to their class content. The teachers' ability to critically reflect in their own teaching and acknowledge other

teachers' experiences is a value opportunity to further PD where teachers can convey their experience and transform their teaching style. All levels of DoR were present in the study, but critical reflection not as often, which confirms other studies (Bates et al., 2016; De Vries et al., 2013; Gutierez & Kim, 2017). Teachers reflect from a general perspective that allowed them to self-reflect on their practice, subject, and experiences.

Limitations of the Study

The limitations of this study are related to research design. In this case study, I interviewed the participants via email. The interview via email limited the face to face observations that can contribute to the data collection process. The collection of data was limited to their interactions, through text with the interview questions, and journal prompts. Another limitation was the number of participants, I found nine teachers that work in the US and shared content on Twitter chats who were willing to participate. The number of participants and criteria that include teachers that work the in US was a limitation in the study. The limitations described could impact the transferability of the findings in the study.

Recommendations

Recommendations for further research are based on study results and limitations of the study. The first recommendation is related to the RQ1 findings that on Twitter, teachers participate in a variety of roles, from lurking to meta-designer and use Twitter to feel professionally connected, to build their professional identity, and to exchange ideas. Therefore, more research needs to be done about the professional identity that teachers experience during their participation on Twitter chats. The professional role that a teacher

shared within Twitter chats relates to their tweets, resources shared, and comments displayed. Also, more exploration is required to find out whether the levels of professional connectedness during Twitter chats could help teachers avoid isolation in their profession. This could bring a deeper understanding about why teachers participate, the effect of their participation, and engagement as form of informal learning that could improve PD allowing teachers a choice and a voice in their how they receive support and training.

The second recommendation is related to the RQ2 findings that teachers primarily use Twitter in nonreflective ways by sharing comments and posting questions, but also reflect at higher levels when they share how their pedagogical practice had been informed and changed by their participation on Twitter. Therefore, more research needs to be done to determine how reflecting on Twitter chats can improve teachers' professional practice. The opportunity for teachers to use Twitter as a PD can allow them to interact, innovate, and learn about technology in real world paradigm. An exploration of Twitter's international impact on teacher pedagogy and whether those ideas change teacher practice and improve student success will be very beneficial to the teachers. Additionally, most of the teachers in this study had chosen individually to use Twitter to connect with teachers digitally. Studies might be done to see if district-wide adoption or top-down encouragement to use Twitter for PD would benefit teachers in their technological proficiency, curriculum development, or collaboration among peers.

The last recommendation is related to the limitations of this study. This study was done with nine teachers in the United States. Therefore, this study should be replicated in

a wider community with teachers from different countries that share content on Twitter

chats. In addition, further research should explore how the DoR can improve teachers PD

that allowed the use of Twitter as learning community of practice, the connectedness

involved in their levels of participation and the growth that they can have because they

participate and shared knowledge, teaching experiences, and engage in a professional

conversation that explored the educational issues of the time.

Implications

This study may contribute to positive social change in several ways. First at the

individual level if more teachers see value in and participate in Twitter chats, more

teachers may learn, engage, and collaborate with teachers across different grade levels

and countries, providing opportunity for informal learning, connectedness, and

personalized PD. There is also potential for change at the organizational level if school

districts can introduce Twitter chats as an opportunity for teachers to share ideas, reflect

about educational issues, and find inspiration that may lead to education innovation. If

school districts can encourage personalized PD via Twitter, it might motivate and

transform teaching practice. This study may also advance knowledge in the field of

educational technology because teachers can acquire technological skills from their

engagement on Twitter chats and use technology to inform their practice.

The second contribution that my study could contribute is in relation to improved

professional practice concerning teachers and their own PD. Results from my study show

that teachers seriously reflect and make changes to their views and classroom practice

based on what they learn in Twitter chats. If this study can encourage more teachers to

begin using Twitter as PD, more classroom practices may be impacted. The last contribution and implications of this study is that it may provide educational stakeholders with a deeper understanding of how teachers interact and reflect on Twitter chats giving them opportunities to reexamine budgets for PD, as well as encourage administrators to make informed decisions about how Twitter is a viable option for teachers' PD programs.

Conclusion

The problem addressed in this study was that while K-12 teachers may use Twitter for professional purposes, what is not understood how professional participation on Twitter influences teacher reflection on pedagogical practices. The purpose of this qualitative case study was to explore how professional participation on Twitter influences teacher reflection on pedagogical practices. To fulfill this purpose I used interviews, reflective journals, and analyzed tweets to see how teachers participate professionally on Twitter and how they reflected on pedagogy based on these Twitter interactions.

The key findings for this study showed that on Twitter, teachers participate in a variety of roles, from lurking to meta-designer and use Twitter to feel professionally connected, to build their professional identity, and to exchange ideas. Results also showed that teachers primarily use Twitter in nonreflective ways by sharing comments and posting questions, but also reflect at higher levels when they share how their pedagogical practice had been informed and changed by their participation on Twitter. Teachers' levels of participation, variety of roles and depth of reflection showed multiple layers that provides a personal approach to PD within Twitter chat. The levels of participation can allow a teacher to feel less isolated in their teaching profession, by

allowing connections and engagement with educators that share their educational passions and topics. The reflections on educational topics showed how teachers use Twitter chats, which allows to further conversations and find ways to connect with teachers in a way that each one shares their voice, improve their teaching practice and connects in a global community of learning. The study confirms and extends the DoR that teacher experiences during Twitter chats. In addition, it also, showed how their variety of roles gave them opportunities to connect, share and discuss educational topics.

Teachers have a variety of professional roles, in this study how they connect on Twitter chats showed that the levels of participation allowed them to connect, interact and reflect on their teaching practice. Teachers in this study who used Twitter for PD felt connected and less isolated. The reflective process that teachers experience on the Twitter chats brings technological advantage and a teacher voice that will allow them to share, learn, and connect.

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Appendix A: Research Questions Aligned to Data Sources

Research Question	Data Collection Tool	Data Source Questions
Research Question 1: In what professional activities do teachers participate on Twitter?	Interview	IQ#1: How did you first begin participating on Twitter? IQ#2: How has your participation on Twitter evolved over time? IQ#3: Describe your experiences with Twitter chats.
	Journal Reflection #1: Types of Twitter participation	Directions: Place an X in the column to indicate which Twitter roles describe your past experiences. Then describe a specific example.
	Journal Reflection #2: Post Twitter Chat: DM	1. Why did you choose to attend the chat? 2. Describe your participation in the chat. 3. How well did the chat meet your expectations? 4. How did you feel during the chat?
	Tweet Content Analysis Form	Form will allow me as the researcher to categorize tweets into types of participation.
Research Question 2: How do teachers use Twitter to help them reflect on pedagogical practices?	Interview	IQ#4: How has your participation influenced what you do in the classroom, if at all? Share an example. IQ#5: How has your participation on Twitter made you reflect about your teaching practice if at all? Share an example. IQ#6: Describe a teaching topic that you are passionate about that has been discussed on Twitter. How has your Twitter participation influenced your views on the topic? IQ#7: Describe a time when something you heard about education on Twitter made you rethink the topic.
	Journal Reflection #2: Post Twitter Chat: DM	5. As you pause now, and reflect on the topic of the chat, what insights do you have about your own teaching? 6. After the Twitter chat, what comment made you reflect about education in general. Share an example and how that impact your previews ideas.
	Tweet Content Analysis Form	Form will allow me as the researcher to categorize tweets for depth of reflection on pedagogy.

Appendix B: Types of Twitter Participation Journal #1

Journal Reflection #1 Types of Twitter Participation

Directions: Place an X in the column to indicate which Twitter roles describe your past experiences. Then describe a specific example.

Twitter Role	Define	Place an X in the columns of the ones that apply to you	For the ones you selected, describe an example of a time you participated in this way.
Lurker	You read others' tweets but do not reply. You might seek out people to follow, but your goal may not include getting others to follow you.		
Passive participant	You read tweets and might retweet another person's post. However, you do not add your own comment or additional resources. Your goal is to find resources or information.		
Active participant	You read and reply to/forward tweets. Posts include a unique addition or contribution to the previous published tweet. You find new hashtags that align with your professional interests. The goal is to help others connect with the resources you're finding. In Twitter chats you follow the chat and may answer a question.		
Collaborator	You read, reply to tweets, but also create new tweets. You seek out new people to follow and seek to increase the number of people who follow you. You use Twitter to connect with others. You use your Twitter network to get answers quickly from your network. In Twitter chats, you answer most of the moderator's questions.		
Curator	You read, reply, and create new tweets. You seek out new		

	information, and tweet resources with the intent to engage others with new content. You seek out new content to tweet under your favorite professional hashtags. You are a "regular" at Twitter chats,		
Meta-designer or Moderator	You are highly visible on Twitter and host Twitter chats; you read, reply, create new tweets, and organize Twitter chats. You follow and post to specific hashtags and consider Twitter a form of professional development. You organize the topics to be discussed on the Twitter chats, moderate Twitter chats, posting, and facilitating Twitter chat discussions to motivate others to engage. Goal is to connect globally and help others to do the same.		

Appendix C: Post - Twitter Chat Journal Reflection #2

Journal Reflection #2 Post-Twitter Chat:
After attending a teacher or education focused Twitter chat, please complete the
following questions.

Date/Time of chat:
Moderator/sponsor of chat:
Hashtag of chat:

1. Why did you choose to attend that chat?
2. Describe your participation in the chat.
3. How well did the chat meet your expectations?
4. How did you feel during the chat?
5. As you pause now, and reflect on the topic of the chat, what insights do you have
about own teaching?
6. After the Twitter chat, what comment made you reflect about education in general.
Share an example and how that impact your previews ideas.

Appendix D: Tweet Content Analysis Form

Teachers' Twitter Handle:

Teacher's Twitter Homepage URL:

Date data from profile was recorded:

Participant Pseudonym:

Years on Twitter:

How many followers does the teacher have?

How many people is the teacher following?

How many tweets has the teacher posted?

Low level Twitter Participation	High Level Twitter Participation
In relation to Fischer's richer ecologies of participation (2011) low level participation is described as unaware consumers (Level 0), consumers (Level 1), and contributors (Level 2).	High level of participation is described as collaborators, facilitators, organizers, curators (Level 3) and Meta-Designers or Moderators (Level 4).
- Follow Twitter profiles and search for information and resources. - They observe, read, and use the resources without any kind of contribution. - May follow an active Twitter chat, however, do not participate on them. - They like or retweet a comment. - They answer questions with a simple text, without a further discussion of the subject.	- Organized Twitter content by hashtags. - Attend and contribute to Twitter chats. - May host Twitter chats on educational topics. - Uses the mention sign to include others in discussions. - Posts tweets with purpose to engage in conversation. - Participate actively with clear examples that promote collaboration.

Levels of Reflection

Level 1	Level 2	Level 3	Level 4
Nonreflection/ descriptive	Understanding	Reflection	Critical reflection
The participants copy an idea or text without further explanations.	The participants comprehend the idea without adding any additional reflective arguments that will relate the topic to a personal experience.	The concept is related to the personal experiences and the participants are able to relate the topic to their profession.	The participants changed their idea about the topic discussed and were able to relate in a critical thinking response that showed a higher level of thinking.

Note. From (*Harland & Wondra, 2011; Kember et al., 2008)*

Date of Tweet	Copy and Pasted Tweet	Purpose of the Tweet (Level/type of participation)	Depth of Reflection Level (1-2-3-4)
		Low or High: and Why	1, 2, 3, or 4, and why
		Low or High: and Why	1, 2, 3, or 4, and why
		Low or High: and Why	1, 2, 3, or 4, and why
		Low or High: and Why	1, 2, 3, or 4, and why