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The Influence of Twitter Educational Opinion Leaders on K-12 Classrooms

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by

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Declaration of Originality

I do hereby declare and attest to the fact that this is an original study based solely upon my own scholarly work at Lindenwood University and that I have not submitted it for any other college or university course or degree.

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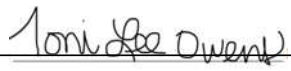
Signature:  Date: 4-2-2020

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Abstract

Global similarity in education policies, with more adventurous and instructionally demanding proposals in education, is causing educational stakeholders to look outside of the school doors to adapt learning opportunities. To ease the strain of such demands, teachers increasingly turn to Twitter to connect to a global network of educators for meaningful and engaging conversations to share and solve a wide range of educational problems. Many authors have concluded that Twitter is an effective tool for professional learning, but scarce attention has been given to the use of Twitter for professional learning. Data from this study were analyzed to identify which role in the flow of communications, opinion leader or information broker, was most influential in an educator's professional learning network. Furthermore, how opinion leaders and information brokers influence K-12 pedagogy was explored. In response to a survey sent out via Twitter, educators indicated that they interact with Twitter for professional learning. Of those with whom educators interact, opinion leaders have the largest influence on pedagogy, and primary strategies sought, as listed by respondents on the survey, pertain to an educator's approach to teaching. Finally, one of the major findings is that professional learning is diverse; therefore, districts providing a one-way approach to professional learning are ineffectively teaching their educators.

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Chapter One: Introduction

For personal or professional reasons, the use of Twitter continues to grow across the globe (Araujo, Neijens, & Vliegenthart, 2017). As the social media environment grows, so too does the way in which viral marketing and social influence occur (Araujo et al., 2017; Turcotte, York, Irving, Scholl, & Pingree, 2015). As people look to ratings, likings, and number of followers for popularity, validity, and credibility, the importance of media literacy increases (Cauberghe, De Veirman, & Hudders, 2017; Filipiak, Mirra, & Morrell, 2018; Garcia, Mavrodiev, Casati, & Schweitzer, 2017; Moldovan, Muller, Richter, & Yom-Tov, 2017; Ognyanova, 2017; Turcotte et al., 2017). Virtual spaces, such as Twitter, provide professional learning opportunities and encourage a community of practice for educators across the globe (Hyndman, 2018; Prenger, Poortman, & Handelzalts, 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Veletsianos, 2018).

In Chapter One the background of the study, theoretical framework, statement of the problem, purpose of the study, significance of the study, definition of key terms, and the study's delimitations, limitations, and assumptions are presented. Within these sections, the history of media communication research and its relation to social networking are summarized. Furthermore, the importance of professional learning via Twitter and the key reasons why educators are turning to Twitter are identified. Katz and Lazarsfeld's (1955) two-step theory of information, and how it provided the basis for a more complex multi-step theory used in social network theory today is discussed (Arriagada, Halpern, Hillbert, Vásquez, & Venezuela, 2017). An introduction to the importance of media literacy skills and the work of John Hattie (2009) are also included in Chapter One.

Background of the Study

The flow of information through the media has been a part of social network theory research since Katz and Lazarsfeld (1955) proposed the two-step flow of communication hypothesis. According to Beacom, Liu, Sidhu, and Valente (2017), "the hypothesis is called two-step because the mass media initially influence opinion leaders, individuals who are perceived as influential, who in turn influence their social contacts" (p. 3). In the context of media effects, the process of diffusion, according to Rice (2011), is defined as "the process through which an innovation spreads through mass or digital media, and interpersonal and network communication, over time, through a social system, with a wide variety of consequences" (as cited in Beacom et al., 2017, p. 7).

According to Afridi and Khan (2017), "a few decades ago teaching learning was quite simple and was limited to the development of reading and writing skills of the students" (p. 212). Global similarity in education policies, along with more adventurous and instructionally demanding proposals in education, are causing educational leaders to look outside the school doors for learning opportunities to help educators adapt (Prenger et al., 2018; Wei, 2017). To help ease the strain of such high demands, "there is a growing trend of teachers using Twitter to connect to a global network of educators to share and solve a wide range of educational problems" (Hyndman, 2018, para. 1). According to Rosell-Aguilar (2018), "Twitter has become a social media tool where meaningful and engaged conversation can take place" (p. 1). This claim is reflected in the literature, with many authors concluding that Twitter is an effective tool for professional development (Greenhalgh & Koehler, 2017; Hyndman, 2018; Prenger et al., 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Veletsianos, 2017).

An increase in collaboration via personal networks has greatly improved educators' skills and confidence in the use of technology, both personally and professionally (Rosell-Aguilar, 2018). Rosell-Aguilar (2018) also stated educators believe they are "delivering more engaging and effective lessons by trying out new strategies which, in turn, are motivating their pupils, improving attainment, and encouraging them to produce more creative outcomes" (p. 3). A modern platform, such as Twitter, allows teachers to share, network, gain emotional support, build professional learning communities, and contribute to their profession (Hyndman, 2018).

Beacom et al. (2017) posed the following question, "How do social networks, including the quality and quantity of relational ties, the structural position of individual actors in a network, and the overall network impact the flow of media messages and their audience?" (p. 3). Although Twitter is an effective tool for professional learning (Greenhalgh & Koehler, 2017; Hyndman, 2018; Prenger et al., 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Veletsianos, 2017), there is very little research that depicts how Twitter is influencing the classroom and student achievement outcomes (Rosell-Aguilar, 2018). Because "demonstrating the relationship between teachers' professional learning and student achievement is a great challenge" (Prenger et al., 2018, p. 2), the purpose of this study was to reveal the influence opinion leaders or information brokers are having on K-12 educator's pedagogy. In addition, connecting the pedagogical changes influenced by an educator's personal learning network to Hattie's (2009) "barometer of influence and zone of desired effects" addressed whether the various pedagogical changes are worthwhile relative to possible alternatives (p. 19).

Theoretical Framework

In a two-step model, Lazarsfeld, Berelson, and Gaudet (1948) explained that information flows from opinion leaders, who are engaged, knowledgeable, and trusted sources of information, to the less active members of the population. Opinion leaders are not always concentrated based on specific social strata but emerge in various domains due to access to information, resources, and popularity (Beacom et al., 2017; Gardner & Mazzalo, 2018; Ognyanova, 2017). Since the 1950s, researchers have built upon the two-step flow model, constructing a more complex multi-step model, where strong and weak ties hold the social network together (Arriagada et al., 2017; Ognyanova, 2017). How an audience perceives information via social media is based on the information provider's online relations such as following, friending, sharing, and liking (Ognyanova, 2017; Turcotte et al., 2015). According to Ognyanova (2017), "one way to quantify power in networks is based on the overall number of social connections a person has (known as degree centrality)" (p. 5). Other forms of centrality, such as closeness or betweenness centrality, take into account indirect connections or bridging roles an individual has in the social networks of others (Ognyanova, 2017). No matter the centrality, individuals are usually influenced by individuals who are engaged, knowledgeable, and viewed as credible sources of information (Beacom et al., 2017; Ognyanova, 2017; Turcotte et al., 2015). According to Turcotte et al. (2015):

> …considering that today's media environment presents news consumers with expansive new choices, "one extremely important way [individuals] decide what to pay attention to is through recommendations that reach them through their online social networks (Mutz & Young, 2011, p. 1038)" (p. 523).

Even though individuals may be geographically separated, social media sites have allowed users to produce, share, and collaborate more than ever (Turcotte et al., 2015).

For this study, whether or not an educator believes they follow an opinion leader and an information broker was of interest. Furthermore, how they interact with information presented by both opinion leaders and information brokers was of greater interest. Gardner and Mazzola (2018) and Turcotte et al. (2015) have eluded to the growing problem of information credibility created by the ability to post on the internet or social media at any time. According to Bisschoff and Jefferis (2017), "conversations take place around the clock… with everyone able to say whatever they want, whenever they want" (p. 47). The volume of information that appears within an individual's Twitter stream can be overwhelming (Bisschoff & Jefferis, 2017).

The diversity of social media and the multi-step model led Ognyanova (2017) and Beacom et al. (2017) to believe in an ever increasing and more influential role of information brokers. The results of this study add to information regarding Twitter use as a professional learning network, and how the media messages of both opinion leaders and information brokers affect their audience, K-12 educators. Identifying whether opinion leaders or information brokers are having the greatest influence on classroom pedagogy provides insight as to who educators believe to be more credible and influential.

Statement of the Problem

The growth of public education through the 20th century resulted in an education system that provides an equitable education to a variety of students with varying educational needs (Cohen, Spillane, & Peurach, 2017). Plus, a standards-based teaching reform that targets schools that fail to educate students by holding teachers and school

leaders accountable was implemented (Cohen et al., 2017). Due to the increased complexity of the 21st century, along with continuous changes in government mandated standards and high-stakes testing, educators and educational leaders struggle to keep pace (Cohen et al., 2017). To meet these demands, there is increased pressure to provide and sustain high quality professional learning (Prenger et al., 2018).

Throughout the globe, educators are collaborating in physical or virtual spaces to chat about curriculum, teaching strategies, behavior management strategies, education reform, and more (Hyndman, 2018). According to Hyndman (2018), "there is a growing trend of teachers using Twitter to connect to a global network of educators to share and solve a wide range of educational problems" (para. 6). Many educators believe social media continually provides new ways to improve and keep cognizant of their content area (Rosell-Aguilar, 2018). While there has been an increase in Twitter usage for professional learning, Tang and Hew (2017) stated that "scarce attention has been paid to the review of Twitter use" (p. 99). More research is needed to understand what educators, involved in informal learning communities, learn from one another (Rosell-Aguilar, 2018). Additional understanding as to how professional learning via Twitter is impacting classroom practice and student outcomes is in demand (Rosell-Aguilar, 2018).

Ognyanova (2017) referred to social influence as the "notion that the people we know can affect our actions and attitudes" (p. 3). The effects of Twitter use as a personal learning network, and how personal influence, largely derived from user's social contacts and friendship networks, significantly affect decisions has been a focal point for educational researchers in the past (Beacom et al., 2017). Historically, audiences did not have the means to easily broaden their information bank; however, innovations to the

internet and social media sites have extinguished those limitations (Bisschoff & Jefferis, 2017; Tour, 2017). The recursive nature of opinion leaders coupled with social media's echo chamber tendencies could be causing the role of opinion leaders to become less pivotal (Bisschoff & Jefferis, 2017; Beacom et al., 2017). According to Bisschoff & Jefferis (2017), "the tendency for users to surround themselves with people whose views they agree with is referred to in Twitter circles as the 'echo chamber'" (p. 60). However, the algorithms used to serve Twitter users content tends to offer users material that they may like or that is similar to what they have been seeing (Bisschoff & Jefferis, 2017). The algorithm does not, however, offer or serve users materials that they may find controversial, contradictory, or offer a multiplicity of resources (Bisschoff & Jefferis, 2017). Thus, potentially increasing Twitter's echo chamber tendency. The identification and categorization of open response questions may reveal the strength of Twitter's echo chamber or lack thereof. (Goodyear, Casey, & Kirk, 2014; Nochumson, 2018).

Purpose of the Study

Elementary teachers who participated in Nochumson's (2018) study indicated that personal learning networks, via Twitter, provide motivation, support, feedback, and a diverse array of instructional practices. Twitter, as an effective personal learning network, is supported in literature (Goodyear et al., 2014; Rosell-Aguilar, 2018; Tang, & Hew, 2017). But there is little to no research to provide insight into what teachers are discovering on Twitter and from whom (Goodyear et al., 2014). According to Nochumson (2018), researchers are still trying to determine how teachers learn and how to help them implement their learning into their practice. The purpose of this quantitative study was to reveal by whom K-12 educators feel more influenced, opinion leaders or

information brokers. Furthermore, the pedagogical strategies of opinion leaders and information brokers that have been implemented in K-12 classrooms were explored.

The potential effect size of each strategy or each strategy category was determined using Hattie's (2009) "barometer of influence and zone of desired effects" (p. 17). Hattie's (2009) research aims to "…present a more global perspective on what are and what are not key influences on achievement" (p. 14). To measure the effect of various influences, Hattie (2009) calculated an effect size *(d)* of over 100 influences. Hattie (2009) also determined an effect size "hinge point" (p. 16) equal to 0.40 (p. 17). According to Hattie (2009), "the effect size of 0.40 sets a level where the effects of innovation enhance achievement in such a way that we can notice real-world differences" (p. 17). However, according to Hattie (2009), an effect size of 0.40 "is not a magic number" (p. 17). The hinge point should be used as a guideline, standard, or comparison to initiate student achievement outcome discussions among educators and educational leaders (Hattie, 2009).

Research questions. The following research questions and hypotheses guided the study:

1. How are personal learning networks via Twitter influencing pedagogy?
2. How do opinion leaders within a teacher's Twitter personal learning networks influence the teacher's pedagogy?
3. How do information brokers within a teacher's Twitter personal learning networks influence the teacher's pedagogy?
4. With what frequency do K-12 educators, who use Twitter, research opinion leader's credentials?

5. With what frequency do K-12 educators, who use Twitter, research information broker's credentials?

Significance of the Study

Even though many researchers support the use of Twitter as a professional learning network and how social contacts influence decision making has been a focal point for researchers in the past, there is little research about what Twitter users learn in informal professional learning networks (Beacom et al., 2017; Goodyear et al., 2014; Rosell-Aguilar, 2018; Tang & Hew, 2017). Popularity within social media increases the belief that an individual is knowledgeable and credible (Cauberghe et al., 2017). Because Garcia et al. (2017) stated, "popularity alone is a better predictor of social influence than reputation" (p. 361), conducting this study reveals whether educators are more drawn to the suggestions of opinion leaders or those of information brokers (Moldovan et al., 2017).

The saturation and diversification of online media are enormous (Cauberghe et al., 2017; Erdem & Eristi, 2018; Joanou, 2017; Salaverria, 2019). The traditional role of media has been transformed by the active participation of citizens in public communications (Salaverria, 2019). Opening and allowing comments, views, and opinions of readers', via digital spaces, has opened many channels for individuals to contribute to the news (Salaverria, 2019). Within these spaces, the concept of collaborative journalism was born, and "… triggered an irreversible transformation within the media and the public" (Salaverria, 2019, p. 6). Companies have discovered the extensive impact and growth potential of influencers who promote their products (Cauberghe et al., 2017).

Individuals are becoming reliant on others within their online social networks for knowledge and opinions (Ardèvol-Abreu, Gil de Zúniga, & Weeks, 2017). Individuals who are active within social media have the potential to hold opinion leadership positions, thus shaping the attitudes and behaviors of their online peers (Ardelvo et al., 2017). Media literacy, the responsibility to inquire and critically think about online information and the individuals who provide it, has become a center of gravity for countering misinformation or fake news (Bulger & Davison, 2018). According to Lemish (2015), "teachers are expected to be able to place themselves outside of these media processes of influence" (as cited in Bulger & Davison, 2018, p. 3), and have the ability to provide themselves and their pupils with skills for critically viewing media information (Bulger & Davison, 2018; Erdem & Eristi, 2018). Exploring whether educators are vetting the credentials of opinion leaders and information brokers adds depth to the current media literacy landscape of educators. Furthermore, whether or not an educator finds individuals they follow as credible also influences whether or not they adopt the pedagogical behaviors of that individual (Beacom et al., 2017; Ognyanova, 2017).

Darling-Hammond, Gardner, and Hyler (2017) defined effective professional development as "structured professional learning that results in changes in teacher practices and improvements in student learning outcomes" (p. 2). Furthermore, Darling-Hammond et al. (2017) concluded that effective professional learning incorporates most of the following: is content focused, incorporates active learning, supports collaboration, uses models of effective practice, provides coaching and expert support, offers feedback and reflection, and is of sustained duration. Even though researchers understand the

components of effective professional learning, many are still seeking to understand the insufficiencies of professional development (Darling-Hammond et al., 2017).

Many barriers to professional development have been identified by educational leaders and classroom teachers (Darling-Hammond et al., 2017). Educational leaders identify choice, approach, fidelity, and assessment of professional development as barriers (Darling-Hammond et al., 2017). Teachers identify a lack of resources, classroom management, and time as barriers to professional development opportunities and implementation (Darling-Hammond et al., 2017). To keep pace and overcome hurdles found within traditional professional development, educators are turning to alternative methods of professional development (Prenger et al., 2018; Wei, 2017). Because much research reveals that Twitter is an effective professional learning tool (Greenhalgh & Koehler 2017; Hyndman, 2018; Prenger et al., 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Veletsianos, 2017), the conclusions of this study provide insight into what educators are looking for within their personal learning.

Definition of Key Terms

For the purposes of this study, the following terms are defined:

Hashtags. Veletsianos (2017) defined hashtag (#) as a:

> …symbol followed by a short phrase, that allows users to find others posting information on similar topics and to share information in an organized fashion. Hashtags provide a way for individuals to interact with one another, curate resources, and share their learning. (p. 285)

Information broker. Moldovan et al. (2017) defined an information broker as an "individual who bridges structural holes between individuals within a network" (p. 537).

Opinion leader. Beacom et al. (2017) defined opinion leaders as "individuals [who] are perceived to be influential" (p. 2).

Personal learning network. Tour (2017) defined a personal learning network as "informal networks of teachers who interact online for professional purposes" (p. 11).

Professional learning community. As cited in Prenger et al. (2018):

> There is no universal definition in the literature as to what a professional learning community is (Stoll et al., 2006). Overall, it refers to "a group of people sharing and critically interrogating their practice in an ongoing, reflective, collaborative, inclusive, learning-oriented, growth-promoting way; operating as a collective enterprise" (Stoll et al., 2006, p. 223). (p. 1)

Twitter. Rosell-Aguilar (2018) explained, "Twitter is a microblogging tool where users can post messages (tweets) of up to 280 characters as well as links, photos, and videos, polls, and live video streaming" (p. 1).

Delimitations, Limitations, and Assumptions

The scope of the study was bounded by the following delimitations:

Time frame. Data collection was accomplished in the 2019 Fall Semester.

Location of the study. The study occurred virtually via Twitter's website.

Sample. The sample for this study was composed of any individual in the K-12 education profession.

Criteria. Any participant who answered "yes" to the question *Do you work in the K-12 education profession?* was asked to complete the survey.

The following limitations were identified in this study:

Sample demographics. In this study, only the influence opinion leaders via Twitter are having on K-12 classrooms were examined. Educators stated their classroom pedagogy has become increasingly stronger due to the use of information and resources found on Twitter (Bisschoff & Jefferis, 2017; Hyndman, 2018; Rosell-Aguilar, 2018; Tour, 2017).

Lack of prior research studies. According to Tang and Hew (2017):

> In order to meaningfully incorporate Twitter in teaching and learning, it is imperative that we know what has been done successfully and what can be further improved. However, no up-to-date empirical literature review has been done in this regard over the recent ten years since Twitter went into market. Hence, a comprehensive and critical review in this regard would be timely to provide a panoramic picture of the current situation and to discuss the role of Twitter in teaching and learning. (p. 98)

Instrument. A self-constructed survey was developed to obtain quantitative data describing the influence opinion leaders are having on K-12 classrooms. According to Krosnick and Presser (2009), "Survey results depend crucially on the questionnaire that scripts this conversation" (as cited in Marsden & Wright, 2010, p. 263). To minimize response errors, the survey utilized in this study was crafted in accordance with Krosnick and Presser's (2009) best practices (as cited in Marsden & Wright, 2010).

The following assumptions were accepted:

1. The responses of the participants were offered honestly and willingly.
2. The sample was representative of the general population of educators who held teaching certificates in K-12 education.

Summary

Because today's educational leaders perceive learning less as a product and more as a process (Afridi & Khan, 2017), "there is a growing trend of teachers using Twitter to connect to a global network of educators to share and solve a wide range of educational problems" (Hyndman, 2018, para. 1). Lack of media literacy and vetting sources of information is leading to a culture of fake news and misinformation that could influence educator's pedagogical behaviors (Bulger & Davison, 2018; Erdem & Eristi, 2018). The background information in this chapter was provided to introduce the flow of communication and social network theory, the theoretical framework of this study. Plus, how interactions of an educator's personal learning network have the potential to affect pedagogy was discussed. Furthermore, the reasons why educators are seeking to expand learning communities were identified. In the theoretical framework section, several concepts of network research and the concepts of opinion leadership and information brokers were introduced.

The statement of the problem includes a brief summary of why Twitter is becoming more popular for learning in the education profession. Moreover, a lack of research correlating Twitter personal learning networks and student outcomes was identified. In the significance of the study, what could be determined and implied by information garnered in this study was described. Chapter Two includes a review of literature focused on the need for high quality, personalized, professional learning, and how Twitter is meeting educator needs. The review of literature includes a more in-depth review of social network theory and the two-step and multi-step models of communication. Furthermore, an overview of existing research on traditional

professional development, Twitter as a personal learning network, media literacy, and contributions to student achievement will be discussed.

Chapter Two: Review of Literature

Educators are turning to social media to broaden professional learning communities and networks (Carpenter, Krutka, & Trust, 2017). Increasing the breadth of learning opportunities has educators feeling less isolated and more up to date with current educational news (Rosell-Aguilar, 2018). Even though Twitter use as a personal learning network is supported in literature, there is little research explaining how Twitter personal learning networks are affecting student achievement (Greenhalgh & Koehler, 2017; Hyndman, 2018; Prenger et al., 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Veletsianos, 2017). The purpose of this study was to reveal who K-12 educators feel more influenced by, opinion leaders or information brokers. Furthermore, in this study the pedagogical strategies of opinion leaders and information brokers that have been implemented in educators' classrooms were explored.

A historical look at opinion leadership and the impact of opinion leaders on the flow of communication through social networks will be discussed in Chapter Two. Key reasons why educators are turning to social media, especially Twitter, will be identified. The challenges of traditional professional development will be addressed, and how Twitter's on-demand learning environment is influencing professional growth will be examined. The importance of media literacy will be summarized, along with the importance of vetting individuals one follows. Lastly, an introduction to Hattie's (2009) six contributions to student achievement will be examined, along with an exploration of Hattie's "barometer of influence" (p. 17) and effect size will be discussed. Other factors influencing student success are summarized.

Theoretical Framework

The flow of communication work completed by Katz and Lazarsfeld (1955) and built upon into a multi-step model served as the theoretical framework of this study. Lazarsfeld, Berelson, and Katz (1948) conducted survey work with the goal to determine individual and media factors that influenced "…. how and why people decided to vote as they did" (Turcotte et al., 2015, p. 522). During this time, ideas flowed from radio or print to opinion leaders, then were conveyed to a more general audience (Ognyanova, 2017; Turcotte et al., 2015). Lazarsfeld and Katz's (1955) two-step model of communication has provided the foundation for media flow research for many decades (Arriagada et al., 2017). The two-step model is focused on the importance of social communication through the use of media and social influence (Ognyanova, 2017).

Since the 1950s, researchers have been studying the flow of information through social communication (Arriagada et al., 2017; Beacom et al., 2017). According to Arriagada et al. (2017), "one of the most well-known theories of social communication, media effects, and personal influence is the six-decade-old 'two-step flow model of communication' by Katz and Lazarsfeld (1955)" (p. 445). In this model, information flows from mass media outlets to individuals of influence, known as opinion leaders (Beacom et al., 2017; Ognyanova, 2017; Turcotte et al., 2015). Opinion leaders put the information into a shareable context for a general audience (Arriagada et al., 2017; Beacom et al., 2017; Ognyanova, 2017; Turcotte et al., 2015). In the decades following the introduction of Katz and Lazarsfeld's (1955) two-step model, much research has been completed (Arriagada et al., 2017; Ognyanova, 2017). Over the years since Katz and Lazarsfeld's work, media types and exposure have drastically increased (Arriagada et al.,

2017; Beacom et al., 2017; Turcotte et al., 2015). Alongside the growth of media, researchers have modified and built upon the two-step model (see Figure 1) that led to the emergence of a more complex multi-step flow model (Arriagada et al., 2017; Beacom et al., 2017; Ognyanova, 2017).

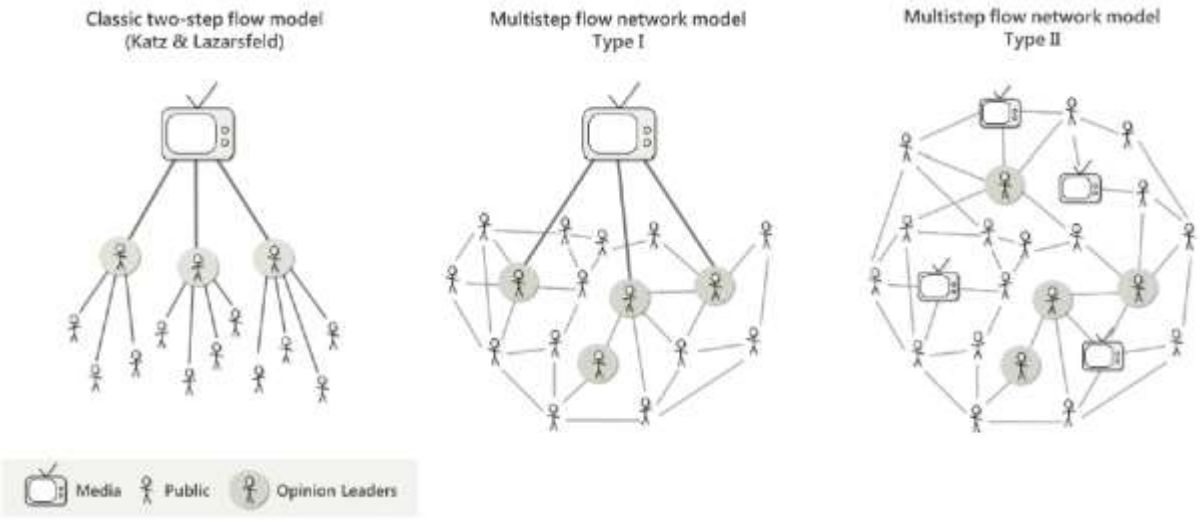

Figure 1. Two-step flow model versus multistep flow network model. The figure illustrates the evolution of the multi-step flow model from the two-step flow. From "Multistep Flow of Communication: Network Effects" by Katherine Ognyanova, 2017, *The International Encyclopedia of Media Effects,* p. 3. Copyright 2017 by John Wiley and Sons. Reprinted with permission (see Appendix A).

Unlike the two-step flow of communication, the multi-step model additionally accounts for the role of information brokers, strong versus weak ties, centrality, cohesion, and structural equivalence within a communication network, now referred to as a social network (Ognyanova, 2017; Turcotte et al., 2015). These additional concepts help researchers define and analyze social network connection patterns, which in turn, helps

determine patterns of innovation diffusion, behavior, and adoption (Beacom et al., 2017; Ognyanova, 2017). The effects of social network positions are explained by three multi-flow model concepts: centrality, cohesion, and structural equivalence (Beacom et al., 2017). According to Beacom et al. (2017), "centrality is measured by closeness, degree, and betweenness; cohesion measures the degree of interconnections among a network, and structural equivalence suggests two or more network positions that share a similar pattern" (p. 1-2).

Twitter users connect, learn, and build their online social media networks by following, liking, searching hashtags, tweeting, and retweeting (Beacom et al., 2017). The "openness, brevity, and immediacy" (Fikis & Wang, 2017, p. 7) of Twitter allows information to diffuse at great speeds among its users (Fikis & Wang, 2017). The number of social media followers an individual or entity has reflects popularity, network size, and media environment (Cauberghe et al., 2017). Furthermore, the number of followers conveys that many people are attracted to the individual's ideas, portrays trust or credibility, and designates the individual or entity as a person of influence or an opinion leader (Beacom et al., 2017; Cauberghe et al., 2017; Dewitt, 2018; Gardner & Mazzola, 2018; Ognyanova, 2017; Turcotte et al., 2015). According to Gardner and Mazzola (2018), "individuals may become opinion leaders not only because they possess certain attributes, but because they occupy the right network positions that enable them to effectively spread information and exert personal influence" (p. 3). Because an opinion leader has so many followers, they are placed at the center of a network, exerting their influence through the unique role of a network's strong and weak ties (Fikis & Wang, 2017).

Measuring Influence within a Social Network

Three main techniques are used to identify opinion leaders in social network analysis research: self-report scale, nomination technique, and the most common method calculating degree centrality scores (Moldovan et al., 2017). The self-report scale is a method in which opinion leaders rate their own opinion leadership, a technique that suffers bias due to individual's overestimating their influence and leadership (Moldovan et al., 2017). The nomination technique, the technique used in this study, is a method that "…people report which other individuals influence their decisions" (Moldovan et al., 2017). Beacom et al. (2017), Moldovan et al. (2017), and Ognyanova (2017) agree that calculating the centrality of each networks' node's connections is the most accurate method to measure opinion leadership. According to Moldovan et al. (2017), calculating degree centrality scores entails constructing a network web (see Figure 2), then using each "…node's in-degree and each node's out-degree to discover which individuals are connected to most others" (p. 537) to calculate opinion leadership strength.

Opinion leaders in direct networks, networks in which users are seeking advice, have "…a large number of incoming ties that may signal high status or expert knowledge" (Ognyanova, 2017, p. 5), and therefore have high degree centrality. Closeness centrality, seen by opinion leaders with direct or small intermediary access to everyone in their community, may be successful in obtaining and dispersing information rapidly (Ognyanova, 2017). The ability of an opinion leader with high closeness centrality to move information fast stems from the shorter distances between the nodes of their social network (Beacom et al., 2017). Betweenness centrality is "calculated by finding the shortest paths connecting any two people in the network and counting how

many of those paths pass through the focal person" (Ognyanova, 2017, p. 5). Connecting otherwise disconnected social groups allows individuals to have high betweenness centrality, and span or bridge structural holes in social groups (Ognyanova, 2017). According to Ognyanova (2017), "occupying a bridging position enhances social capital and makes one more likely to be identified by peers as an opinion leader" (p. 6).

Along with centrality, the diffusion of information through a social network also depends on weak or strong ties (Beacom et al., 2017; Moldovan et al., 2017; Ognyanova, 2017). Strong ties are those created by family or close friends, whereas weak ties are those created by someone of slight friendship or acquaintance (Beacom et al., 2017). Weak and strong ties are measured by frequency of contact, duration of the interaction, reciprocity, and level of intimacy exchanged in a relationship (Beacom et al., 2017). According to Beacom et al. (2017), strong ties often emerge from the center of a network, which gives them greater capacity to diffuse information and exert social influence. The peripheral position of weak ties "makes them better able to reach outside information, and thus provides strength in their ability to reach a broader, and potentially more heterogeneous set of information sources" (Beacom et al., 2017, p. 6). However, according to Moldovan et al. (2017), "studies repeatedly show that in spite of the importance of weak ties in bridging between the groups, it is strong ties within the groups that are more influential when it comes to decision making" (p. 538).

Cohesion and structural equivalence are other factors that contribute to how information flows within a social network. Structural equivalence indicates two or more network positions that share a similar pattern of connections and similar characteristics, such as social status or profession (Beacom et al., 2017). Due to the similarities found

within structural equivalence, individuals of this network are more likely to receive similar information from similar sources, which could be a stronger predictor of information adoption when compared to cohesive influence (Beacom et al., 2017). Network cohesion measures the interconnections of a group of nodes, serves as an important "structural feature that moderates the influence of interpersonal networks, and has long been used to detect subgroups or cliques within the larger social network" (Beacom et al., 2017, p. 2).

Since the 1980s, scholarly research has revealed that media influence is not one directional but is a process of recursive steps (Beacom et al., 2017). According to Fikis and Wang (2017), "to date, user-generated Twitter data have been considered as real-time 'social sensors' of public opinion" (p. 8). The circular flow of information within social media networks is causing the role of opinion leaders to become less pivotal (Moldovan et al., 2017). Opinion leaders are active and influential in small-tie groups, network connections that consist of family members or close friends (Beacom et al., 2017; Moldovan et al., 2017; Li, 2015; Ognyanova, 2017). However, as the network of opinion leaders weak ties or acquaintances grow, followers may find opinion leader information redundant, weakening opinion leader effect considerably (Beacom et al., 2017; Li, 2015; Moldovan et al., 2017).

Another key role in social network theory is that of an information broker (Beacom et al., 2017; Li, 2015; Moldovan et al., 2017). According to Ognyanova (2017), "brokers are individuals who connect otherwise disconnected social groups" (p. 5) and thus have high betweenness centrality. Social groups, such as Cluster A and Cluster B (see Figure 2), are disconnected until individual one (labeled 1) connects with individual

two (labeled 2). Once this connection is made, individual 1 and individual 2 hold brokering positions within their communities. Being the only one (or one of few) whose ties reach outside of the local network, brokers have access to new information and control whether or not that information enters their local network (Beacom et al., 2017; Ognyanova, 2017). The diversity of broker information decreases the recursive nature of the two-step model and allows information to flow to a broader, more heterogeneous network of individuals (Beacom et al., 2017; Moldovan et al., 2017). Araujo et al. (2017) stated, "information brokers are the most important type of user for information diffusion in social media" (p. 500).

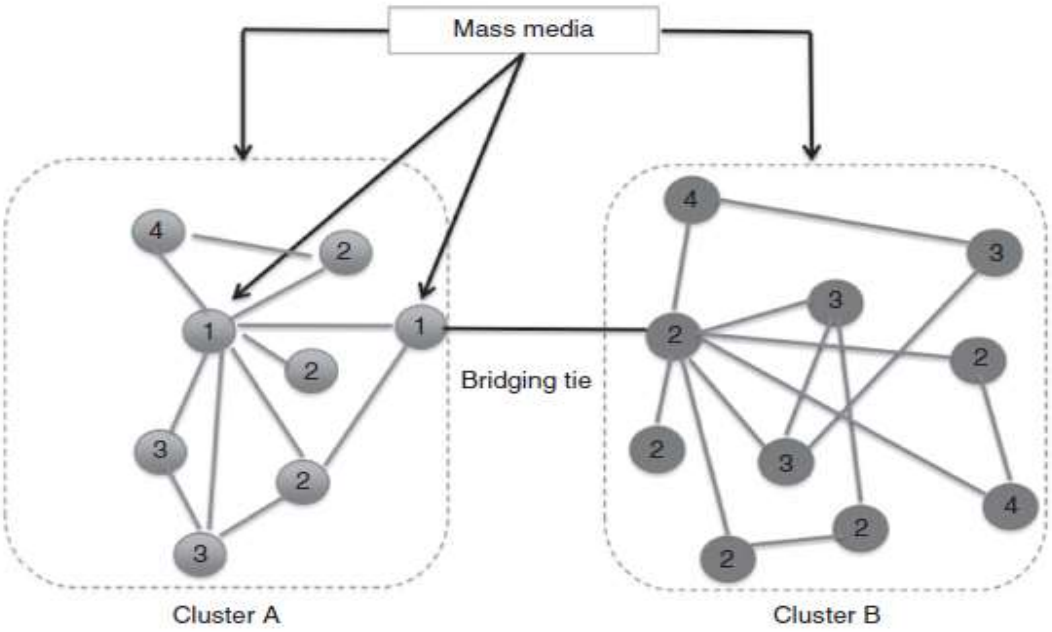

Figure 2. Information Brokers. Information brokers form bridging ties between two disconnected networks. From "Social Network Theory" by A.M. Beacom, W. Liu, A. Sidhu et al., 2017, *The International Encyclopedia of Media Effects,* p. 8. Copyright 2017 by John Wiley and Sons. Reprinted with permission (see Appendix B).

The flow of communication through media has been a part of research since the introduction of Katz and Lazarsfeld's (1955) 1950s study. How information flows from opinion leaders to the general audience was the basis for the two-step model, and the foundation for the emergence of the multi-step flow model and the role of information brokers (Arriagada et al., 2017; Beacom et al., 2017; Ognyanova, 2017). The multi-step flow model helps individuals understand innovation diffusion, behavior, and adoption patterns (Beacom et al., 2017). Calculating and analyzing network model concepts such as centrality, cohesion, and ties helps researchers measure the influence opinion leaders or information brokers are having on their audience, and how effortlessly information flows within the networks of opinion leaders and information brokers (Beacom et al., 2017; Moldovan et al., 2017; Ognyanova, 2017).

Challenges of Traditional Professional Development

Professional development opportunities that are not directly aligned to specific content, embedded in day to day instruction, and supported or sustained for a prolonged period of time are leading to stagnant professional learning growth (Darling-Hammond et al., 2017). According to Tour (2017), "teachers have different professional needs, and a de-contextualized 'one size fits all' approach to professional learning cannot address them effectively" (p. 13). Furthermore, districts that lack the effort to identify and recognize each educator's learning style and learning preference have created an environment in which professional learning is passive and superficial (Tour, 2017). Along with the obstacles of district provided professional learning, "many teachers have reported needing avenues to enhance emotional support, resources and relationships to

develop resilience, and environments to help build an identity and prevent isolation" (Hyndman, 2018, para. 4).

Opportunities are needed for teachers to learn and refine sophisticated forms of pedagogy necessary to develop 21st-century student competencies (Darling-Hammond et al., 2017). To support teachers and their practice, most school districts provide mandated, in-house traditional professional development activities such as workshops, lectures, and seminars throughout the year (Barrett, Evering, & Visser, 2014; Carpenter et al., 2017). However, these forms of traditional professional development have been criticized for failing to deliver meaningful experiences, which "…honor or account for the agency, motivation, and needs of teachers" (Carpenter et al., 2017, p. 247; Tour, 2017). Furthermore, traditional professional development opportunities tend to be short-term, one-time events in which information cannot be presented in meaningful and connected patterns, and have little or no follow-up (Barrett et al., 2014; Harris, Holland, & Sherman, 2018; Tour, 2017). Traditional professional development can be very costly, due to geographic constraints or funding, in a time when schools have limited financial resources (Barrett et al., 2014; Hyndman, 2018; Nochumson, 2018; Prenger et al., 2018; Tour, 2017). Additionally, traditional professional development is not content specific, covers materials and skills that are frequently disconnected from practice, does not necessarily contribute to the teacher's repertoire of skills, and often do not focus on improving instruction" (Barrett et al., 2014). Even though traditional professional development has many pitfalls, schools and districts across the globe persist with this type of professional development because other forms of professional learning are impractical for many schools (Tour, 2017).

Perhaps most importantly, major questions remain about how teachers learn and how professional development can improve pedagogy (Darling-Hammond et al., 2017). According to Korthagen (2017), "a lot of knowledge is available about how teaching could become more effective at influencing student learning… however, an overwhelming number of studies have shown there is a huge gap between theory and practice" (p. 387). Traditional professional development is not designed with teachers in mind and thus is not synonymous with professional learning (Barrett et al., 2014; Carpenter et al., 2017; Korthagen, 2017; Nochumson, 2018). To overcome the challenges of traditional professional development, more attention is being paid to how teachers learn and how to meet their professional needs (Carpenter et al., 2017; Korthagen, 2017). According to Carpenter et al. (2017), "considering the shortcomings of traditional professional development, some teachers access their professional learning networks to meet their professional interests, goals, and needs" (p. 247).

The expectation for teachers today is to provide students with active, engaging, higher order thinking learning opportunities (Matherson & Windle, 2017). Therefore, the expectations set forth for teachers should be reflected and modeled within professional learning opportunities (Matherson & Windle, 2017; Prenger et al., 2017). However, this is not the case for most professional development opportunities and becomes even more problematic for individuals who do not have any personal or professional connection to the topic being presented (Carpenter et al., 2017; Nochumson, 2018). Matherson and Windle (2017) determined four themes that teachers want from professional development opportunities: *learning that is interactive, engaging, and relevant to their students*; *learning that shows them a more practical way to deliver content*; *learning that is*

teacher-driven; and *professional development that is sustained over time*. Teachers need to have opportunities to develop and apply the related knowledge, skills, and attitudes necessary to improve student learning (Prenger et al., 2017). Providing socially interactive professional development opportunities increases a teacher's motivation to participate, engage, and learn (Matherson & Windle, 2017; Nochumson, 2018; Prenger et al., 2017).

To overcome the obstacles of district provided professional learning opportunities, isolation brought about by small or rural districts, and the emotional support many teachers need, many administrators across the globe have implemented within-school or beyond-school professional learning communities or personal learning networks (Prenger et al., 2018). According to Nochumson (2018), "it is hard for some teachers to imagine what a 21st-century classroom should look like, let alone facilitate one themselves" (p. 5). The urge and expectation to constantly advance both professional knowledge and that of the profession has brought about increasing trials for educators across the globe (Cohen et al., 2017; Prenger et al., 2018). According to Prenger et al. (2018), "teachers can be supported in rethinking their own practice and improving their teaching by working and learning together" (p. 1).

Twitter as a Personal Learning Network

To extend professional learning beyond learning experiences provided by schools or districts, educators have begun to construct and expand their personal learning networks (Carpenter et al., 2017; Prenger et al., 2018). According to Barrett et al. (2014), "personal learning networks have recently emerged as a popular alternative to conventional models of professional development" (p. 396). Teachers' personal learning

networks uniquely reflect their professional interests, needs, and goals (Carpenter et al., 2017). Personal learning networks create opportunities for social, job-embedded, continual, and reflective learning, which a number of researchers have identified as essential components of effective teacher professional development (Carpenter et al., 2017; Darling-Hammond et al., 2017). According to Carpenter et al. (2017), personal learning networks are "…uniquely defined systems of interactions made up of people, spaces, and tools that support learning and professional growth" (p. 247). Engaging in collaborative conversations with peers, observing colleagues' classrooms, attending conferences and un-conferences, and participating within social media or blogs are methods of enriching personal learning networks and professional learning (Akiba & Liang, 2016; Barrett et al., 2014; Carpenter et al., 2017; Tour, 2017).

Teachers have started using social media as a form of self-learning and an extension of personal learning networks beyond local contexts (Carpenter et al., 2017; Hyndman, 2018; Nagle, 2018; Tour, 2017). Since the launch of the internet and social media sites, such as Facebook and Twitter, administrators and individuals in the education profession have the opportunity to expand their professional learning communities into a larger network for professional and personalized learning (Tour, 2017). According to Barrett et al. (2014), social networks, such as Twitter, "…contain information and resources that can be used by educators to develop their professional practice" (p. 396). The worldwide popularity of Twitter's real-time information network is impressive (Barrett et al., 2014; Fikis & Wang, 2017). Twitter "is what's happening in the world and what people are talking about right now" (Twitter, 2019d, para. 1). The Twitter environment allows users to connect, via tweets, to stories, ideas, and opinions

that the user finds interesting (Barrett et al., 2014; Tang & Hew, 2017). Hashtags, written with a # symbol, are placed within tweets to index or categorize keywords or topics on Twitter (Fikis & Wang, 2017; Twitter, 2019b). The use of hashtags makes searching on Twitter almost effortless and streamlined (Barrett et al., 2014; Twitter, 2019b). By connecting and collaborating with educators located in different states or countries, teachers have the opportunity to act as both a teacher and learner accessing a variety of tools (Carpenter et al., 2017; Tour, 2017). Personal learning networks allow educators to grow in a variety of directions by providing just-in-time, job-embedded assistance that can complement or extend traditional professional development learning experiences (Carpenter et al., 2017; Nochumson, 2018). Educators state that personal learning networks via Twitter are not just about the instant connections, but about the opportunities to be exposed to the work of people who are "…paving the way for many critical conversations in our society" (Laskowski, 2018). According to Akiba and Liang (2016), allowing educators the "…flexibility and autonomy in choosing topics for their professional learning may lead to instructional improvement by trying out new ideas and approaches" (p. 107).

Social media sites, like Twitter, allow teachers to customize or differentiate their learning through increased informal opportunities to choose not only what to learn, but also how, when, and with whom to learn (Tour, 2017). Informal professional development, conducted via a Twitter personalized learning network, is appealing and valuable to educators for numerous reasons (Barrett et al., 2014). Personalized learning networks offer information and resources directly connected to an educator's needs and classroom (Barrett et al., 2014). According to Barrett et al. (2014), "informal

professional development is nearly always accessible and therefore tends to become embedded in the teacher's daily routine" (p. 397). New Jersey teacher and principal Baruti Kafele (as cited in Laskowski, 2018) stated, "not a day goes by without me tweeting something" (p. 45). Furthermore, according to Tour (2017), "the evolution of the internet opened access to different materials, courses, teachers, experts, and other learners allowing people to engage in learning with comparatively few restrictions" (p. 11).

Teacher professional learning is considered crucial for improving the quality of education and is promoted through diverse partnerships and networks (Prenger et al., 2018). The ability to customize learning via an online environment, such as Twitter, has led to an increase in spontaneous and self-initiated learning among educators (Tour, 2017). Furthermore, the use of digital spaces, such as Twitter, has become a major component of many educators' diverse learning communities (Hyndman, 2018; Prenger et al., 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Veletsianos, 2017). This is due to the recognition of digital learning as a beneficial form of professional development and is a fruitful way to expand participation and engagement within an individual's professional learning community (Hyndman, 2018; Tang & Hew, 2017). The infinite ability to follow, share, collaborate, and mentor like-minded colleagues has allowed educators to have professional learning on demand (Tour, 2017).

Media Literacy

The research of social communication and social networking is used to examine the diffusion of information through social environments, supporting the idea that information discovered within Twitter influences one's perceptions of innovations and

adoption behaviors (Beacom et al., 2017). Many entities understand that individuals tend to adopt the decisions of others, and they utilize Twitter to market and influence target audiences (Araujo et al., 2017; Cauberghe et al., 2017; Li, 2015). Twitter is based on a business model, and the algorithms within Twitter continually suggest connections of like-minded individuals to users (Nagle, 2018). The Twitter environment centers on spaces of a commercially contrived business model, and thus "…lacks the ability to be genuinely educational, even as a professional learning environment" (Nagle, 2018, p. 88). The bombardment of available information and advertisers seeking to attract the attention of users is increasing the need to be media literate (Cauberghe et al., 2017; Celik, Çokçalişkan, & Yorulmaz, 2018; Erdem & Eristi, 2018; Joanou, 2017; Nagle, 2018). The far-reaching impact and viral growth potential of opinion leaders and information brokers have raised concerns regarding the credibility of mainstream news (Cauberghe et al., 2017; Turcotte et al., 2015).

The use of Twitter and other social media technologies is now being documented in scholarly research (Celik et al., 2018; Nagle, 2018; Rosell-Aguilar, 2018). According to Nagle (2018), in the field of education, "these digital competencies include being adept at using a variety of technological tools, such as the internet, for the multimodality, global connectivity, and the collaboration it affords" (p. 86). Social media sites, such as Twitter, allow teachers to gather, communicate, and understand knowledge in multimodal ways transforming teacher pedagogy (Nagle, 2018). To increase professional learning and knowledge diversity, educators need to be aware of how Twitter or other social media technologies work (Burkhardt, 2017; Erdem & Eristi, 2018; Nagle, 2018). According to Nagle (2018), "educators and new teachers need to become

aware of where [our] attention lies, how [our] communication tools work, and what indeed are the affordances and pitfalls of each type of social media" (p. 91).

Many educators report positive experiences while using Twitter as a personal learning network (Hyndman, 2018; Nagle, 2018; Prenger et al., 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Veletsianos, 2018). The optimism of utilizing Twitter could stem from Twitter's tendency to connect like-minded groups or create homogenous spaces (Nagle, 2018; Turcotte et al., 2015). Twitter offers users a symbiotic relationship in which users are shaped by content and shape their own content, sometimes altering the identity of the educator (Nagle, 2018). Twitter's ability to connect and offer like-minded information contributes to the echo-chamber tendencies of social media (Bisschoff & Jefferis, 2017; Nagle, 2018). The lack of neutrality within Twitter increases the need for media literacy professional development among educators (Erdem & Eristi, 2018; Nagle, 2018). Developing a culture of informed learning among teachers is not an option but an obligation (Erdem & Ersti, 2018). Informal learning includes the ability to engage in constructive conversations with people who hold a variety of differing perspectives.

Information flowing through social media is often brought directly to users, rather than requiring them to search for it via sharing from friends and followers (Burkhardt, 2017). One way to measure Twitter users' popularity or influence is to have a long list of followers (Cauberghe et al., 2017; Dewitt, 2018; Gardner & Mazzola, 2018; Beacom et al., 2017; Ognyanova, 2017; Turcotte et al., 2015). Therefore, most social media users easily friend or allow individuals to follow them to increase their number of followers (Burkhardt, 2017). According to Burkhardt (2017):

> …the friends list is great when everybody on it is human, however, it is possible for social media friends to be bots. Bots are sometimes programmed to gather and provide information that is similar to what users like…or to gather and spread misinformation or disinformation. (p. 22)

Wojcik (2018) summarized five key takeaways from a Pew Research Center study in the blog post *5 Things to Know about Bots on Twitter*. During the summer of 2017, the Pew Research Center examined 1.2 million tweets, which contain URL links, to determine which tweets were shared by bots (Wojcik, 2018). The study found that "66% of all tweeted links are shared by suspected bots, estimating that automated accounts are more prolific than human users in sharing links on Twitter" (Wojcik, 2018, para. 4). Furthermore, "about 89% of tweeted links to popular news aggregation sites were posted by bots, not human users. Aggregation sites often feature a screenshot or posted image of a news story produced by another news outlet, as well as a description of the original reporting" (Wojcik, 2018, para. 7). Lastly, "a small number of highly active bots were responsible for a large share of links to prominent news and media sites" (Wocjik, 2018, para. 8). Five hundred of the most active bots were responsible for 22% of popular news and event links, whereas, 500 of the most active human users were responsible for about 6% of tweeted links (Wocjik, 2018).

Another reason misinformation or disinformation spreads is that human users or bots rely on headlines to relay information without looking at the attached story (Burkhardt, 2017). According to Burkhardt (2017), "headlines are meant to capture the attention, and they are often written to provoke a strong reaction" (p. 23). Headlines should act as a warning to users to slow down, ask questions, and possibly check the

information with a fact-checking site (Burkhardt, 2017). Social media sites are attempting to make use of fact-checking sites to easily identify misinformation and the bots that spread it (Burkhardt, 2017). Furthermore, to increase media literacy skills, Twitter users need to understand that the number of followers is not always composed of just humans, and that number of followers is not always an adequate measurement of true popularity (Burkhardt, 2017).

In the 21st century, individuals need the expertise to be powerful analysts and producers of digital media (Celik et al., 2018; Erdem & Eristi, 2018; Filipiak et al., 2018). To catch up or stay abreast in the information age, K-Higher educators have attached greater importance to the development of media literacy skills, such as evaluation of text, creator, audience, and stakeholders (Celik et al., 2018; Filipiak et al., 2018). Educators need assistance and support as they utilize Twitter as a personal learning network (Nagle, 2018). Professional development focused on ways to guide and monitor Twitter use, along with reflective conversations about Twitter use experiences that have the potential to increase media literacy skills among educators (Nagle, 2018). To help balance the use of Twitter as a personal learning network and counter the culture of fake news and misinformation, teachers need to acquire media literacy skills that make them efficient media users (Erdem & Eristi, 2018). According to Filipiak et al. (2018), "as media technologies transform, educators must be constantly vigilant in revisiting their notions of media literacy, media engagement, and media education" (p. 15).

Contributions to Student Achievement

Worldwide, learning within the K-12 classroom has changed from rote learning and knowledge acquisition to knowledge generation and comprehension (Afridi & Khan,

2017; Prenger et al., 2018). Teacher-centered instruction emphasizing lecture, practice, and review may have worked for teachers and students in the past but will not meet the demands of current and future national and state standards (Marzano, 2014). According to Magee and Jensen (2018), "a systemic commitment to producing educated citizens, along with a deep-rooted social consciousness that drives continual improvement towards better outcomes for diverse learners, spurs constant educational reform and innovation" (p. 18). The national focus on school improvement through the art of teaching has changed the perception of learning, for both teachers and students, as a product to a process (Afridi & Khan, 2017). Teachers' continuous engagement in professional learning activities is critical for the improvement of their practice and positively influences students' learning (Akiba & Liang, 2016; Carpenter et al., 2017). According to Akiba and Liang (2016), "…few empirical studies have been conducted to examine the effects of professional conferences, informal communication, and individual learning activities on student achievement" (p. 100). Furthermore, many educators struggle to articulate or are unsure of the impact their professional learning, via social media, is having on student learning (Carpenter et al., 2017). Carpenter et al. (2017) stated, "we have found ourselves on different occasions interacting online failing to evaluate the quality of sources of ideas and resources and neglecting consideration of the impact our personal learning networks have on our students' learning" (p. 246).

To become more mindful of the impact personal learning networks are having on student achievement, teachers need to be more intentional with whom they choose to follow, the tools they utilize, and the spaces in which they learn (Carpenter et al., 2017). Carpenter et al. (2017) constructed a framework for personal learning network

enrichment. The framework tool is meant to be recursive and flexible, allowing educators to consider *what has happened* and *what they would like to happen* in their personal learning network (Carpenter et al., 2017). According to Buskist, Busler, and Kirby (2018), "it falls upon teachers to create and subsequently tinker with conditions that foster, enhance, and maintain student motivation for learning" (p. 56). Evidence from many studies showed instructional approaches that involve students as active participants in tackling small group activities to gain mastery of learning outcomes have the greatest impact on student achievement outcomes (Fuller et al., 2018). Overall, more students do their work because they want to earn the points possible to maintain a certain grade, not because they are genuinely interested in learning the material (Fuller et al., 2018). Applying new teaching methods and educational technologies that reflect the needs of students plays an important role in raising student motivation, engagement, and performance within the educational process (Benhamed, Hamdan, Murad, & Razzaque, 2019; Hnapovska & Liashenko, 2019).

Various instructional content delivery and learning activities have been entering and exiting K-12 classrooms for years (Lin, Hung, Chen, & Kinshuk, 2019). To keep pace with the skills necessary for current learners, schools must continue to improve and update systems of teaching according to the vital requirements of the modern society and workforce (Hnapovska & Liashenko, 2019). Scholastic Teacher (2018) constructed a list of S*even Innovations That Are Changing the Classroom.* Of the seven mentioned innovations, Project Based Learning, Genius Hour, and S.T.E.A.M (science, technology, engineering, arts, and math) require sustained hands-on, real-world problem solving (Mathewson, 2019). A major focus of 21st-century learning is to promote an intrinsic

drive to learn (Lahullier, 2018; Mathewson, 2019). Engaging students in applicable academic rigor is essential for success in the current and future workforce (Marzano, 2014; Mathewson, 2019).

The major issue with increasing student engagement is that teachers are not trained to design academically rigorous lessons that properly motivate students (Mathewson, 2019). School provided professional learning opportunities are seldom set up to give teachers the time to design engaging and academically rigorous lessons (Mathewson, 2019). Therefore, teachers move to extrinsic factors such as grades, intrinsic factors such as academic grit or teacher-student relationships to engage students (Mathewson, 2019; Buskist et al., 2018). According to Mathewson (2019), "one consequence of using grades to motivate students is that they stop challenging themselves for fear of trying something hard and failing" (p. 39). According to Collie and Martin (2019), "across the breadth of education and psychology, there are numerous theories that directly or indirectly conceptualized the role of interpersonal relationships in students' academic engagement" (p. 862). High-quality teacher-student relationships lead to students developing academic values similar to their teachers (Collie & Martin, 2019). Positive teacher-student relationships increase academic enjoyment and engagement and therefore have a positive correlation with student success in academic domains (Collie & Martin, 2019).

Evidence Based Teaching Practices

For some educators, teacher-centered instruction is all they have experienced in primary and secondary school environments and at the collegiate level (Korthagen, 2017; Marzano, 2014). To ensure students achieve the level of skills required by state academic

standards, educational leaders and teachers need to think about how to shift classroom instruction to meet the demands of these standards (Marzano, 2014). To prepare educators, many districts offer workplace learning or professional development (Barrett et al., 2014; Carpenter et al., 2017; Korthagen, 2017; Marzano, 2014). High stakes testing and necessary shifts in pedagogy have both teachers and students feeling anxious or even burnt out (Marzano, 2014). After attending professional development sessions, educators may try information or resources obtained in professional learning opportunities, but often do not continue the practice (Harris et al., 2018). Even though most teachers desire change, the challenge of sustaining new practices stems from a lack of support when inevitable challenges arise (Harris et al., 2018).

One of the most communicated and long-lived messages is that everything in education seems to work (Hattie, 2009). Education professionals acknowledge that teachers teach differently, and students have different learning needs; and have coined terms such as teaching style, learning style, or independence (Hattie, 2009; Marzano, 2014). According to Hattie (2009), "teaching is a private matter; it occurs behind closed doors, and it is rarely questioned or challenged" (p. 1). Research has revealed how social media may be used by educators to equip or enhance themselves with a variety of skills and support (Nagle, 2018). While moving through social media platforms, such as Twitter, educators find new strategies they believe will increase their instruction, curriculum, student engagement, and student outcomes (Rosell-Aguilar, 2018). As marketing and advertising companies manipulate social media platforms, educators need to become more cognizant of the impact various instructional strategies pose or provide

to student success (Burkhardt, 2017; Cauberghe et al., 2017; Erdem & Eristi, 2018; Nagle, 2018).

Along with support, educators discover "try me" (Hattie, 2009, p. 2) lessons or strategies, via their Twitter personal learning networks (Rosell-Aguilar, 2018). Not only do individuals influence teachers to implement discovered lessons or strategies, but so do the pictures or blog links attached to the post (Beacom et al., 2017; Bulger & Davison, 2018; Erdem & Eristi, 2018). To become more informed of the effects new strategies have on student outcomes, educators should look to evidence-based teaching practices (Hattie, 2009; Marzano, 2000; Masters, 2018). Many organizations and individuals have researched instruction and student outcomes (Hattie, 2009; Marzano, 2000). Hattie's (2009) research and book *Visible Learning* is the result of fifteen years of research and represents the largest collection of evidence-based research relating to the influences on achievement in school-aged students (Hattie, 2009).

Hattie's (2009) meta-analyses are the synthesis of more than 50,000 separate research studies and 15 years of research work (Hattie, 2009; Wrigley, 2018). A meta-analysis is a form of research in which the effects of each study are converted to a common measure, known as effect size (Hattie, 2009). Effect size allows all studies within the meta-analyses to be placed on a single continuum (Hattie, 2009). The common measure of effect size allows each effect within the study to be compared and interpreted globally (Hattie, 2009; Wrigley, 2018). According to Hattie (2009), "the use of effect sizes highlights the importance of the magnitude of differences, which is contrary to the usual emphasis in much of our research literature on statistical significance" (p. 8). To illustrate effect size, Hattie (2009) constructed a "barometer of

influence" (p. 19). The barometer addresses and creates clear goals for "… excellence for all in schools to aspire towards, and most importantly for [them] to know when they get there" (Hattie, 2009, p. 19). Through research, Hattie (2009) determined that the average effect size for possible influences is 0.40 (p. 16); therefore, this is considered the barometers hinge point. Within the barometer of influence, Hattie (2009) constructed a "zone of desired effects" (p. 16). An influence with an effect size below 0.40 (p. 16) is outside of the zone of desired effects and should be given in-depth thought before implementing. An influence above 0.40 is regarded as effective, within the zone of desired effects, and should yield student gains (Hattie, 2009, p. 16).

Hattie (2009) stated that "learning is a very personal journey for the teacher and the student" (p. 23). Educators need to understand what makes a difference in student achievement outcomes, and evidence-based research acts as a guide to this understanding (Hattie, 2009; Marzano, 2000; Masters, 2019). Hattie (2009) recognized that pedagogy is not the only influence on student outcomes, but that many other influences affect the achievement of students. Therefore, Hattie (2009) centered his work around six factors or contributions: the child, the home, the school, the curricula, the teacher, and the approaches to teaching. Prior knowledge, expectations, being receptive, and beliefs or values about learning all factor into the contributions of the child (Hattie, 2009). Parental knowledge and expectations set for the child are contributions from home (Hattie, 2009). Peer influences and school climate factor into the contributions of the school (Hattie, 2009). Quality, clarity, and expectations are major characteristics of the contributions of the teacher (Hattie, 2009). A strong balance between surface and deep learning, along with a focus on learning strategies attribute to the contributions of the curriculum (Hattie,

2009). Lastly, the contributions to teaching approach are accredited to collaborating about teaching, setting specific learning intentions and goals, and implementation of challenging tasks (Hattie, 2009).

As posted on the Missouri Department of Elementary and Secondary Education (2019) website, "Dr. Hattie's meta-analysis of more than 800 meta-analyses has been recognized as a singular landmark in educational research and the single largest assembly of research in the world" (p. 1). In many countries, Hattie's (2009) findings have become important in informing teacher professional development and guide districts in prioritization of initiatives (Balow, 2017). The focus of Hattie's (2009) research is to construct and defend models of teaching and learning built around evidence. Other educational researchers, such as Marzano, have critiqued the work of Hattie, and have also conducted research as to what works in classrooms (Hattie, 2009; Marzano, 2014). However, much of the research conducted by Marzano is more isolated and specifically designed around the influence of the teacher (Marzano, 2014). Because the data obtained in this study had the potential to be very broad, the utilization of Hattie's (2009) work was chosen. Furthermore, Hattie (2009) stated that the influences that lead to increased achievement outcomes for students are similar to what works best for teachers.

Summary

Educators are utilizing the worldwide popularity of the Twitter platform to expand and enhance personal and professional learning (Barrett et al., 2014; Carpenter et al., 2017; Fikis & Wang, 2017; Tour, 2017). The emergence of Twitter has brought about much research correlated with professional learning or development (Tour, 2017). However, research focusing on the influence Twitter is having on pedagogical behaviors

and student outcomes is thin (Barrett et al., 2014). Scholarly research reveals evidence that information does not flow in the same manner it did sixty years ago (Beacom et al., 2017; Li, 2015; Moldovan et al., 2017; Ognyanova, 2017). Social media platforms have allowed media outlets and individuals to combine into a multidimensional network that can generate, filter, and disseminate information across the globe (Ognyanova, 2017). The mass availability of information has increased the importance of media literacy skills (Celik et al., 2018; Erdem & Eristi, 2018; Joanou, 2017). Parents, communities, and businesses are advocating for the expansion of a public education system that enhances student engagement, innovative creativity, increased academic rigor, and positive teacher-student relationships (Nagle, 2018; Hattie, 2009).

National, state, and district education leaders are calling upon educators to design learning environments that reflect empathy, warmth, encouragement, and learner-center beliefs (Hattie, 2009; Nagle, 2018). Teachers who participate in online personal learning networks must have the skills to determine the affect resources and strategies will have on student learning outcomes (Carpenter et al., 2017). To become more informed about the impact unfamiliar instructional strategies have on student success, educators need to look to educational research and evidence-based practices (Hattie, 2009; Marzano, 2000; Masters, 2019). Educators who understand Hattie's (2009) work will have an introduction to a vast array of items that positively influence and affect student outcomes.

The methodology for this research study is provided in Chapter Three. The chapter contains an overview of the problem and purpose of the study, along with the restatement of the research questions. Furthermore, Chapter Three includes a summary of the study's quantitative design. Because this study was conducted on Twitter, the

population of Twitter users will be discussed, and how a random-purposive sample was gathered will be explained. Chapter Three also includes a brief overview of this study's survey design and an outline of the data collection process within the Twitter platform. Lastly, an overview of the data analysis process is explained, along with the identification of the ethical considerations of the study to assure confidentiality and anonymity.

Chapter Three: Methodology

The fast, ever-changing society of the 21st Century has led to an international focus on student preparation for increased educational demands (Goodyear et al., 2014; Prenger et al., 2018). Due to the costliness of sending educators beyond school walls for professional learning, it has been proposed that social media could act as a virtual location external to the school site to support teachers changing or improving their practice (Goodyear et al., 2014). Professional learning via Twitter has an impact not only on classroom practice but also on the development of an educator's professional knowledge (Rosell-Aguilar, 2018).

The methods in which social media, such as Twitter, impacts its' audience have been a part of the flow of communication and social theory research since the 1950s when Katz and Lazarsfeld (1955) introduced the *two-step theory* (Ognyanova, 2017). For this study, a quantitative survey approach was utilized to obtain information regarding K-12 educators' use of Twitter as a personal learning network. In this chapter, the methodology used for this study is explained. An overview of the problem and purpose of the study is provided, followed by a restatement of the research questions. Description of the research design, the population and sample, the instrumentation, data collection, data analysis, ethical considerations, and a summary are presented.

Problem and Purpose Overview

Previous studies have revealed that teachers have a positive perspective on the use of social media for online professional learning (Bisschoff & Jefferis, 2017; Tour, 2017; Veletsianos, 2017), even though understanding the educational impact of technology,

ideas, and resources found on Twitter is complicated (Rosell-Aguilar, 2017; Veletsianos, 2017). According to Nardi (2018),

> …how we see the world around us is shaped by a variety of forces that include the books we read, the television, and movies we see, the culture's rules and guidelines we hear, … and the teachings from the schools we attend. Every day we make conclusions and act on them with similarly limited information. (p. 2)

Tang and Hew (2017) stated, "many published articles reported empirical studies of Twitter; but very few provided a comprehensive review of Twitter use" (p. 99). Furthermore, according to Cauberghe et al. (2017), "no study has investigated whether the number of followers is an important trait for consumers in the assessment of an influencer" (p. 2). The purpose of this study is to investigate the influence Twitter opinion leaders are having on educators' pedagogical behaviors.

Research questions. The following research questions and hypotheses guided the study:

1. How are personal learning networks via Twitter influencing pedagogy?
2. How do opinion leaders within a teacher's Twitter personal learning networks influence the teacher's pedagogy?
3. How do information brokers within a teacher's Twitter personal learning networks influence the teacher's pedagogy?
4. With what frequency do K-12 educators, who use Twitter, research opinion leader's credentials?
5. With what frequency do K-12 educators, who use Twitter, research information broker's credentials?

Research Design

A quantitative research design was utilized in this study. Like almost all types of research, this study aims to provide basic information describing the topic and respondents involved (Nardi, 2018). Quantitative research establishes an association between variables and allows the researcher to use statistical procedures to analyze data collected using an instrument (Creswell & Creswell, 2018). To reveal the influence opinion leaders or information brokers are having on professional learning survey responses were analyzed through descriptive statistics including frequency and percentage. In addition, connecting the pedagogical changes, influenced by an educator's professional learning network, to Hattie's (2009) "barometer of influence and zone of desired effects" (p. 16) addressed whether the various pedagogical changes are worthwhile relative to possible alternatives. Conclusions from this research provide educational leaders with a list of reported Twitter opinion leaders and information brokers along with their strategies that have been implemented in K-12 classrooms.

Population and Sample

The setting of this study was Twitter's virtual space; therefore, the population of this study is all active users on Twitter. According to Cooper (2019), "326 million people use Twitter every month" (para. 1). Since the purpose of the study was to analyze the effect opinion leaders and brokers are having on K-12 classrooms, only responses from individuals in the K-12 education profession were analyzed. For this reason, the sample of participants was drawn from a random, purposive sample. A random sampling technique allows any individual on Twitter an equal chance to complete the survey (Fraenkel, Hyun, & Wallen, 2019), while purposive sampling allows the researcher to

recruit a study sample that shares certain characteristics (Creswell & Creswell, 2018). Once the survey was posted on Twitter for any individual to take, 90 individuals elected to participate in completing the survey. Out of 90 participants, 84 answered "yes" to the statement "I work in the K-12 education profession," and their responses were analyzed.

Instrumentation

According to Nardi (2018), "doing survey research is a skill, an art, and an intellectual process involving collaboration, patience, and creativity" (p. 15). To explore or obtain a rough sense of how opinion leaders and information brokers are influencing classrooms, a survey approach was used (see Appendix C). According to Creswell and Creswell (2018), "survey research provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population" (p. 12). Furthermore, quantitative survey data collection methods are ideal for asking about opinions and attitudes, less costly to reach large samples, and can address multiple topics within one survey (Nardi, 2018). This study's survey was developed by the primary investigator and was informed by the research of Rosell-Aguilar (2018) and Prenger et al. (2018).

Several steps are involved in developing a survey questionnaire (Nardi, 2018). First, analysis of the research questions and identifying what topics will be covered within the survey (Nardi, 2018). For this study, the self-constructed survey contained 19 prompts. The first five items were questions posed to collect descriptive demographic information. The next 10 items were four-point, Likert-type statements regarding participants' perspectives concerning the influence Twitter opinion leaders and brokers have on educator pedagogy. Likert-type statements are one of the most common formats

used in survey questions, and research favors scales with an even number of responses (Subedi, 2016). Likert-type statements easily measure the beliefs of respondents, capture the important qualities of a topic, and are generally easier to understand (Subedi, 2016).

Furthermore, the display of the Likert scale is easy to visualize in online surveys (Subedi, 2016). The last four items within this study's survey were open-response questions. These questions were posed to gather specific information from participants including questions related to names of opinion leaders and brokers they follow on Twitter, and specific resources or strategies obtained from Twitter that they have implemented in their classrooms. Next, the survey was piloted with a group of ten K-12 educators. Survey research poses some disadvantages (Nardi, 2018). One of which revolves around the difficulty in explaining the meaning of questions or statements within the survey (Nardi, 2018). Another disadvantage evolves from survey question misinterpretation and the inability to obtain clarification (Nardi, 2018). Lastly, the feedback obtained from the pilot test was used to revise and clarify all necessary survey items for the final survey draft.

Data Collection

Following Lindenwood University Institutional Review Board approval (see Appendix D), this study's survey was then entered into Lindenwood University's e-survey platform, Qualtrics. Once the survey was finalized with the Qualtrics platform, access to the survey's URL was available. The study's promotion and recruitment occurred via the Twitter platform. The following words and hashtags were constructed in a tweet (see Appendix E) along with the survey's Qualtrics link:

> EdD student researching the influence Twitter educational opinion leaders and brokers are having on K-12 classrooms. Please complete the survey and retweet [survey link] #edchat #edu #educhat, #globaled #globaledchat #CollaborativePD #lifelonglearning #personalizedpd #PLN #PLC #teacherPD #edleaders.

The listed hashtags were chosen from Day's (2017) *100 Education Hashtags for Teachers and Edleaders*.

The constructed tweet was sent out via the investigator's personal Twitter account on September 19, 2019. Following the invitation to complete the survey, a link to the survey was provided. Once a participant accessed the survey link, an explanation of informed consent (see Appendix F) preceded the survey items. Completion of the survey indicated a participant's consent. A new tweet was retweeted or constructed about the survey each day, at various times of the day, for two weeks. Due to low survey participation the first two days, the researcher constructed new tweets that included the original tweet but also incorporated some of the following hashtags #survey, #teachers, #lesson, #socialmedia, #education, #dissertation, #research, #please, #thanks, #classroom, #responses, #goal, #Twitterispd, and #MOedchat. One disadvantage of quantitative survey methods is that the "return rate can be low for computer-based surveys" (Nardi, 2018). Trending hashtags, such as #Nationalcoffeeday, #chiefskingdom, #teachersday2019, and #Sunday, were also included within the original tweet. According to Twitter (2019c):

> … trends are determined by an algorithm… and are tailored for the user based on who they follow, their interests, and their location. The algorithm identifies topics that are popular now, rather than topics that have been popular for a while

> or on a daily basis, to help the user discover the hottest emerging topics of discussion on Twitter. (para. 1)

Five other Twitter users further dispersed the tweet through retweeting. The most followers any one individual who retweeted the survey tweet had was 16,600 followers. Furthermore, two Twitter users clicked "like" on the post, thus further dispersing the tweet. Since the researcher's Twitter account is a public account, anyone with or without a Twitter account could view the tweet and interact with the post.

Data Analysis

Because the individuals who educators personally interact with or virtually follow can affect the educators' actions and attitudes (Ognyanova, 2017), the purpose of this quantitative study was to reveal the influence of Twitter educational opinion leaders and information brokers on classroom pedagogy. Furthermore, this study explored the instructional strategies of opinion leaders or information brokers that K-12 educators were implementing in their classrooms. Quantitative research methods involved constructing survey items, quantifying responses, and statistically analyzing the data (Nardi, 2018). An advantage of utilizing a quantitative survey method is that close-ended items are easier to code (Nardi, 2018). According to Fraenkel et al. (2019), quantitative, descriptive data "can only be reported three ways: through words, through numbers, and sometimes through graphs or charts" (p. 181). Therefore, descriptive data from this study was organized in tables and graphs. Descriptive data such as frequencies and percentages were determined from the Likert-type statements.

Open-response questions were categorized, coded, and themed. According to Fraenkel et al. (2019), "codes are tags or labels for assigning meaning to chunks of data,

and are often refined iteratively" (p. 391). Coding, categorizing, and quantifying data are methods found within quantitative research and survey methods (Nardi, 2018). Each open response question was coded, categorized, and quantified independently. Open response questions pertaining to the names of opinion leaders were initially coded based on the area of specialization, influenced by Hattie's (2009) research. The identified areas of specialization became the categories for the data analysis of this study. Once all opinion leader names had been categorized, the frequency of names per category was determined and converted to a percentage. The percentages were visualized in a graph as shown in Chapter Four. The same method was applied to the remainder of open-response survey questions.

Ethical Considerations

The researcher established safeguards throughout the data collection and analysis phase. The safeguards included, yet were not limited to the following:

To assure confidentiality. Participants were informed that demographic data and survey responses were stored on a password-protected, personal device. No personally identifiable data was collected. Furthermore, all data will be destroyed three years from the completion of the project.

To assure anonymity. The data collected from participants were non-identifiable. The researcher did not collect participants' Twitter usernames, email addresses, or computer IP addresses, thus assuring participant anonymity.

Summary

The goal of this quantitative study was to determine the influence opinion leaders and brokers, within an educator's Twitter personal learning network, are having on

classroom pedagogy. Because quantitative survey methods are less costly, advantageous for online environments, and quintessential for asking about attitudes, a survey instrument was constructed (Nardi, 2018). More than "326 million people use Twitter every month" (Cooper, 2019, para. 1); therefore, the sample for this study was random, purposive; only K-12 educators' online survey responses were analyzed. The survey was constructed within Lindenwood's Qualtrics platform and sent out via a tweet on Twitter in the fall of 2019. The survey was composed of five descriptive questions, ten four-point Likert-type statements, and four open response questions.

In Chapter Four, the statistical analysis of demographic data, four-point Likert-type statements, and open-response questions are presented. Through the visualization of graphs, grade level taught, size of the institution, and geographic location data is presented. Chapter Four also includes a closer analysis of the perception of Twitter opinion leaders' and brokers' influence on classroom pedagogy. Within this analysis, responses to open response questions about specific instructional practices or resources found on Twitter are presented.

Chapter Four: Analysis of Data

While many have not internalized how the speed and pace of change have increased in recent times, educators hear the clamor to prepare students for a rapidly changing future (Culberhouse, 2019). Many educators feel disconnected and adrift in their teaching practices (Rosell-Aguilar, 2018; Tang & Hew, 2017). Social media is a conduit for inspiring or motivating professional growth (Laskowski, 2018). While existing studies focus on the benefits that social networking sites, like Twitter, offer to professional learning, the purpose of this quantitative study is to explore the influence Twitter opinion leaders and information brokers are having on educators' pedagogical behaviors (Hyndman, 2018; Prenger et al., 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Veletsianos, 2017). According to O'Keefe (2018), "while Twitter has become commonly accepted as an informal academic learning space, more thoughtful attention to how staff use such technologies is needed" (p. 2).

Educators today not only have to be life-long learners, but they must also take the initiative to find opportunities to learn (Culberhouse, 2019). Strained educators have been "unable to wholly partake in formal opportunities for professional learning, resulting in calls for alternative, flexible, and informal learning opportunities" (O'Keeffe, 2018, p. 2). According to Cheng, Luo, and Sickel (2017), "Twitter promotes grassroots professional development and extends educators' personal learning networks through discussion and collaboration with professionals" (p. 226). The flow of communication has been studied through the lens of Lazarsfeld and Katz's (1955) two-step theory and built upon by others to form the multi-step flow of communication (Arriagada et al., 2017; Beacom et al., 2017; Ognyanova, 2017).

A survey, sent out via Twitter, was used to collect data from K-12 educators across the globe. The survey was constructed using a series of descriptive, demographic questions; four-point Likert-type statements; and open-ended response questions informed by the research of Rosell-Aguilar (2018) and Prenger et al. (2018). Likert-type statements were on a four-point scale and gave teacher respondents the option to strongly agree, agree, disagree, or strongly disagree. The open response questions allowed teacher respondents to construct a list of opinion leaders or information brokers they follow on Twitter, along with any of those individuals' suggested strategies the participants have implemented in the classroom. Likert-type statements were quantified by frequency then converted to a percentage and graphed. Answers to the open-response questions were coded, categorized, and quantified by determining the frequency of responses per category and converting the frequency to a percentage.

Demographics of the Study

The research sample was selected from all users on Twitter who are in the K-12 education profession. Out of the 326 million monthly Twitter users (Cooper, 2019, para. 1), 90 individuals elected to participate in the survey. The first survey question was posed to obtain a random, purposive sample. Survey respondents who did not answer yes to the question *Do you work in the K-12 education profession?* were not allowed to complete the full survey and were prompted to a screen that stated they had concluded the survey. Out of 90 survey respondents, 84 respondents answered yes to the question *Do you work in the K-12 education profession?,* allowing them to complete the full survey. The second survey question asked educator respondents whether or not they have a Twitter account. Of the 84 educator respondents who elected to participate in this

study, 79% indicated that they have a Twitter account. By default, the account the survey Tweets were sent out on was public. Therefore anyone, with a Twitter account or without a Twitter account, can view and interact with the Tweet (Twitter, 2019a).

Survey items three through five were designed to gather demographic information about the individuals taking the survey. Of the educators who responded, 90% of the educators responded that they live in the United States, 8.75% in Australia, and 1.25% live in Egypt. The next survey question, question four, asked participants what position they hold in the K-12 education profession. For this question, 44.44% of teacher respondents indicated they are grade 9-12 teachers, 12.35% are grade 6-8 teachers, and 14.82% are grade K-5 teachers. Other educator respondents indicated they held instructional coaching positions (9.88%), technology coaching positions (3.70%), counselor positions (1.24%), director positions (4.94%), or administrative positions (8.64%) (see Figure 3). Overall, 71.61% of the participants are grade K-12 teachers compared to 28.39% of participants who are in an administrative or alternative role.

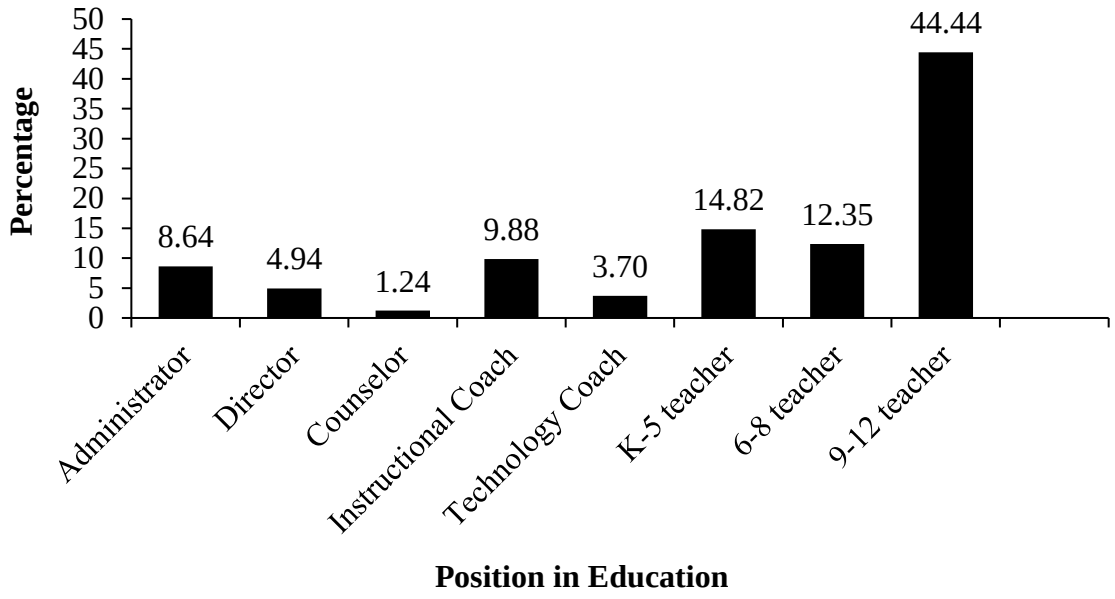

Figure 3. K-12 education position held by survey participants. *N* = 81.

For the next survey item, question five, educator respondents indicated which range best described the student population of their K-12 education institution. Approximately 47% of the educator respondents indicated that their institutions are composed of student populations between 500-1,999 students. Slightly more than 32% of the respondents indicated that their institutions are composed of a student population of less than 500. Fewer respondents, 20.98% indicated that their institutions' populations were equal to or greater than 2000 students (see Figure 4).

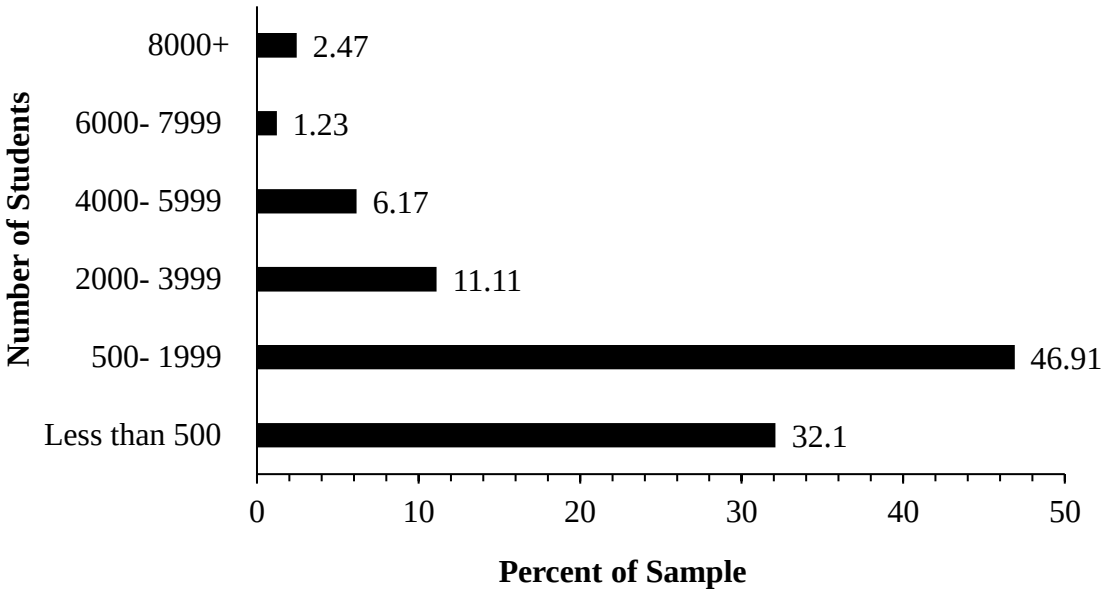

Figure 4. Student population size of survey respondents K-12 education institution. *N* = 81.

Data Analysis

As with any media, opinion leaders are a vital element to the flow of information and how audiences perceive or adopt products (Cauberghe et al., 2017; Gardner & Mazzola, 2018; Li, 2015). A less repetitive and more diversified role appearing in the flow of communication is that of an information broker (Araujo et al., 2017; Beacom et al., 2017; Moldovan et al., 2017). Connecting social media groups that are otherwise disconnected makes the information broker's position in social media even more important than the role of opinion leaders (Araujo et al., 2017). The social and informal learning occurring via Twitter is considered essential to some educators (O'Keeffe, 2018). The next ten survey items were four-point Likert-type statements and were designed to answer the research questions posed in this study.

Likert-type statements. A four-point Likert-type scale was used within this study's survey. The Likert-type statements focus on participants' use of Twitter for professional learning, and whether or not the participants believe opinion leaders or information brokers have influenced their pedagogy. Likert-type statement responses were converted to percentages for statistical analysis. The first two Likert-type statements, items six and seven, focus *on beliefs of teachers concerning their use of Twitter as a personal learning network.* Item six prompted educator respondents for their strength of agreement concerning their interaction with Twitter for professional learning. As presented in Table 1, a larger percentage, 65.33%, of educators *strongly agree* (21.33%) or *agree* (44%) that they interact with Twitter for professional learning. Fewer, 34.66%, of educator respondents *disagree* (21.33%) and *strongly disagree* (13.33%) that they interact with Twitter for professional learning. Comparatively, more educator respondents indicate that they interact with Twitter for professional learning.

Next, item seven, educators were prompted for their strength of agreement pertaining to being exposed to information regarding the education profession while on Twitter. Of the 75 participants, 76% of educator respondents *strongly agree* (28%) and *agree* (48%) that they are exposed to information regarding the education profession during Twitter use. A much smaller percentage, 24%, of educators *disagree* (12%) or *strongly disagree* (12%) that they are exposed to information regarding the education profession during Twitter use. Combining items six and seven, a greater percentage of educators are utilizing Twitter for professional learning and exposed to education content while on Twitter.

Table 1

Summary of 4-point Likert-type statements that focus on the use of Twitter for professional learning.

Statement	Strongly agree	Agree	Disagree	Strongly disagree
6. I interact with Twitter for professional learning.	21.33%	44.00%	21.33%	13.33%
7. When on Twitter, I am exposed to information regarding the education profession.	28.00%	48.00%	12.00%	12.00%
8. I follow at least one education opinion leader on Twitter	34.67%	36.00%	14.67%	14.67%
9. I follow at least one education information broker on Twitter.	25.33%	32.00%	28.00%	14.67%
10. Opinion leaders have affected my pedagogy.	11.84%	55.26%	25.00%	7.89%
11. Information brokers have affected my pedagogy.	11.84%	46.05%	31.58%	10.53%
12. I implement opinion leaders suggested strategies in my classroom.	13.33%	54.67%	24.00%	8.00%
13. I implement information brokers suggested strategies in my classroom.	9.33%	50.67%	50.67%	10.67%
14. I research the credentials of opinion leaders.	19.74%	43.42%	26.32%	10.53%
15. I research the credentials of information brokers.	15.79%	35.53%	38.16%	10.53%

Note. $N = 75$.

The next six statements focus on the beliefs of teachers concerning the *influence opinion leaders and information brokers, within a teacher's Twitter personal learning network, have on their pedagogy.* The four-point Likert-type statements data points were converted to percentages for statistical analysis. Item eight prompted educators for their strength of agreement as to whether they follow an opinion leader on Twitter. As shown in Figure 5, more educators, 70.67%, *strongly agree* (34.67%) or *agree* (36%) that they follow at least one opinion leader on Twitter. Fewer, 29.34%, educators *disagree* (14.67%) or *strongly disagree* (14.67%) that they follow at least one opinion leader on Twitter.

The next Likert-type statement, survey item nine, was similar to the previous Likert-type statement, item eight, but focused on the following of information brokers on Twitter. When asked to provide a strength of agreement, over half, 57.33% of educator respondents *strongly agree* (25.33%) or *agree* (32%) that they follow at least one information broker on Twitter. More educators, 42.67%, *disagree* (28%) or *strongly disagree* (14.67%) that they follow at least one information broker on Twitter compared to the percentage of educators, 29.34%, who *disagree* or *strongly disagree* that they follow an opinion leader on Twitter.

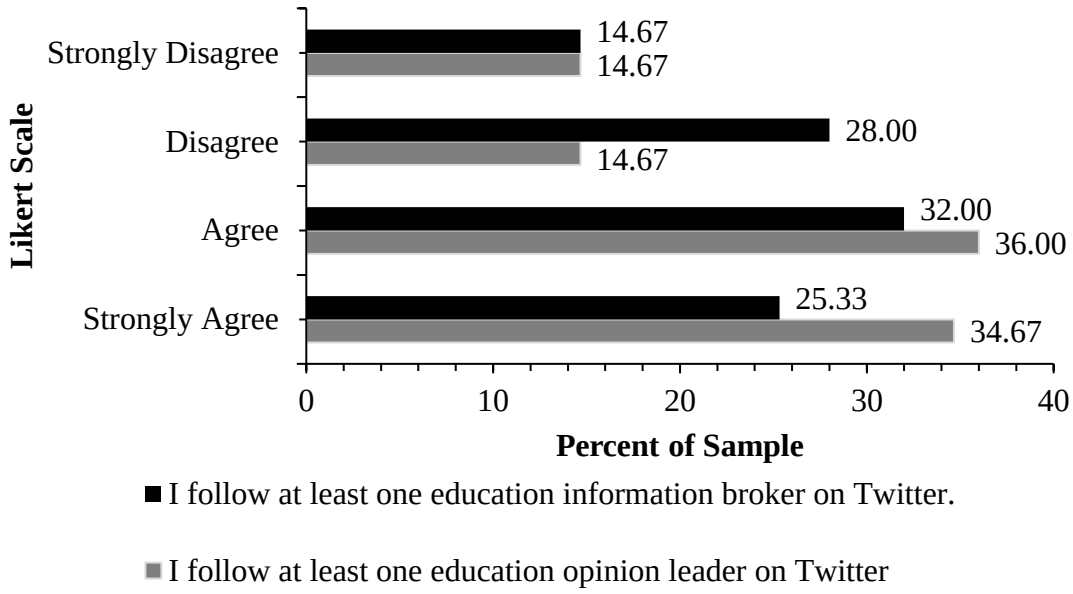

Figure 5. K-12 educators follow at least one information broker or opinion leader on Twitter. *N* = 75.

For the next Likert-type statement, survey item 10, educators were prompted to indicate if they believed opinion leaders affect their pedagogy. The response choices were presented on a four-point Likert-scale, ranging from *strongly agree* to *strongly disagree*. The data points were converted to a percentage for statistical analysis. According to responses of educators, presented in Figure 6, a large percentage, 67.1%, of teachers *strongly agree* (11.84%) or *agree* (55.26%) that opinion leaders affect their pedagogy. In contrast, when prompted, on item 11, for their strength of agreement pertaining to the influence information brokers have on pedagogy, 57.89% of educators *strongly agree* (11.84%) or *agree* (46.05%) that information brokers affect their pedagogy. Fewer teachers *disagree* (31.58%) or *strongly disagree* (10.53%) that information brokers affect their pedagogy. Comparatively, more educators *strongly*

agree or *agree* that opinion leaders influence their pedagogy when compared to information brokers.

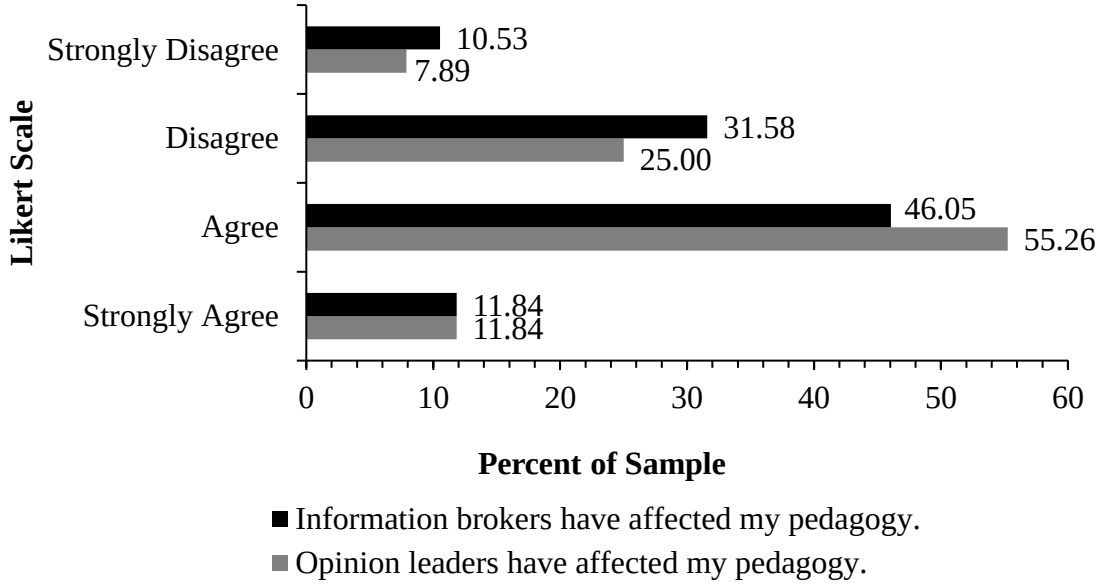

Figure 6. Twitter information brokers or opinion leaders affect K-12 educator's pedagogy. *N* = 75.

Next, on survey item 12, educator respondents indicated whether or not they implement information broker or opinion leader's strategies in their classrooms. The four-point Likert-type statements data points were converted to percentages for statistical analysis. In the analysis, shown in Figure 7, 68% of teachers *strongly agree* (13.33%) or *agree* (54.67%) that they implement opinion leaders' suggested strategies in their classrooms. A smaller total percentage, 32%, of teachers *disagree* (24%) or *strongly disagree* (8%) that they implement opinion leaders' suggested strategies in their classrooms. Comparing the implementation of opinion leaders strategies to those of

information brokers, on survey item 13, 60% of teachers *strongly agree* (13.33%) or a*gree* (50.67%) that they implement information brokers' suggested strategies in their classrooms. Whereas, 40% of teachers *disagree* (29.33%) or *strongly disagree* (10.67%) that they implement information brokers' suggested strategies in their classrooms. Overall, slightly more educators implement opinion leader's suggested strategies when compared to strategies suggested by information brokers.

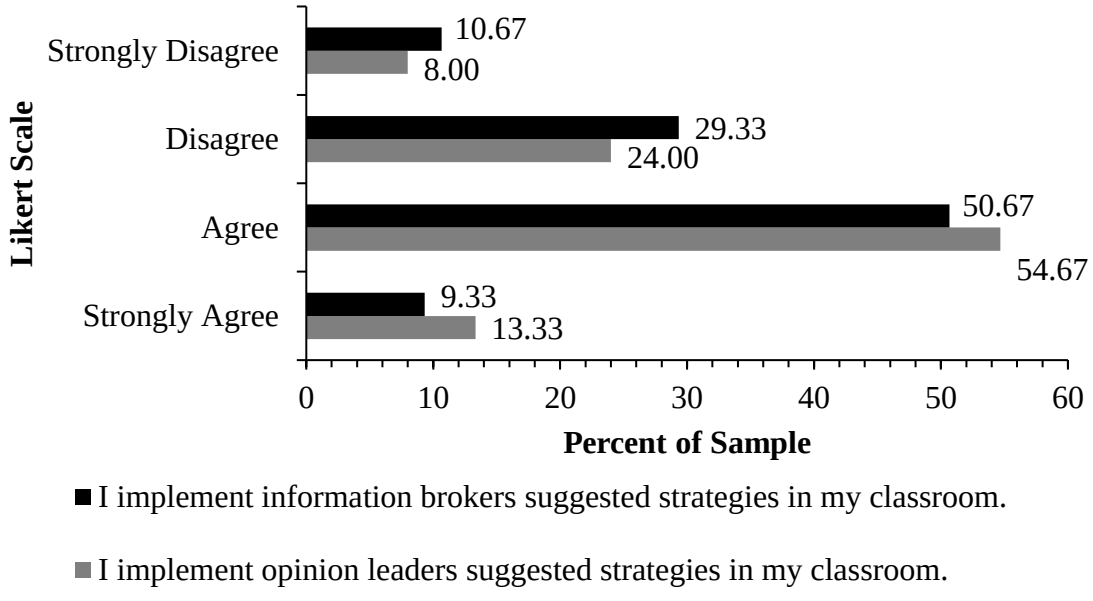

Figure 7. K-12 educators implement information brokers or opinion leaders suggested strategies in their classrooms. *N* = 75

The last two Likert-type statements, items 14 and 15, focus on the *beliefs of teachers concerning the frequency in which they research the credentials of Twitter opinion leaders and information brokers.* The answers were presented on a four-point Likert-scale, ranging from strongly agree to strongly disagree. The data points were

converted to a percentage for statistical analysis. In the data analysis, shown in Figure 8, 63.16% of teachers *strongly agree* (19.74%) or *agree* (43.42%) that they research the credentials of opinion leaders. A smaller percentage, 36.85%, of teachers *disagree* (26.32%) or *strongly disagree* (10.53%) that they research the credentials of opinion leaders. In contrast, 51.32% *strongly agree* (15.79%) or *agree* (35.53%) that they research the credentials of information brokers. Fewer teachers, 48.69%, *disagree* (38.16%) or *strongly disagree* (10.53%) that they research the credentials of information brokers. From these two statements, 63.16% of participants *strongly agree* or a*gree* that they research the credentials of opinion leaders, while only 51.32% *strongly agree* or *agree* that they research the credentials of information brokers.

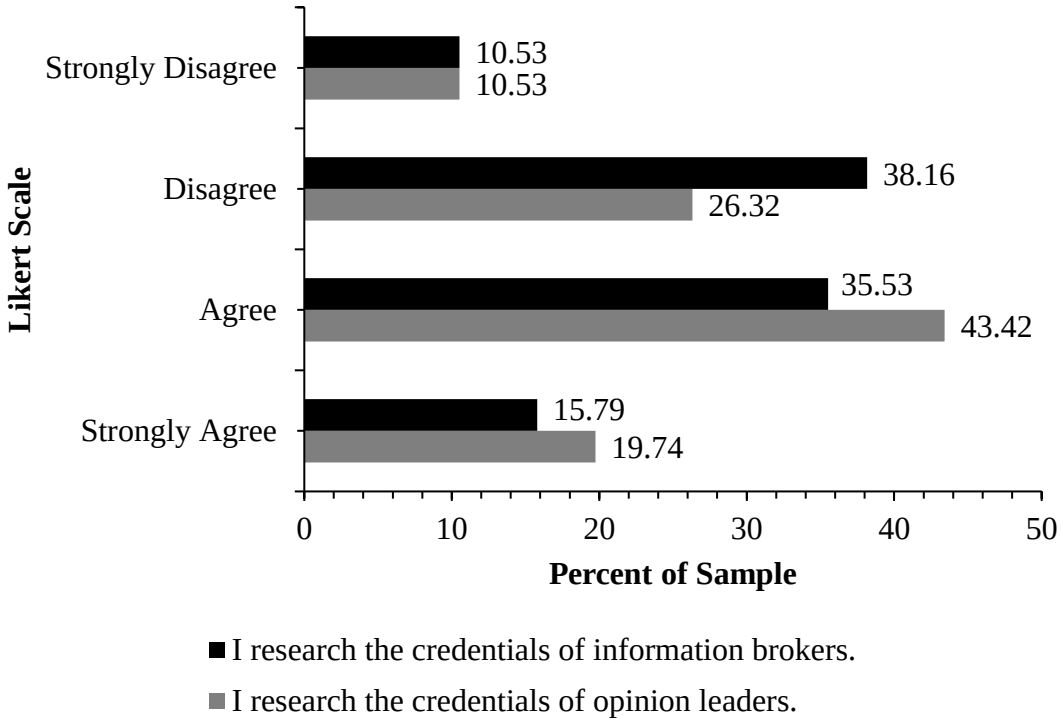

Figure 8. K-12 educator's research the credentials of Twitter information brokers or opinion leaders. *N* = 75.

Open-response questions. In the next series of survey items, questions 16-19, respondents were asked to list the names of opinion leaders or information brokers they follow on Twitter, and to provide examples of suggested strategies they have implemented in their classrooms. Question 16 asked educators to list the top opinion leaders they follow on Twitter. Names of 38 different opinion leaders' were listed and identified. Out of the 38 opinion leader names, four were duplicates, meaning they were given by two different respondents.

Furthermore, two individuals were identified as an opinion leader more than twice. Dave Burgess and George Couros were identified as opinion leaders by three and four different educators respectively. Opinion leaders were grouped according to their specialization. Merriam Webster Dictionary (2019) defined specialization as "to concentrate one's efforts in a special activity, field, or practice" (p. 1,128).

Through further analysis, seven specialization categories were identified, and the percentage of opinion leaders in each category was calculated. The categories were influenced by Hattie's (2009) research. Opinion leaders placed in the teaching approach category (31.58%) specialize in one or more of the following areas: increasing student engagement, improving pedagogy, implementing school-wide programs, or transforming classroom environments. Opinion leaders in the student-teacher relationships category (2.63%) are indirectly connected to the teaching approach and provide strategies for building relationships with students to increase student success. Opinion leaders placed in the curriculum resources category (21.05%) provide educators with a content-specific curriculum, of which 63% is free for educators. Transformational leadership opinion leaders (15.79%) specialize in building positive school culture, improving leadership

skills, and increasing the relationship between effective leadership and student success. Opinion leaders placed in the educational technology category (5.26%) are considered experts in Google Apps for Education or utilizing educational technology to innovate student learning.

Opinion leaders who did not fall within the previous categories were placed in the auxiliary (10.53%) or other (13.16%) categories. An individual placed in the auxiliary category provides educators with help or support that does not fit within the other five categories given in Figure 9. All of these auxiliary opinion leaders are science teachers with active Twitter accounts who did not have a website or other media with an educational focus. Auxiliary opinion leaders shared pictures of their K-12 students completing labs, and scientific information from the science Twitter community. Lastly, opinion leaders placed in the "other" category did not fit within any of the other six categories. School websites (40%), educational entertainment (40%), and Hattie (20%) were all subgroups of the "other" category.

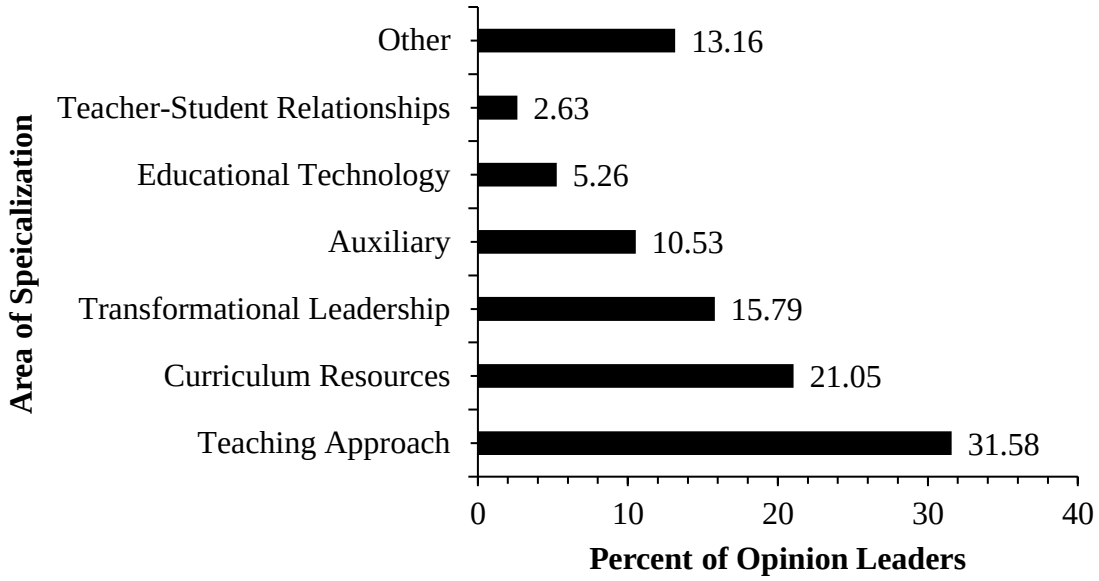

Figure 9. Educators provided a list of opinion leaders they follow on Twitter. Each opinion leader was categorized by area of specialization. *N* = 29.

Survey participants were then asked to list the information brokers they follow on Twitter. Names of 18 information brokers were listed and identified, only one of whom was also listed as an opinion leader. When asked to identify information brokers, 50% of participants' responses were a company or organization. Again, the names identified were grouped and categorized based on specialization. Five out of seven categories used to categorize opinion leaders emerged and are presented in Figure 10. Similar to opinion leaders followed on Twitter, many educators follow information brokers who share information related to the teaching approach (38.89%). The percentage of names placed in the information broker's educational technology category (22.22%) was almost four times higher than opinion leaders (5.26%), whereas the percentage of names placed in the information broker's curriculum resources (11.11%) was nearly half when compared to

opinion leaders (21.05%). Furthermore, 22.22% of participants identified information brokers who were categorized in the transformational leadership category, and 5.56% of participants identified information brokers who were placed in the auxiliary category. Zero percent of information broker names listed fit into the teacher-relationships category or the "other" category; therefore, these are not present in Figure 10.

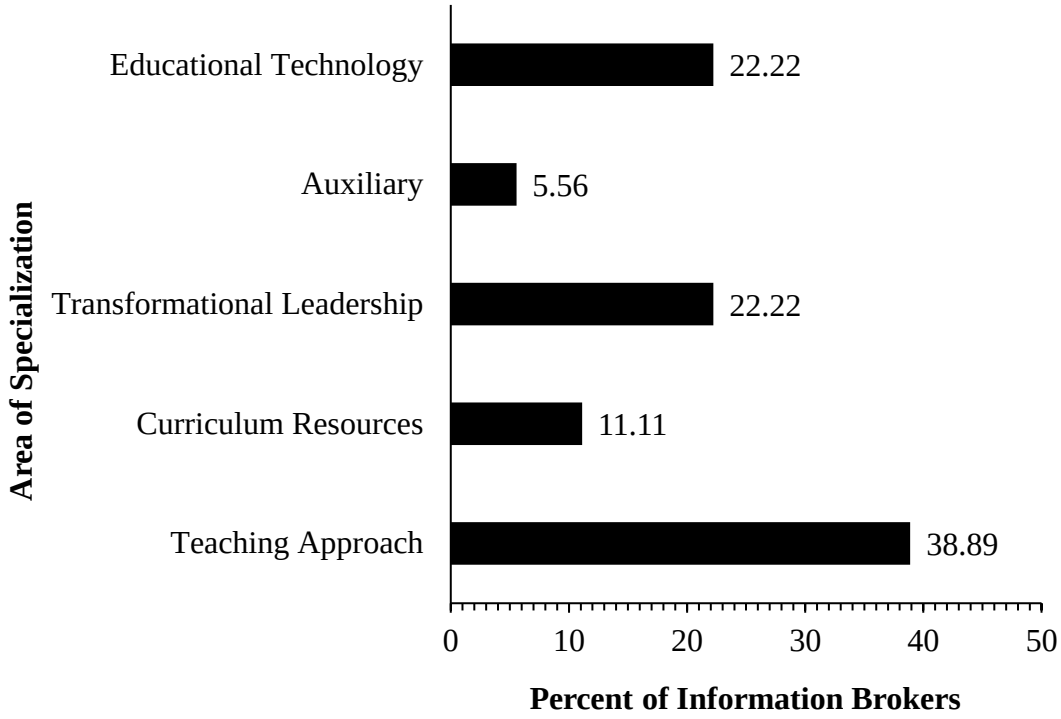

Figure 10. Educators provided the names of information brokers they follow on Twitter. Each information broker was categorized by area of specialization. *N = 25*.

In the final section of the survey, participants were asked to provide examples of opinion leaders' or information brokers' suggested strategies they have implemented in their classrooms. Educators listed 28 strategies, suggested by Twitter education opinion leaders, that they had implemented in their K-12 classrooms. None of the strategies were

identified more than once. Initially, each strategy was placed within the *teaching approach, curriculum resources, transformational leadership, auxiliary, educational technology, teacher-student relationships,* and *other* categories (see Figure 11). The *teaching approach* category contained 57.14% of all implemented opinion leaders' suggested strategies. Furthermore, *curriculum resources* was ranked second (17.86%) and *transformational leadership* was ranked third (10.71%) in opinion leaders' implemented strategies. The other four categories, transformational leadership, auxiliary, educational technology, teacher-student relationships, and "other" each had one strategy mentioned (3.57% respectively) of the total implemented opinion leaders' strategies.

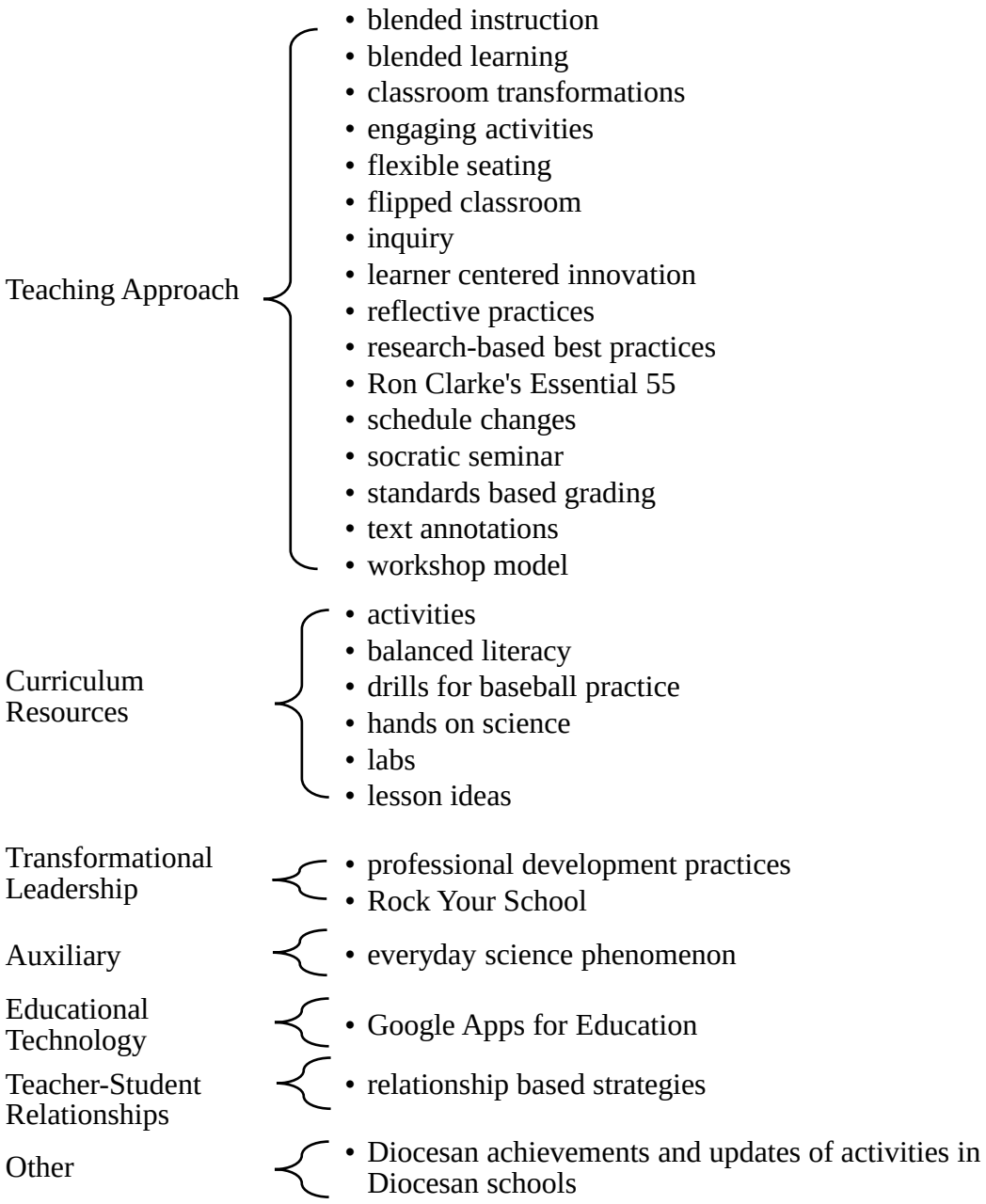

Figure 11. Strategies suggested by educational opinion leaders on Twitter and implemented by K-12 educators. *N = 28.*

Further analysis of the opinion leader's teaching approach category (see Figure 12) led to the creation of the following sub-categories: *computer-assisted instruction*, *student engagement*, *grading*, and *other*. *Student engagement* comprised 56.25% of the teaching approach strategies. The *other* category comprised 25% of the teaching approach category and was composed of names of strategies that are complex and could potentially fit into several categories but not cohesively. Additionally, *computer-assisted instruction* comprised 12.5% of the teaching approach category, and *grading* completed categorization of the teaching approach strategies with 6.25%.

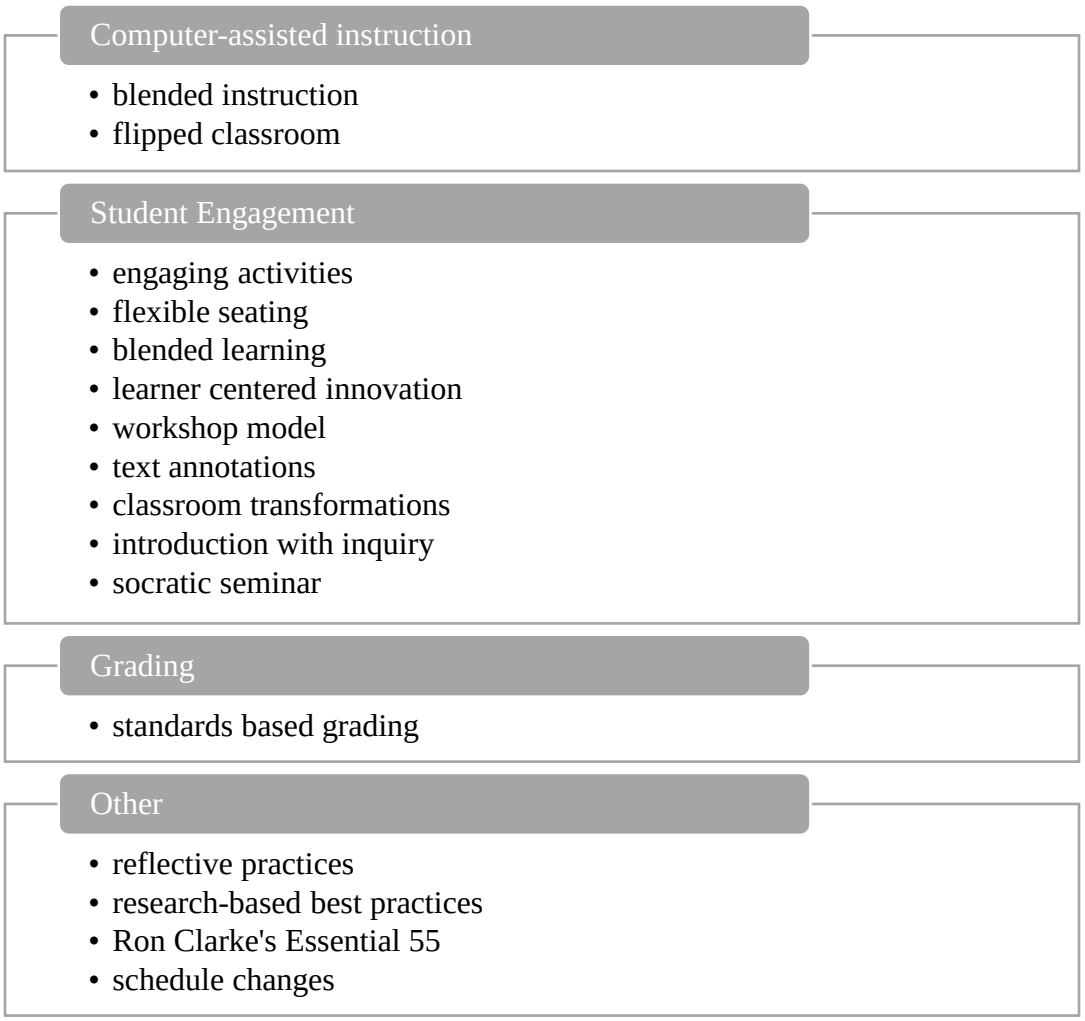

Figure 12. Further categorization of the opinion leaders implemented teaching approach strategies. $N = 28$.

Lastly, participants listed suggested information brokers' strategies that they have implemented in their K-12 classrooms. Only 13 information broker strategies were identified from survey responses. Information broker strategies related to the *teaching approach* comprised 30.77% of the implemented information broker strategies (see Figure 13). Classroom management (15.39% of responses) was added as a new category

for implemented information broker strategies. Curriculum resources comprised 23.08% of participant responses, educational technology comprised 15.39% of participant responses. Furthermore, teacher-student relationships and transformational leadership were equal in response percentage at 15.8% of information brokers' implemented strategies.

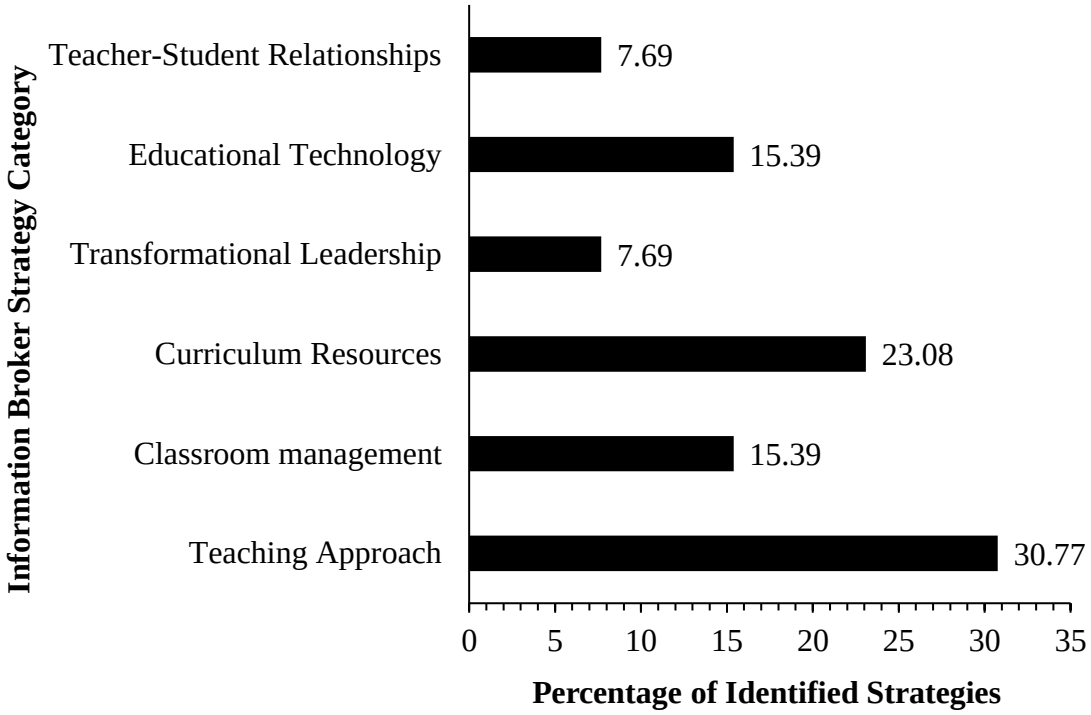

Figure 13. Strategies suggested by information brokers on Twitter and implemented by K-12 educators. *N* = 14.

Summary

All K-12 educators who utilize Twitter were given the opportunity to complete *The Influence Twitter Educational Opinion Leaders Are Having on K-12 Classrooms* survey in the Fall of 2019. Even though the survey was sent out publicly via Twitter, a

random, purposive sample was obtained by allowing only responses from survey participants who answered yes to the question *Do you work in the K-12 education profession?*. Data for this quantitative study was collected via a self-constructed survey containing descriptive demographic questions, four-point Likert-type statements, and open-response questions. Frequencies were determined and converted to a percentage for demographic questions and Likert-type statements. Open response questions were coded, categorized, and quantified for a more profound understanding.

Data presented in Chapter Four highlights the influence of Twitter opinion leaders and information brokers on educator's pedagogical behaviors. Specialization areas, influenced by Hattie's (2009) research, emerged and were used to categorize names and strategies of opinion leaders and information brokers. Chapter Five includes a presentation of this study's findings pertaining to the research questions posed in Chapter One and Three. Conclusions drawn from these findings and the significance of the study are presented. Furthermore, Chapter Five includes the implications for practice, recommendations for future research, and a final summary.

Chapter Five: Summary and Conclusions

This study was conducted to explore the influence Twitter opinion leaders and information brokers have on K-12 educators' pedagogical behaviors. Furthermore, how a teacher's Twitter personal learning network influences the teacher's pedagogy, and with what frequency K-12 educators research opinion leader's or information broker's credentials. Chapter Five includes the findings of the study pertaining to each research question. Additionally, conclusions are drawn regarding the significance of the study, the implications for practice that have been determined, and recommendations for future research are discussed.

Findings

The following findings are an indication of the influence educator's personal learning networks, via Twitter, have on pedagogical behaviors in K-12 classrooms.

Research question one. How are personal learning networks via Twitter influencing pedagogy? Survey participants, any individual within the K-12 profession, were asked to *strongly agree*, *agree*, *disagree*, or *strongly disagree* with a series of Likert-type statements pertaining to professional learning via the Twitter microblogging platform. The largest group of respondents (65.33%) *strongly agree* or *agree* that they interact with Twitter for professional learning. This finding echoes Carpenter et al. (2017), Hyndman (2018), Nagle (2018), and Tour (2017), all of whom report that educators have started using social media as a form of self-learning. Additionally, this finding shows that online informal professional development is appealing to educators (Barrett et al., 2014). Next, educators were asked to determine the strength of exposure to information regarding the profession of education while on the Twitter platform.

When compared to the percentage, 65.33%, of educators who *strongly agree* or *agree* that they interact with Twitter for professional learning, a larger percentage, 76%, of educator respondents *strongly agree* or *agree* that they are exposed to information regarding the education profession during Twitter use. This finding reverberates the opportunity Twitter provides educators to expand their professional learning through the construction of a personal learning network (Barrett et al., 2014; Fikis & Wang, 2017; Tour, 2017). Moreover, this finding may reveal that educators are given the opportunity to customize or differentiate their learning due to the diversity of Twitter content (Hyndman, 2018; Prenger et al., 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Tour, 2017).

Research question two. How are opinion leaders, within an educator's Twitter personal learning network, influencing K-12 pedagogy? Four-point Likert-type statements were used to determine the strength with which educators believe opinion leaders affect their pedagogy. A large portion (70.7%) of participants *strongly agree* or *agree* that they follow at least one opinion leader on Twitter. Slightly more than 67% of educator respondents *strongly agree* or *agree* that opinion leaders affect their pedagogy, and 68% of participants *strongly agree* or *agree* that they implement opinion leaders' suggested strategies in their classrooms. These findings reveal that many educators are attracted and influenced by the ideas of opinion leaders (Beacom et al., 2014; Cauberghe et al., 2017; Dewitt, 2018; Gardner & Mazzola, 2018; Ognyanova, 2017; Turcotte et al., 2015). This finding could also echo the work of Ognyanova (2017), supporting the idea that opinion leaders have greater degree centrality, and therefore are more successful at obtaining and dispersing information rapidly.

One of the open response survey questions, question 16, allowed educators to construct a list of opinion leaders they follow on Twitter. These names were organized into specialization categories. The specialization types were influenced by Hattie's (2009) research. As stated in the review of literature, Hattie's (2009) research focused on six contributions to student achievement outcomes. Four of Hattie's (2009) contributions to student achievement emerged in this study's opinion leader data analysis: the contributions of the school, the contributions of curricula, the contributions from the teacher, and the contributions from the teaching approach. Each of Hattie's (2009) contributions has multiple influences within, some of which emerged in this study's findings.

Seven opinion leader specialization categories emerged from the analysis of survey item 16. Five of the seven categories that emerged are located within Hattie's (2009) research as a contribution to student achievement. Percentages representing the number of opinion leaders per category were calculated and ranked: teaching approach (31.58%), curriculum resources (21.05%), transformational leadership (15.79%), other (13.16%), auxiliary (10.53%), educational technology (5.26%), and student-teacher relationships (2.63%). Diversity of the responses from survey item 16 emphasizes that traditional professional development is not always aligned with the needs of teachers and that a "…one size fits all approach" (Tour, 2017, p. 13) to professional development does not provide meaningful learning experiences for educators (Barrett et al., 2014; Carpenter et al., 2017; Korthagen, 2017; Nochumson, 2018; Tour, 2017).

The third open response question, survey question 18, asked educator respondents to list strategies suggested by opinion leaders that participants have implemented in their

classrooms. These responses led to the construction of seven categories, mirroring the categories constructed for the opinion leaders name list. Again, five of the seven categories are located within Hattie's (2009) contributions to student achievement. Percentages representing the number of opinion leader's implemented strategies per specialization category were calculated and ranked: teaching approach (55.6%), curriculum resources (18.5%), transformational leadership (11.1%), educational technology (5.26%), and student-teacher relationships, auxiliary, and other had one strategy equal to 3.7%.

The large percentage of educators looking to improve the teaching approach supports the work of Darling-Hammond et al. (2017). Darling-Hammond et al. (2017) propose that educators need more opportunities to acquire and refine pedagogy necessary for student success in the 21st-century. Moreover, this finding suggests that teachers believe they are expected to have a teaching approach that provides students with active, engaging, rigorous learning opportunities (Matherson & Windle, 2017). Further analysis of the teaching approach category led to the creation of four sub-categories: computer-assisted instruction, student engagement, grading, and "other." Student engagement and "other" composed slightly more than 81% of the teaching approach categories. These findings bring about a more in-depth look at what specific interests, goals, or needs educators are looking for in their personal learning network (Carpenter et al., 2017).

Research question three. How are information brokers, within an educator's Twitter personal learning network, influencing K-12 pedagogy? Four-point Likert-type statements were used to determine the strength with which educators believe information brokers affect their pedagogy. Compared to the percentage, 70.7% of

educators who *strongly agree* or *agree* that they follow an opinion leader on Twitter, fewer, 57.3%, respondents *strongly agree* or *agree* that they follow at least one information broker on Twitter. Additionally, approximately 58% of educator respondents *strongly agree* or *agree* that information brokers affect their pedagogy, and 60% of participants implement information brokers' suggested strategies. Responses to this study's survey reveal that educators are following information brokers on Twitter. Furthermore, K-12 educators are implementing information broker strategies in their classrooms. These findings support the role of information brokers and the more complex media network depicted in the multi-step flow model of communication (Ognyanova, 2017).

One of the open response survey questions, question 17, allowed educators to construct a list of information brokers they follow on Twitter. These names were organized into specialization categories. The specialization types were influenced by Hattie's (2009) research. As stated in the review of literature, Hattie's (2009) research focuses on six contributions to student achievement outcomes. Three of Hattie's (2009) contributions to student achievement emerged in this study's information broker data analysis: the contributions of the school, the contributions of curricula, and the contributions from the teaching approach (p. 31). Zero names listed for information brokers fell within the contributions of the teacher which was included in the analysis of opinion leaders. Each of Hattie's (2009) contributions has multiple effects within, some of which emerged in this study.

Five information broker specialization categories emerged from the analysis of survey item 17. Four of the five categories are located within Hattie's (2009)

contributions to student achievement. Percentages representing the number of information brokers per category were calculated and ranked: teaching approach (38.89%), educational technology (22.22%), transformational leadership (22.22%), curriculum resources (11.11%), and auxiliary (5.56%). Zero percent of the information broker names listed fit into the teacher-student relationships or "other" categories constructed for opinion leaders. This finding reiterates the findings from opinion leaders open response questions and the need for educators to be provided with professional learning specific to their pedagogical needs (Rosell-Aguilar, 2018; Tour, 2017).

The fourth open response question, survey question 19, asked participants to list strategies suggested by information brokers that participants have implemented in their classrooms. These responses led to the construction of six categories, somewhat different than those of opinion leaders. For information brokers implemented suggested strategies, auxiliary and "other" categories were removed, and a classroom management category was added. The addition of a new implemented strategies category, 'classroom management' could suggest that information brokers decrease the recursive nature of opinion leaders, and therefore broaden the amount of information educators are exposed to while on Twitter (Beacom et al., 2014; Carpenter et al., 2017; Moldovan et al., 2017; Prenger et al., 2018). All six of the implemented strategy categories are located within Hattie's (2009) effect size list. Educators identified significantly fewer, 13, information brokers' implemented strategies when compared to the number of opinion leaders' strategies implemented. Percentages representing the number of information brokers' implemented strategies per category were calculated and ranked: teaching approach (30.77%), curriculum resources (23.08%), classroom management and educational

technology each represented 15.38% of responses respectively, and one strategy listed was placed in the transformation leadership category (7.69%). The differences in information broker implemented strategy categories could suggest that information brokers are occupying informational holes within an educator's personal learning network (Ognyanova, 2017). The educators who elected to participate in this study utilized information broker resources to enhance classroom management practices, along with other categories similar to those of opinion leaders.

Research questions four and five. With what frequency do K-12 educators, who use Twitter, research opinion leader's or information brokers' credentials? Four-point Likert-type statements were used to determine the strength with which educators believe they research the credentials of opinion leaders (research question four) and information brokers (research question five). Slightly more than 63% of educator respondents research the credentials of opinion leaders. Comparatively, 59.21% research the credentials of information brokers. These findings offer the idea that educators understand the devious tactics used by social media platforms, advertising, and marketing companies (Araujo et al., 2017; Cauberghe et al., 2017; Celik et al., 2018; Erdem & Eristi, 2018; Joanou, 2017; Li, 2015; Nagle, 2018). Furthermore, educators are aware of the current information credibility epidemic within social media platforms (Cauberghe et al., 2017; Turcotte et al., 2015).

Conclusions

Conclusions were developed based on the responses of K-12 educators who elected to participate in this study and then considered in relation to the research questions and significance of the study. The use of Twitter as a personal learning

network and for professional learning was discussed in the review of literature (Rosell-Aguilar, 2018; Tang & Hew, 2017). Additionally, the lack of research exploring the effects of professional learning, via Twitter, on student achievement outcomes was introduced and emphasized (Greenhalgh & Koehler, 2017; Hyndman, 2018; Prenger et al., 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Veletsianos, 2017). This study revealed by whom educators feel more influenced, opinion leaders or information brokers. Furthermore, this quantitative study showed the pedagogical strategies of opinion leaders and information brokers that have been implemented in K-12 classrooms.

The categories constructed during the analysis of data identify areas of pedagogy for which educators are turning to personal learning networks to explore. The idea that an individual's behaviors and perceptions are influenced by Twitter opinion leaders and information brokers is supported (Beacom et al., 2014; Arriagada et al., 2017; Ognyanova, 2017; Turcotte et al., 2015). Even though educators are being influenced by Twitter influencers within the education profession, a large percentage of educator respondents are researching the credentials of opinion leaders or information brokers they follow.

Research question one. How are personal learning networks via Twitter influencing pedagogy? This study explored the influence educators' personal learning networks via Twitter are having on K-12 pedagogy. Overall, the findings of this study show that educators are turning to and interacting with Twitter to expand and elevate their professional learning experiences (Carpenter et al., 2017; Hyndman, 2018; Prenger et al., 2018; Nagle, 2018; Tour, 2017). The analysis and categorization of implemented strategies reveal that a large majority of K-12 educators are using their Twitter personal

learning networks to discover or enhance their approach to teaching. Based on research concerning the learning of current and future K-12 students, educators need assistance improving pedagogy that meets the demands of a fast-paced, global society (Afridi & Khan, 2017; Hnapovska & Liashenko, 2019; Prenger et al., 2018). Since almost all implemented strategy categories fall within Hattie's (2009) list of contributions, this study's results indicate educators use of Twitter for online professional learning has resulted in the selection of strategies shown to positively impact student achievement outcomes (Bisschoff & Jefferis, 2017; Tour, 2017; Veletsianos, 2017).

As stated in the review of literature and this study's findings, Hattie (2009) constructed six contributions to student achievement and outcomes in his *Visible Learning* research. Of the six contributions, four emerged in this study's opinion leader data analysis, whereas three emerged in the information broker's data analysis. According to Hattie (2009), teaching approach strategies have an overall effect size of 0.42 (p. 201). Because contributions to teaching approach have an effect size larger than Hattie's (2009) hinge point of 0.40 (p. 16), teachers who attempt to improve their teaching approach have the potential to have a positive effect on student achievement outcomes. Furthermore, educators identified other pedagogical items that Hattie (2009) identified as contributions to student achievement outcomes. According to Hattie (2009), curricular resources or contributions from curricula has an overall effect size of 0.45 (p. 130). Computer-assisted instruction, an influence placed within Hattie's (2009) contributions from teaching approaches, has an overall effect size of 0.37 (p. 220). Computer-assisted instruction does not fall within Hattie's (2009) zone of desired effects. Even though computer-assisted instruction is outside of Hattie's zone of desired effects, it

should not be forgotten due to the current trends and future trends of technology in the workplace (Lahullier, 2018). Educators who become more comfortable with educational technology and couple it with strong instructional practices may find the combination of the two effects increases student engagement and outcomes (Hattie, 209).

Research question two. How do opinion leaders, within a teacher's Twitter personal learning network, influence the teacher's pedagogy? In this study, the influence Twitter educational opinion leaders are having on K-12 pedagogy was explored. For this study, opinion leaders placed in the opinion leader the *teaching approach* category (31.58%) specialize in one or more of the following areas: increasing student engagement, improving pedagogy, implementing school-wide programs, or transforming classroom environments. According to Hattie (2009), the teaching approach is the learning intentions and success criteria that frame the challenge and purpose of the lesson. In Hattie's (2009) book *Visible Learning*, contributions from the teaching approach are divided into two chapters: strategies emphasizing learning intentions, and the teaching approaches that emphasize teaching strategies. Hattie (2009) stated that the:

> …key ingredients of what it means to be strategic in teaching and learning relates to teachers findings ways to engage and motivate students, teach appropriate strategies in the context of various curricula domains, and constantly seeking feedback about how effective their teaching is being with all students. (p. 161)

As stated in the conclusion concerning research question one, the greatest percentage of educator respondents indicated they implement teaching approach strategies provided by opinion leaders. The diversity of teaching approach strategies listed in survey responses

revealed the additional learning teachers need in content-specific practices (Carpenter et al., 2017). Furthermore, many of the responses of implemented strategies are related to S.T.E.A.M. content, one of seven trending innovations identified by Mathewson (2019).

Teaching approach. For an educator's teaching approach to be successful, the educator must provide appropriate feedback, take account of students' views of the process of learning, and ensure students are actively engaged in their own learning and metacognitive skills (Hattie, 2009). Additionally, Marzano (2014) stated that instruction should reflect a higher frequency of engaged students working through tasks that involve peer collaboration and rigor (p. 13). Student engagement is multi-faceted, and teaching strategies to increase student engagement covers a wide gambit of methods (Fuller et al., 2018; Hattie, 2009). Furthermore, student engagement seldom occurs spontaneously and is more likely to occur when teachers plan for it (Buskist et al., 2018). According to the findings of this study, educators are looking to their Twitter professional learning network for a breadth of teaching strategies (44% of responses) and "other" approaches (25% of responses) to increase student achievement outcomes. Survey participants identified 28 student engagement strategies suggested by education opinion leaders that they have implemented in their K-12 classrooms.

For the past decade, school systems around the world have been grappling with what it means to prepare and engage students in skills that will allow them to thrive in the future of their lives (Magee & Jensen, 2018). Findings from this study suggest that educators are looking to Twitter personal learning networks to discover and stay cognizant of a plethora of teaching approaches. Many strategies mentioned in the findings of this study, such as blended learning, flexible seating, and flipped classrooms,

are relatively new to education (Hnapovska & Liashenko, 2019; Lin et al., 2019; Scholastic Teacher, 2018). Other strategies, such as inquiry-based learning, workshop model, and learner-centered innovations, have been part of education for decades (Scholastic Teacher, 2018).

New approaches such as flexible seating and flipped classrooms have yet to be added to Hattie's (2009) research, but three of the teaching approach strategies given made Hattie's meta-analyses list. Inquiry-based teaching appears on Hattie's list and is a practice in which teachers ask students to involve themselves in the process of observing, posing questions, engaging in exploration, and analyzing findings (Hattie, 2009). Hattie (2009) concluded that inquiry-based teaching has an overall effect size of 0.31 (p. 209), slightly outside of Hattie's (2009) zone of desired effects. However, the underlying concepts of inquiry-based teaching align with several of Marzano's (2014) *13 Essential Instructional Strategies to Achieve Rigor*: helping students record and represent knowledge; helping students practice skills, strategies, and processes; helping students examine their reasoning; and helping students engage in cognitively complex tasks. Overall, Marzano's (2014) *Essential 13* that aligns with inquiry-based teaching allows students to create their own representations of content and processes through increased competence and confidence. According to Marzano (2014), the "*Essentials for Achieving Rigor* model scaffolds instruction through the taxonomy from content retrieval to knowledge utilization while conveying high expectations to all students in a student-centered classroom" (p. 17).

Another teaching approach strategy identified and found within Hattie's (2009) list is student creativity. Increasing student creativity through learner-centered

innovations and workshop models were both opinion leaders' strategies that respondents indicated they have implemented in their classrooms. Creativity models or programs are identified as influences of successful student achievement outcomes (Hattie, 2009). According to Hattie (2009), "creativity programs are grounded in a common idea that training, practice, and encouragement in using creative thinking skills can improve an individual's ability to be fluently and flexibly creative in their future lives" (p. 155). Hattie (2009) concluded that creativity programs have an overall effective size of 0.65 (p. 155) and have a large positive effect on student achievement outcomes.

Educator quality. Reflective practices and classroom transformations are all components of quality teaching, which were connected to the contributions of the teacher. Within Hattie's (2009) contributions from the teacher, the quality of teaching is addressed. According to Hattie (2009), "quality teachers, as rated by students, are those who challenge, who have high expectations, who encourage the study of their subject, and who value surface and deep aspects of their subject" (p. 116). Hattie (2009) concluded that the quality of teaching has an overall effect size of 0.44 (p. 115) and falls within Hattie's (2009) zone of desired effects. Even though few participants listed opinion leaders' names or strategies for building teacher-student relationships, this category should be noted due to its major impact on student achievement. Opinion leader's in the student-teacher relationships category (2.63%) are indirectly connected to the teaching approach and provide strategies for building relationships with students to increase student success. Hattie's (2009) meta-analysis concludes that teacher-student relationships have an overall effect size of 0.72 (p. 118) well within the zone of desired effects. According to Collie and Martin (2019), "positive teacher-student relationships

have an energizing function that activates positive academic-related emotions and can drive achievement behavior in the form of engagement" (p. 862).

Classrooms are not strictly intellectual and rational settings (Fuller et al., 2018). Classrooms are highly emotion-packed environments in which students may experience a wide spectrum of affective reactions (Buskist et al., 2018; Fuller et al., 2018). Therefore, "how students perceive their teachers' attitudes and actions toward them will largely determine how they feel about their courses and their willingness to engage in them" (Buskist et al., 2018, p. 56). Furthermore, as educators' model and show effort in their profession and within the classroom, they are teaching or influencing students about the advantages of sustaining effort (Marzano, 2000). These types of behaviors can have major effects on achievement set by both educators and students (Hattie, 2009; Marzano, 2000).

Research identifies two major forms of leadership within K-12 education, transformational, and instructional (Hattie, 2009; Marzano, 2018). Individuals within transformational leadership roles are those who inspire new levels of positive energy, commitment to students, and moral purpose within their staff (Hattie, 2009). Instructional leaders are those whose major focus in on "…creating a learning climate free of disruption, a system of clear teaching objectives, and high teacher expectations for teachers and students" (Hattie, 2009, p. 83). Marzano (2018) also includes the role of an operational leader within his research. According to Marzano (2018), operational leaders "…operate all aspects of the functioning of the school: culture, climate, safety, and the budget" (p. 7). From this study's survey, 16% of respondents indicated they follow opinion leaders who specialize in transformational leadership. Due to the nature of the

survey, the variation of survey respondents' roles in education (teachers, administrators, directors, coaches), and anonymous responses, the conclusions drawn from the transformational leadership category will encompass all K-12 leadership roles. Furthermore, educational leaders within some districts embrace the transformational, instructional, and operational roles of their district (Cohen et al., 2017; Hattie, 2009; Marzano, 2018). Additionally, transformational leadership is intimately connected to instructional leadership and operational leadership (Marzano, 2018).

According to Marzano (2018), "the school leader's involvement may take many forms: leading and supporting teacher learning teams, providing rich classroom observation feedback, modeling effective instruction, providing professional development opportunities, supporting standards-based instruction, and ensuring equal learning opportunities for all students" (p. 6). Hattie (2009) concluded that school leaders have an overall effect size of 0.36 (p. 74), outside of the zone of desired effects. Within school leadership, leaders who promote and support challenging goals for teachers and focus on student achievement through instructional practices have the most effect on student outcomes (Hattie, 2009). An understanding and commitment to instructional practices optimizes student learning (Marzano, 2018). No matter the specific leadership role of an educator, the more he or she focuses on his or her influence, learning, and relationships with teachers the more likely he or she is to positively influence student outcomes (Hattie, 2009).

Curriculum. The findings of this study showed that educators are looking to online personal learning networks for specific curricular resources. Survey responses revealed that 21% of followed opinion leaders specialize in areas of curriculum, and

18.5% of implemented opinion leader strategies were in the curriculum category. Hattie's (2009) meta-analyses concluded that contributions from the curricula have an overall effect size of 0.45 (p. 130), within the zone of desired effects. According to Marzano (2018), school leaders ensure that district curriculum and assessment align with state standards.

Furthermore, teachers align curriculum and skills that are critical to mastery of the standards (Marzano, 2014). Hattie argued that changes to the curriculum are often more "…cosmetic than transformational" (p. 159). According to Hattie (2009), "it is less the content of curricula that is important than the strategies teachers use to implement the curriculum so that students progress upwards" (p. 159). Hattie's statement reiterates the emphasis placed on the teaching approach and the findings of this study. More educators, approximately 10%, who responded to this study's survey, are utilizing their Twitter personal learning networks to improve teaching approach than to find curriculum resources.

Even though student engagement and "other" approaches composed a large portion of implemented strategies, no strategy listed duplicated another. These findings show that the ability to customize learning via digital spaces or personal learning networks has become a major component of educators' professional learning (Hyndman, 2017; Prenger et al., 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Tour, 2017; Veletsianos, 2017). Furthermore, the lack of duplicated implemented strategies and the small portion of duplicated opinion leader names is contrary to the idea that information shared by opinion leaders or information brokers is redundant (Beacom et al., 2014; Moldovan et al., 2017). The findings of this study support that Twitter professional

learning networks have opened access to professional learning with very few restrictions (Tour, 2017).

Suggestions, tips, and advice pertaining to teaching and learning strategies are replete in the literature (Buskist et al., 2018). Many key factors affect engagement within the classroom environment such as creating a positive learning environment and the relationships that evolve from an educator's classroom (Fuller et al., 2018). In the current environment, full of significant changes in technology, academic standards, and how educators teach, validated methods are required to provide real-time feedback to instructors that will inform a cycle of quality improvement (Fuller et al., 2018). The outcomes of student achievement extend far beyond knowledge acquisition and skills development; they have significant positive implications for students' personal lives as well (Buskist et al., 2018).

Research question three. How do information brokers within a teacher's Twitter personal learning networks influence the teacher's pedagogy? This study explored the influence Twitter educational information brokers are having on K-12 pedagogy. The results of this study placed 50% of the information broker's names in the *teaching approach* category. The teaching approach's number one ranking of implemented strategies mirrors that of opinion leaders. The next largest area of specialization for information brokers is educational technology. This category for information brokers was almost four times larger than the percentage of opinion leaders placed into the educational technology category. This is unique in that few individuals who specialize in educational technology are seen as opinion leaders, but they are seen as holding brokering positions. As technology becomes more prevalent in K-12 schools,

some teachers feel ill-prepared to utilize the technology within their classrooms (Nochumson, 2018). Teacher preparation courses, programs, or other professional learning opportunities are lacking the engagement or rigor necessary to fully prepare educators for educational technology integration (Nochumson, 2018).

Educational technology. Educational technology was ranked second in information brokers' area of specialization. There has been a significant increase in educational technology, both financially and pedagogically, all over the globe in the past two decades (Benhamed et al., 2019). Educational technology supplements both an educator's teaching approach and curriculum. Educational technology trends like game-based learning will continue to be a popular approach for student engagement (Lahullier, 2018). According to Lahullier (2018), "the STEM or STEAM trend is not likely to be going anywhere anytime soon. A push to help students prepare to fill anticipated jobs in STEM fields is driving this trend" (p. 33). Current educational technology trends are not on Hattie's (2009) meta-analyses list or included in Marzano's (2000) research *What Works in Classroom Instruction*. However, Hattie's (2009) research concluded that computer-assisted instruction has an overall effect size of 0.37 (p. 220), below the zone of desired effects. According to Hattie (2009), the use of computers is more effective when there is a diversity of teaching strategies, multiple opportunities for learning, when the student is in control of the learning, and when peer learning and feedback are optimized. All of which are part of a teacher's approach to teaching, the largest category of responses and influence of both opinion leaders and information brokers in this study.

Research questions four and five. With what frequency do K-12 educators, who use Twitter, research opinion leader's and information broker's credentials? This study explored the frequency with which educators research the credentials of both Twitter educational opinion leaders and information brokers. The data from this study indicated that 63% of educators *strongly agree* or *agree* that they research the credentials of opinion leaders, whereas only 51% of educators *strongly agree* or *agree* that they research the credentials of information brokers. The results of this study reveal that educators understand the need to be media literate (Cauberghe et al., 2017; Celik et al., 2018, Erdem & Eristi, 2018; Joanou, 2017; Nagle, 2018). Furthermore, findings could reveal that educators are increasing their media literacy skills as they navigate through the bombardment of information provided by Twitter users (Nagle, 2018).

This study's findings are contrary to the idea that the influential role of opinion leaders is declining, while the influential role of information brokers is increasing (Beacom et al., 2014; Li, 2015; Moldovan et al., 2017). Out of 75 participants, 13.4% more participants indicated that they follow an opinion leader compared to an information broker. Furthermore, almost 10% more participants indicated that opinion leaders affect their pedagogy than do information brokers. Combined, results reveal opposition to Moldovan et al.'s (2017) idea that those who bridge structural holes, information brokers, may be more influential than opinion leaders. Data from this study indicated that educators see opinion leaders as more influential than information brokers. However, both opinion leaders and information brokers can positively contribute to educators' pedagogy.

Implications for Practice

Several major implications for practice emerged from the findings of this study. First, teachers can use Twitter to seek and receive pedagogical information that best suits their individual needs. Twitter is supported as a form of personal and professional learning and allows educators to grow in a variety of directions (Carpenter et al., 2017; Hyndman, 2018; Nagle, 2018; Tour, 2017). In the present study, most educators relied on Twitter to customize or personalize their informal learning through networks of educational professionals across the globe (Tour, 2017).

Moreover, Twitter's anytime availability and flexibility allows educators to access support and resources at any time (Tour, 2017). Most Twitter-based professional learning is self-initiated, self-directed, spontaneous, and specifically connected to an educator's needs (Barrett et al., 2014; Tour, 2017). For all reasons implicated, everyone in the K-12 profession should be creating Twitter accounts and building personal learning networks via the Twitter platform. Secondly, educational leaders should not assume that their staff are aware of or understand the impact Twitter can have on improving pedagogy. To ensure all teachers and other K-12 educators understand the learning opportunities available via Twitter, its use should be included within professional development.

The findings of this study reveal that educators are drawn to information provided by opinion leaders rather than information brokers. Therefore, educational leaders should keep cognizant of current educational opinion leaders' work and integrate that work into components of district provided professional learning opportunities. Researching opinion leaders' strategies and aligning them to the work of educational researchers such as

Hattie (2009) or Marzano (2000) provide evidence of what works in K-12 classrooms. Any strategies that fall within Hattie's (2009) zone of desired effects or Marzano's (2014) *Essential 13* have the potential to increase student achievement outcomes. Furthermore, a large portion of the opinion leaders listed in this study are authors, whether their work is published via a blog or book. Considering blogs and books are enriching methods of professional learning (Akiba & Liang, 2016; Barrett et al., 2014), these text-based resources provide numerous and diverse opportunities for collaboration and professional learning among educators. To further meet the needs of educators, professional development programs revolving around choice-based book studies provide engaged and collaborative learning opportunities (Akiba & Liang, 2016).

Another conclusion drawn from this study is that individuals respond to popular influencers and brokers for current, innovative ideas. Responses to this survey reveal that many educators are taking the extra, necessary step of researching the credentials of individuals who may influence their pedagogical behaviors (Cauberghe et al., 2017; Filipiak et al., 2018; Moldovan et al., 2017; Ognyanova, 2017; Turcotte et al., 2017). Within school walls, professional learning should reinforce the vital importance of media literacy when navigating social media platforms for both teachers and students. Many times, the algorithms within a social media platform deliver information to users they like or may be interested in (Burkhardt, 2017). This free delivery of likable information needs to be handled just like any other opportunity that seems too good to be true; through critique and evaluation, the components of strong media literacy skills (Burkhardt, 2017). Additional learning opportunities focused on how social media

platforms work, how misinformation spreads, and the importance of using fact-checking sites such as Snopes.com or factcheck.org should be of great emphasis (Burkhardt, 2017).

Use of Twitter provides educators the opportunity to collaborate for professional learning (Hyndman, 2018; Prenger et al., 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Veletsianos, 2018). The names of opinion leaders and information brokers were diverse; very few listed were duplicates or repeats. Additionally, none of the implemented strategies respondents listed were duplicates. This conclusion reveals that teachers have different professional needs. Using Twitter allows teachers to customize or differentiate their learning on a just in time, personal needs basis (Barrett et al., 2014; Tour, 2017). Findings from this study should draw attention to the disservice traditional approaches to professional development provide teachers. Educators are looking to professional learning beyond school walls to keep pace with current expectations to advance professional knowledge (Prenger et al., 2018). Educational leaders need to acknowledge current expectations and support teachers in all professional or personal learning endeavors.

Since all responses to this study's survey could be placed into eight categories, educational leaders should explore providing professional learning opportunities that follow the rankings of this study. According to the findings of this study, many educators are seeking teaching approach strategies, more specifically strategies for student engagement on Twitter. The work of both Hattie (2009) and Marzano (2014) shows that student engagement increases student achievement outcomes. Furthermore, educators new and old struggle with designing academically engaging, collaborative, and rigorous lessons specific to their content area (Mathewson, 2019). Allowing the use of personal

learning networks as professional development opportunities offers gains in lesson design and instructional strategy implementation.

The findings of this study add to the body of research focused on how teachers' use of Twitter is influencing classroom pedagogy and pedagogical contributions to student outcomes. Few studies have been conducted to examine the effects of professional learning on student outcomes (Akiba & Liang, 2016). Many educators struggle to articulate or are unsure of the impact their online professional learning is having on student learning (Carpenter et al., 2017). A method through which educators can become more informed about research-based contributions to student achievement outcomes, and the importance of aligning resources found on Twitter to the work of such educational research would be beneficial. For example, utilizing the broad range of influences found within Hattie's (2009) meta-analyses would be a starting place. Further alignment with the work of Marzano (2000) would contribute to greater success of student learning and achievement outcomes.

This study brings a unique perspective regarding what teachers are learning via their Twitter professional learning networks. The findings determined from the exploration of opinion leaders and information brokers highlight weaknesses in professional learning. Overall, teachers are researching, discovering, and implementing methods to enhance their approach to teaching, and more specifically methods to increase student engagement. For a large majority of students, engagement in the classroom decreases with each passing year of school (Mathewson, 2019). To combat the lack of student engagement, this study reveals that educators are finding and implementing strategies related to educational technology and creativity. Even though this study does

not provide specifics as to what content area or exactly how an educator implemented a particular strategy, the findings suggest that teachers feel as though they are improving their professional knowledge and utilizing this knowledge to contribute to student outcomes.

Recommendations for Future Research

In this study, the researcher found that both opinion leaders and information brokers are influencing K-12 educator pedagogy. It is important to understand that teachers are choosing to follow and interact with the content provided by these individuals. They choose to do so because, as opposed to traditional professional development opportunities, these individuals provide resources, strategies, support, or other information that the teacher finds appealing or necessary (Barrett et al., 2014; Laskowski, 2018). However, many district administrators remain reluctant to credit informal professional learning as contact hours for district mandated professional development contact hours. Before re-evaluating professional development guidelines, educational leaders will need more empirical evidence that suggests informal learning conducted on social media platforms can lead to the transformation of pedagogy and improved student achievement outcomes. The researcher, therefore, recommends that future research continue to examine the impact online, informal professional learning has on teacher pedagogy. Future studies should include longitudinal studies that examine changes in teaching behavior and the effects the behavioral changes have on student achievement outcomes.

The author also recommends examining more closely the kinds of opinion leaders and information brokers influencing K-12 educators. Findings from this study suggest

that teachers are mostly influenced by Twitter educational opinion leaders who have strong knowledge related to approaches to teaching. Further research regarding the influence of Twitter opinion leaders on K-12 educators may shed light on whether teachers are seeking advice from these individuals due to popularity or necessity. Future studies should include not only the names of opinion leaders and their strategies but take a more personal approach to determine why educators feel compelled to integrate strategies or resources provided by opinion leaders.

Another recommendation for future research is to examine the kinds of educators who are and who are not using Twitter. More research is needed to examine the reasons why Twitter is or is not used by a diverse population of educators. Further research on Twitter use within the education profession may provide insight into the demographics of teachers who are or who are not utilizing Twitter for professional learning purposes. Furthermore, a larger study, utilizing different online personal learning networks, would derive findings that are generalizable outside of the Twitter platform. Further research on the use of social media as a form of informal learning would help build a panoramic view of social media's use in professional learning. Finally, it is vital to conduct research to understand whether social media is providing effective pedagogical strategies to educators, and the impact informal professional learning is having on student achievement.

Summary

Participatory technologies, such as Twitter, Facebook, and Pinterest, have expanded the boundaries of professional learning networks by bridging the local with the global (Nagle, 2018). In the world of social media, where information is brought directly

to users, bots are programmed to gather and provide information that is similar to what users like, and the construction of fake information makes involvement in these online communities risky (Burkhardt, 2017; Nagle, 2018). However risky, many educators are turning to social media sites like Twitter to address the increased complexities of education which is trying to keep pace with a fast-changing world (Prenger et al., 2018). Ample research was discussed in this study supports the use of Twitter as an influential means of professional learning (Greenhalgh & Koehler 2017; Hyndman, 2018; Prenger et al., 2018; Rosell-Aguilar, 2018; Tang & Hew, 2017; Veletsianos, 2017). The flow of information through media and the individuals who are most influential has been an area of research for decades (Arriagada et al., 2017; Beacom et al., 2014; Ognyanova, 2017). Even though many educators believe social media provides optimal ways to improve and keep cognizant of their profession, scarce attention has been paid to the use of the Twitter microblogging platform as a form of professional learning (Rosell-Aguilar, 2018; Tang & Hew, 2017). Furthermore, less research explores the influence educators' informal learning experiences are having on student achievement (Greenhalgh & Koehler, 2017; Prenger et al., 2018; Rosell-Aguilar, 2018; Veletsianos, 2017).

District provided professional learning has posed many obstacles for educators (Hyndman, 2018; Prenger et al., 2018; Tour, 2017). To overcome these obstacles, individuals in the education profession have the opportunity to expand professional learning indefinitely via online professional learning networks (Tour, 2017). Twitter allows educators the opportunity for collaborative engagement with other educators in a global space (Nagle, 2018). Knowledge about what makes online professional learning so appealing, that people engage and devote significant time to it, can have important

implications for formal learning contexts (Tour, 2017). The purpose of this study was to explore the influence that Twitter opinion leaders and information brokers are having on educators' pedagogical behaviors. Furthermore, the information obtained in this study contributes to the scarce amount of research available regarding the use of Twitter as a professional learning network (Tang & Hew, 2017).

Through the results of this study, it has been established that the role of opinion leaders is more influential on K-12 educators than that of an information broker. Connections have been made as to what educators are discovering via their Twitter personal learning networks and implementing in their K-12 classrooms. Opinion leaders' approaches to teaching focused on student engagement is the number one category implemented in K-12 classrooms, followed by curricular resources provided by opinion leaders, and educational technology resources or skills given by information brokers. Even though neither opinion leaders nor information brokers were often followed for strategies in the teacher-student relationship category, the effect teacher-student relationships have on student outcomes makes the category worth mentioning.

A consideration of literature on these topics revealed there is an opportunity to understand who educators are looking to for professional learning. The majority of results indicated strength in the influence of opinion leaders, but educators are not just allowing popularity to validate the credentials of opinion leaders. Educators are taking the extra step in researching the credentials of those who influence their pedagogical behaviors. One of the most reassuring findings from the study was that of the 56 given names of opinion leaders and information brokers, only six individuals were identified more than once. This diversity reiterates the personalization educators can have via their

Twitter personal learning networks, and how a one-way approach to professional learning is ineffective and creates a professional learning environment of passivity.

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Appendix A

Permission Letter

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Appendix B

Permission Letter

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Portion	Figure/table
Number of figures/tables	1
Original Wiley figure/table number(s)	Figure 3. Two-step flow.

Appendix C

Survey

1. Do you work in the K-12 education profession?

___Yes

___No

2. In what country do you live? Fill in the blank_____

3. Which of the following describes your position in education?

___Administrator

___Director

___Counselor

___Instructional Coach

___Technology Coach

___Pre-kindergarten teacher

___K-5 teacher

___6-8 teacher

___9-12 teacher

4. Which of the following best describes the size of your educational institution?

___Less than 500 students

___500-1999 students

___2000-3999 students

___4000-5999 students

___6000-7999 students

___8000+ students

5. Do you have a Twitter account? ___Yes ___No

Questions 6-15 are Likert-type statements that pertain to your use of Twitter for professional learning and interactions with Twitter opinion leaders and information brokers. The last four prompts, 16-19, pertain to specific resources you have utilized in your role as an educator.

6. I interact with Twitter for professional learning.

Strongly disagree, Disagree, Agree, Strongly agree

7. When on Twitter, I am exposed to information regarding the education profession.

Strongly disagree, Disagree, Agree, Strongly agree

For the purposes of this survey, the following terms have been defined.

Information broker. Moldovan, Muller, Richter, and Yom-Tov (2017) defined an information broker as an "individual who bridges structural holes between individuals within a network" (p. 537).

Opinion leader. Liu, Sidhu, and Valente (2017) defined opinion leaders as "individuals [who] are perceived to be influential" (p. 2).

8. I follow at least one education **opinion leader** on Twitter.

Strongly disagree, Disagree, Agree, Strongly agree

9. I follow at least one education **information broker** on Twitter.

Strongly disagree, Disagree, Agree, Strongly agree

10. **Opinion leaders** have affected my pedagogy.

Strongly disagree, Disagree, Agree, Strongly agree

11. **Information brokers** have affected my pedagogy.

    Strongly disagree, Disagree, Agree, Strongly agree

12. I implement **opinion leaders'** suggested strategies in my classroom.

    Strongly disagree, Disagree, Agree, Strongly agree

13. I implement **information brokers'** suggested strategies in my classroom.

    Strongly disagree, Disagree, Agree, Strongly agree

14. I research the credentials of **opinion leaders**.

    Strongly disagree, Disagree, Agree, Strongly agree

15. I research the credentials of **information brokers**.

    Strongly disagree, Disagree, Agree, Strongly agree

16. List the top **opinion leaders** you follow.

17. List the top **information brokers** you follow.

18. Provide examples of **opinion leaders'** suggested strategies you have implemented.

19. Provide examples of **information brokers'** suggested strategies you have implemented.

Appendix D

IRB Approval Letter

Sep 16, 2019 7:43 PM CDT

RE: IRB-20-21: Initial - The Influence Twitter Educational Opinion Leaders Are Having on K-12 Classrooms

Dear Toni Owens,

The study, The Influence Twitter Educational Opinion Leaders Are Having on K-12 Classrooms, has been approved as Exempt.

Category: Category 2.(i). Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording). The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects.

The submission was approved on September 16, 2019.

Here are the findings: Regulatory Determinations

This study has been determined to be minimal risk because the research is not obtaining data considered sensitive information or performing interventions posing harm greater than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests.

Sincerely, Lindenwood University (Lindenwood) Institutional Review Board

Appendix E

Recruitment Tweet

EdD student researching the influence Twitter ed opinion leaders and info brokers have on K-12 classroom Please complete the 3 minute survey & share. #edchat #edu #educhat, #globaled #globaledchat #CollaborativePD #lifelonglearning #personalizedpd #PLN #PLC #teacherPD #edleaders <survey link>

Appendix F

Consent Form

LINDENWOOD

Survey Research Information Sheet

You are being asked to participate in a survey conducted by Toni Owens and Dr. Kathy Grover at Lindenwood University. We are doing this study to explore the impact Twitter opinion leaders are having on K-12 educators' instruction. The survey includes questions, Likert-type statements, and open-ended prompts that pertain to educator and institution demographics, how the survey participant interacts and gathers information from Twitter opinion leaders or information brokers, and how participants utilize this information or resources in their classrooms. It will take about five (5) minutes to complete this survey.

Your participation is voluntary. You may choose not to participate or withdraw at any time by simply not completing the survey or closing the browser window.

There are no risks from participating in this project. We will not collect any information that may identify you. There are no direct benefits for you participating in this study.

WHO CAN I CONTACT WITH QUESTIONS?

If you have concerns or complaints about this project, please use the following contact information:

Toni Owens, [redacted]

Dr. Kathy Grover, kgrover@lindenwood.edu

If you have questions about your rights as a participant or concerns about the project and wish to talk to someone outside the research team, you can contact Michael Leary (Director - Institutional Review Board) at 636-949-4730 or mleary@lindenwood.edu.

By clicking the link below, I confirm that I have read this form and decided that I will participate in the project described above. I understand the purpose of the study, what I will be required to do, and the risks involved. I understand that I can discontinue participation at any time by closing the survey browser. My consent also indicates that I am at least 18 years of age.

You can withdraw from this study at any time by simply closing the browser window. Please feel free to print a copy of this information sheet.

Vita

Toni Owens graduated from Fordland High School in Fordland, Missouri, in 2002. After high school, she attended Drury University in Springfield, Missouri, where she earned a Bachelor of Science degree in Biology in the spring of 2007. In the fall of 2007, Toni began her first job in the education profession as a Title 1 paraprofessional. At this time, Toni discovered her love for students and teaching, and in the spring of 2008, she enrolled in Missouri State University's Master of Arts in Teaching program. Toni started in the education profession as a junior high and high school science teacher in Galena, Missouri in 2010, and graduated from Missouri State University with a Master's in Teaching degree in 2014. In 2012, Toni was hired as a high school science teacher in the Fordland R-3 School District, a place that has been her home her entire life. She is currently in her ninth year of teaching high school science at Fordland High School. Over the past four years, Toni has also served as an Instructional Coach to the Fordland K-12 staff.