

## ABSTRACT

Title of Document: INVESTIGATING HOW INDIVIDUAL SCHOOL INTERNAL SOCIAL NETWORKS CONTRIBUTE TO THE COMMUNICATION OF SYSTEMIC INITIATIVES IN A LARGE URBAN SCHOOL DISTRICT.

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Implementation of initiatives and mandates in schools and districts has increased over the last decade and districts are constantly tasked with disseminating new information to staff in the schools. Recently studies have been conducted in the field of education using Social Network Analysis (SNA) to explore how information and knowledge flow between people in schools and districts in order to identify key

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disseminators, brokers, and hinders of information, as well as the overall patterns of communication.

The purpose of this study was to examine the informal communication networks and key actors used to disseminate information about the Common Core State Standards (CCSS) in four elementary schools in a large urban school district. The study was based on the premise that obtaining a better understanding of the informal communication pathways in these schools would allow school and district leaders to better understand how information flows throughout schools and to determine whether the positions intended to communicate new information in a school were actually being used. This exploratory study used an online survey and SNA to identify the flow of and key actors for communication around two initiatives, CCSS and Data Wise.

The findings suggest that each of the four schools had highly centralized networks where only a few key staff members were integral for sharing information about initiatives. The key people in each school tended to be administrators and individuals who held two positions. One of the key positions in each school was the Professional Development Lead Teacher (PDLT), which is the position the District had created to ensure information about key initiatives was disseminated.

**Keywords:** Social Network Analysis, Common Core State Standards, dissemination, initiative, communication, change

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INVESTIGATING HOW INDIVIDUAL SCHOOL INTERNAL SOCIAL  
NETWORKS CONTRIBUTE TO THE COMMUNICATION OF SYSTEMIC  
INITIATIVES IN A LARGE URBAN SCHOOL DISTRICT

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# INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

## **Dedication**

To my Lord and Savior, for providing me the path and fortitude despite my desires to go in other directions.

To Frederick and Diane Kochanowski, my parents and my foundation who always pushed me to do more.

To Erik and Shane Kochanowski, my brothers who always believed in me and lovingly nudged me to be my best and the “favorite.”

To my nieces and nephew, you continue to inspire me and keep me young. I love you to the moon and back and look forward to seeing you blossom into the most wonderful young women and man out there.

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**List of Acronyms**

CCSS – Common Core State Standards

DC – Department Chairperson

ED – United States Department of Education

FfT – Framework for Teaching

ILT – Instructional Lead Teacher

IRB – Institutional Review Board

NCLB – No Child Left Behind

OTD – Office of Talent Development

PARCC – The Partnership for Assessment of Readiness for College and Careers

PDLT – Professional Development Lead Teacher

SNA – Social Network Analysis

SLO – Student Learning Objective

STC – School Test Coordinator

STEM – Science, Technology, Engineering, and Mathematics

## Section I

### Introduction to the Problem and Literature Review

“Without attention to the social norms and relationships within the school and across the district, deep and sustained improvement seems unlikely.” (Finnigan & Daly, 2012, p. 67)

#### Introduction to the Problem

Each year a large urban district in the Mid-Atlantic region of the United States implements many new initiatives. For the purposes of this paper, the particular district studied will be referred to as the District. In such a large district, communicating an initiative for successful implementation can be complex. Often, new initiatives must travel through many channels before they reach the school and ultimately the teacher, who is expected to implement them. For the purpose of this study, an initiative will refer to any program, policy, reform, or initiative whether internally driven or externally mandated that was implemented in the district.

In the District, both system-wide and department initiatives were being implemented at the same time. System-wide programs and policies are often mandated as a result of federal or state initiatives or from key leadership. Department programs, such as the implementation of the new reading series, Reading Street, or implementation of the new science, technology, engineering, and mathematics (STEM) curricula may be implemented at the same time, but may only impact a specific department, cluster of schools, or grade level.

With the implementation of each new system-wide or department initiative, each group of staff or school responsible for implementing the initiative developed its own plan to communicate the purpose and details of the proposed policy, program, or project.

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Often, system-wide initiatives were communicated through a memo and sometimes information was included in countywide email updates. More detailed information was often shared in face-to-face meetings with the building administrators and/or a few key representatives from each building who were then responsible for disseminating the information to all staff in their buildings. New programs, materials, curricula, or instructional foci that were initiated by a department were often communicated via email to the specific staff and administrators who were to be involved in the implementation. In some instances, a department may have brought all those involved in implementing a new program together for a face-to-face meeting. Other departments brought key representatives together to then disseminate the information to the relevant staff in their buildings.

One major new system-wide initiative that had to be communicated to all schools as well as various departments in the county was the Common Core State Standards (CCSS) (District, 2011b). The State adopted the CCSS in June of 2010 (Maryland State Department of Education, n.d.). The District began preparing for implementation of the CCSS in August of 2011. The first two years focused on conducting needs assessments, updating and revising curricula, and identifying new core materials necessary for alignment with the CCSS. In school year 2013-14, full implementation of the CCSS was expected in the county and many of the new curricula began being used (District, 2011b).

As part of the implementation of the CCSS, the District revised curricula and materials. In addition, each core content area supervisor for Reading English Language Arts, Mathematics, Social Studies and Science developed a professional development plan to train teachers in their subject areas on the CCSS. Most of these trainings in the

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first two years included the use of turnkey trainings, with the reading specialists or department chairpersons being trained and then being responsible for disseminating the information at their school. Additional trainings were also to be provided for the building administrators on the CCSS in order to help them understand the key differences and implications of the standards (District 2011b). The District's CCSS planning documents did not address communication, other than through the specific professional development activities that were planned. In addition, the information regarding the content of the professional development was minimal and only the key people who were being trained were provided with it (District, 2011b). How the information would ultimately reach all teachers in the schools was not described. The stakes were very high for the District as the system adopted the CCSS, and in order to successfully introduce and implement this change, effective communication needed to be present.

### **Importance of Communication in Implementation**

Communication is a key component to the successful implementation of any initiative (Dannefer, Johnston, & Krackov, 1998; George, 2002; Proctor & Doukakis, 2003). How well a new initiative is understood will affect how well it can be implemented (Gallivan, 2001). Further, schools can have very different understandings of what is expected from an initiative (Berends, Bodilly, & Kirby, 2002). According to the District climate surveys, District employees generally rated communication poorly. As reported in the district employee satisfaction surveys from 2006 through 2011 of school-based administrators and support staff (combined school-based support staff and all central office staff), administrators perceived that the district did not communicate to them in a timely fashion (Keane & Sunmonu, 2011a; 2007a). Additionally, the District

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school climate surveys administered between 2006 and 2011 of school-based instructional staff indicated that teachers perceived that communication between the staff and administration was infrequent or ineffective (Keane & Sunmonu, 2011b, 2009, 2007b). Though the District climate surveys were conducted in 2013, the format for reporting was not the same as in previous years. The general results were provided in an executive report as well as individual school reports, but there was no report of the aggregate findings by item across the three administrations of the survey. Therefore, data could not be compared across years (Keane & Sunmonu, 2013).

Successful communication must encompass not only all staff in the district, but also all other stakeholders who might have input or be impacted by the change, which could include school board members, administrators, teachers, students, parents, community representatives, universities, and local businesses (Jenlink, Reigeluth, Carr & Nelson, 1998; Gallivan, 2001). Additionally, the communication must be clear and result in all schools and other relevant stakeholders having a shared understanding of the goals of what is to be implemented, such as the CCSS, and the specific implementation requirements.

With school districts constantly being challenged to reach forever-increasing targets, it can be very risky if the new programs do not promote results (Canadian Council on Learning, 2009). With the success of so many of these programs at stake and communication being one of the key components to the success of initiatives, it is important for school systems to not only have a communication plan and/or policy in place but also to examine the most effective pathways for communicating new initiatives.

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### **Purpose of the Study**

The purpose of this study was to examine, through the use of social network analysis (SNA), the communication networks and key actors intended to disseminate information about the CCSS in four elementary schools in the District. The study was based on the premise that obtaining a better understanding of the communication pathways in these schools would allow school leaders to better understand how information flows throughout schools and to determine whether the positions intended to communicate new information in a school were being used effectively. Additionally, the communication pathways could also help to determine which people or positions might be most effective at sharing new information.

Social network analysis can at times be confused with social networks such as Facebook, LinkedIn, and twitter that are used to connect individuals virtually. SNA on the other hand, is a method that uses network and graph theory to explore the relationships between actors in a network. Networks in SNA are comprised of three main components, the overall network or system being explored, the actors or nodes in the network, and the relationships or ties between the actors (Borgatti, Everett, & Johnson, 2013). The actors in the network can be comprised of individuals or a group and signify a social unit. Actors could include teachers in a school, departments, parents, etc. (Carolan, 2014). Various types of ties can be explored between actors, such as friendship ties, advice, giving, communication, etc. (Borgatti, Everett, & Johnson, 2013; Carolan, 2014).

The data collected from SNA studies can be used to run a myriad of analyses on individual actors in the network, groups of actors in the network or the network as a



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whole. The SNA shows the relationship (social, behavior, physical, etc.) between actors in the network and helps to characterize actors and their role in the network. SNA uses map theory to develop sociograms or visual representation of the networks (see Figure 1). The circles in the sociogram represent the actors and the lines represent the relationships between the actors. In figure one, the line between person two and person three shows that person two goes to person three for the relationships being measured.

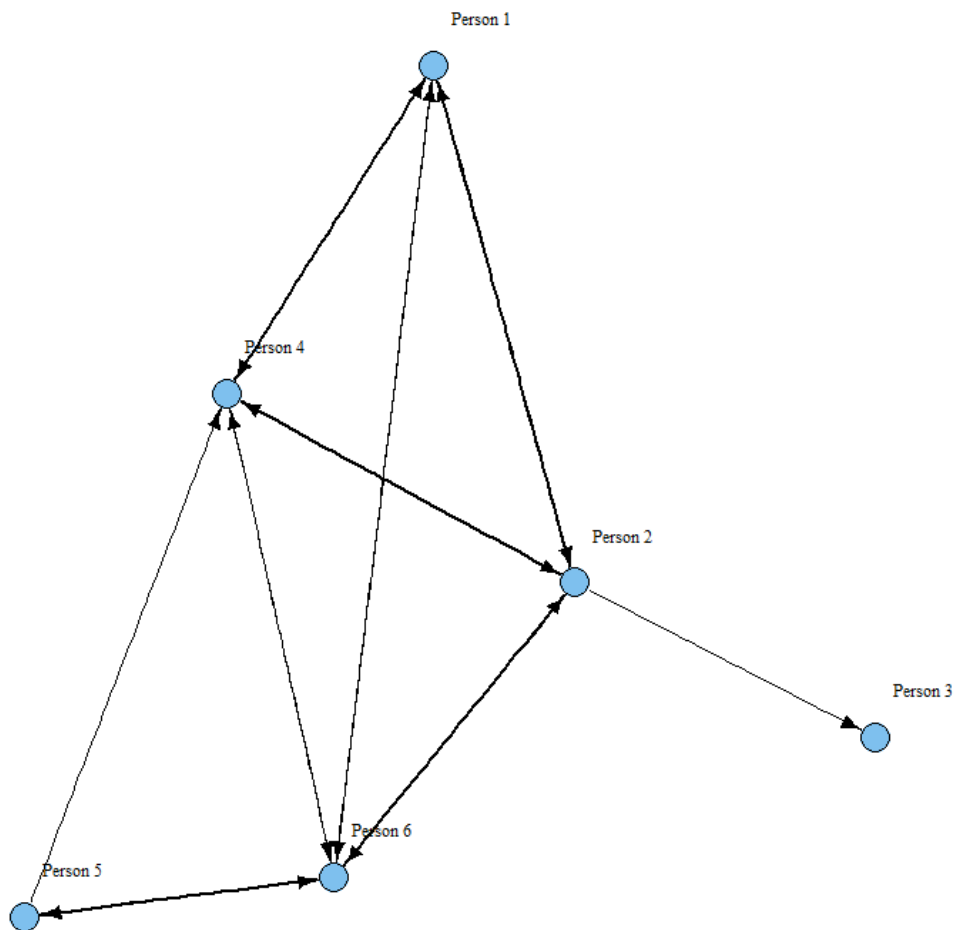


Figure 1. Sample SNA Sociogram

This study utilized SNA to examine the flow of information. Communication studies in education using SNA have been conducted recently by several researchers (Daly, Moolenaar, Bolivar & Burke, 2009; Chen & Reigeluth, 2010; Daly & Finnigan, 2010; Finnigan & Daly, 2012; Coburn, Russell, Kaufman & Stein, 2012; Spillane & Kim,

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2012). However, none has yet looked at whether positions intended to disseminate specific information about an initiative are in fact central to the flow of information in schools or whether the communication networks in a school remain the same regardless of the initiative. In the following section, I first describe how the District has responded to the need to communicate its various programs, plans, and system goals. This is followed by a review of the literature related to communication within school districts.

### **Communication Strategies in the District**

The District is typical of many large school systems that are faced with implementing a variety of programs and policies originating from the federal government, the state, and the district. As of August 2014, the District enrolled around 125,000 students and was the 19<sup>th</sup> largest school district in the nation (District, 2014a). There were 207 schools in the system: 122 elementary schools, 12 academies (K-8), 24 middle schools, 23 high schools, and 23 other schools (charter, alternative, vocational, special centers) (District, 2014a). During just the past 10 years, the system has had to implement a variety of federal and state policies and programs, such as No Child Left Behind (NCLB) (The U.S. Department of Education (ED), 2002), Race to the Top (ED, 2009), Science, Technology, Engineering, and Math (STEM), Turn Around Low-Performing Schools, Develop Great Teachers and Leaders, and Ensure All Students are College and Career Ready (MSDE, 2010). Laws such as NCLB and more recent initiatives such as the Race to the Top grants have mandated a number of changes in how and what schools teach, and have increased the accountability for teachers and school systems for raising student achievement. In addition to these federal initiatives, The District has also been under pressure to implement many new state mandates.

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The State had been through two education reform movements since the 1970s and most recently entered into its third wave of reform. All of the State's reforms had focused on being national leaders in education and preparing students for success in college and in their careers (MSDE, 2012b). With many of the new federal and state programs, there were new sets of curricula to develop, new tests to administer, and new expectations for students and teachers to meet. Currently, the District's Board of Education policies required the system leadership to develop strategies and initiatives to meet the system's goals that were focused on improving student achievement and closing the achievement gap (District, 2008a).

Annually, the system is required by the state to submit a Master Plan outlining its successes and challenges of the previous year and the plan it will implement to continue to improve student achievement (MSDE, 2012a). The Master Plans have clear goals and describe specific programs and policies, but the District did not have a policy for how to communicate or implement these new initiatives (or programs) to schools or throughout the county as a whole. The District's annual goals and initiatives were outlined in the District's Bridge to Excellence Master Plans. Over the past few years, some of those countywide initiatives have included Children Come First (District, 2008a), America's Choice, Institute for Learning, Disciplinary Literacy (District, 2009), Secondary School Reform, Special Education Reform, Human Capital Reform (District, 2010, 2011a, 2012), Implementation of Common Core State Standards, and Student-based Budgeting (District, 2012).

In addition to the countywide initiatives in each Master Plan, additional smaller department initiatives, with distinct instructional foci, such as implementation of a

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reading series and instructional writing strategy focus were also included in the plan to address the specific needs of different departments, students, teachers, and administrators. Given the size of the District and the multitude of programs, policies and other changes that have been imposed on schools over the past decade, the communication burden has been great.

**Theory of action.** In March 2008, The District's Board of Education developed a theory of action that provided a framework for how the county would reach its goal of educating all children and closing the achievement gap (District, 2008b). The theory of action had eight key components that described how the District would work to become a high performing district. One of the components of the theory of action was change management. Change management refers to how the superintendent would move the county from a traditional school district to one of managed performance/empowerment. Managed performance places more of the power, responsibility, and control for implementing initiatives in the hands of the school administrators and ultimately the parents and students.

One of the factors identified in the theory of action as necessary to make the change from a traditional system to one of managed performance was a comprehensive internal and external communication system. However, details on how departments and offices would actually communicate and execute new initiatives were not provided in detail in the theory of action or supporting policies.

**Previous approaches.** When implementing new initiatives, the District often had used a train-the-trainer approach. With the train-the-trainer approach, select teachers from each school, often referred to as department chairpersons, were selected to represent

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different content areas (reading, math, science, social studies, special education, etc.). These teachers were responsible for attending meetings and trainings to learn new content, which they in turn must share with colleagues in their schools.

For school year 2012-13, the District's Office of Talent Development (OTD) led the county in implementing one of its main systemic initiatives, Framework for Teaching (FfT). The FfT was the new model of evaluation of teachers that was to be used by all schools (OTD Supervisor, personal communication, August 22, 2013). The implementation of this new initiative required that all teachers and administrators be trained. For FfT training, each school assigned a FfT facilitator who was trained by the OTD. Each facilitator was responsible for learning about FfT and disseminating the information at their schools to all the school staff, including the teachers and administration. There were pros and cons with the FfT facilitator model. As noted by the OTD, there were inconsistencies in the communication. For example, not all participants took the information back to their schools to the same degree. "To get the message back to the teachers and get the same message has been a challenge" (OTD Supervisor, personal communication, August 22, 2013).

For school year 2013-14, the OTD developed a new position, Professional Development Lead Teacher (PDLT). The PDLT was primarily responsible for helping to provide professional development to successfully implement four of the key initiatives in the county: Student Learning Objectives (SLOs), the Partnership for Assessment of Readiness for College and Careers (PARCC), CCSS, and FfT (District Office of Talent Development (District OTD), 2013).

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The PDLTs were classroom teachers who received a stipend to provide professional development sessions, distribute resources, and collaborate with administrators and staff at their school to help integrate the CCSS and FfT into the school's vision and goals (District OTD, 2013). The PDLTs attended training during the summer and then monthly throughout the school year to gain new information and knowledge around the four new reform initiatives and were then responsible for sharing the information at their schools.

The majority of the PDLTs were classroom teachers. Each elementary and middle school had two PDLTs and each high school had three PDLTs. Teachers applied for the PDLT position through the OTD, however the principal made the final decision to select the PDLTs in his school. In addition to training the PDLTs, the OTD also trained all administrative staff (principals and assistant principals) on the same content for school year 2013-14. The goals were to ensure everyone in the building was hearing the same message and could have conversations around the same content and to have more uniform communication across the county (OTD Supervisor, personal communication, August 22, 2013). The county continued to explore new avenues for training and communicating with teachers around new reforms and initiatives. At a retreat in the summer of 2014, the deputy superintendent of teaching and learning, the coordinating supervisor of teaching and learning, and the Executive Director of Curriculum and Instruction shared that a lack of communication was a key challenge with the implementation of the CCSS. (District, 2014b).

For systemic change, not only should information be communicated to the stakeholders who will be implementing the initiative, but also they must have input in

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either choosing the initiatives or in how the initiatives will be implemented (Chen & Reigeluth, 2010; Council of the Great City Schools, 2009). Stakeholders must also play a part in the design, choice, development, implementation, and measurement of the reform or initiative (Healey & DeStefano, 1997). The following section provides information regarding the extent to which staff in schools in the District reported to be satisfied with the communication efforts undertaken from 2006 through 2011.

**Climate surveys.** Employee satisfaction and school climate surveys have been conducted in the District intermittently over the last seven years. The surveys looked at the perception of parents, teachers, administrators, and central office staff. As noted earlier, data from three of District's climate surveys have shown that staff have varying perspectives on how well information was communicated and the timeliness of the communication. In each survey only one or two questions regarding communication were asked and there was no continuity across surveys as different questions about communication were asked of each group (teachers, support staff, administrators, and central office staff).

Teachers' and support staffs' perception of the frequency and effectiveness of communication between administrators and faculty declined for all school levels (elementary, middle, high, and special centers) from 2006-2007 to 2008-2009 and the overall perception increased slightly in 2010-2011 (see Table 1).

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Table 1

*Teachers' Responses to the School Climate Survey for 2006-2011 (in percent)*

Question/Topic	School Year	Overall	Elementary Schools	Middle Schools	High Schools	Special Centers
Communication between the faculty and administration is frequent and effective.	06-07	71.75	76.5	66.6	61.0	89.4
	08-09	70.5	70.5	54.6	54.3	80.0
	10-11	71.8	Not broken out by subgroup in report.			

Note. Number indicates the percent of participants that strongly agree and agree. Adapted from "School Climate Survey District-Wide Report," by Keane & Sunmonu, 2007; "School Climate Survey District Report," by Keane & Sunmonu, 2009; "School Climate Survey Summary of District-wide Report," by Keane & Sunmonu, 2011.

Administrators and central office staff were surveyed in school year 2007-2008 and again in 2010-2011. Minimal data were collected regarding communication.

Though both groups were asked one main question about communication, neither group was asked the same question. Administrators were asked if the District leadership communicated priorities in a timely manner and their perceptions improved slightly between the two surveys (see Table 2).

Table 2

*Administrators' Responses to the Employee Satisfaction Survey (in percent)*

Question/Topic	School Year	Administrator
District Leadership communicates in a timely fashion.	07-08	58.4
	10-11	61.1

Note. Number indicates the percent of participants that strongly agree and agree. Adapted from "Research Report: Survey of Employee Satisfaction" by Keane & Sunmonu, 2007; "Research Report: Survey of Employee Satisfaction" by Keane & Sunmonu, 2011.

Central office staff were asked if they received information about training opportunities, job opportunities, and district events in a timely fashion. Their overall



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perception of the timeliness regarding communicating key information decreased dramatically from 2007-2008 to 2010-2011 (See Table 3).

Table 3

*Central Office Staff Members' Responses to Employee Satisfaction Survey (in percent)*

Question/Topic	School Year	Central Office Staff
Information about training opportunities, job opportunities, district events, is communicated in a timely manner.	07-08	62.7
	10-11	38.1

Note. Number indicates the percent of participants that strongly agree and agree. Adapted from "Research Report: Survey of Employee Satisfaction" by Keane & Sunmonu, 2007; "Research Report: Survey of Employee Satisfaction" by Keane & Sunmonu, 2011.

All of the survey questions that revolved around communication, whether they were regarding communication of events or communicating in a timely fashion, scored 76% or lower, with most scoring below 65% agree or strongly agree. The only exception to this data was the special centers, which scored at or above 80% each time. Though these results were not directly related to the communication of initiatives, they did show that the perceptions of all employees regarding communication over the past few years decreased, except for administrators, which increased slightly.

Communication was only referenced briefly and with limited detail in county documents and policies, such as the Master Plans (District, 2008a, 2009, 2010, 2011a, 2012), theory of action (District, 2008b), and county planning documents for the CCSS (District, 2011b). Additionally, there was no uniform way to communicate new information, knowledge, and initiatives across the District.

Furthermore, though the district-wide employee satisfaction and climate surveys contained questions about communication, the information collected was very limited (Keane & Sunmonu, 2007a, 2007b, 2009, 2011a, 2011b, 2013). The surveys asked staff

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whether they had received information, but there was limited focus on the ways in which information and knowledge was communicated and whether the avenues the District used for communication were appropriate for disseminating information to all staff. Thus, the surveys conducted in the District lacked depth and only minimally focused on how employees perceived the effectiveness and timeliness of communication. The surveys did not show how information was actually communicated in schools or throughout the District.

### **Review and Critique of Literature on Effective Communication Strategies**

When implementing an initiative, information and new knowledge must not only flow from those individuals requiring the initiative to those individuals implementing the initiative, but also there must be two-way communication that allows for individuals at all levels of the county to understand the needs of the initiative as well as express their doubts and new ideas (Proctor & Doukakis, 2003). Furthermore, districts must not only consider with whom they will communicate and what they will communicate, but also they must determine the best pathways to share the new information (Chen & Reigeluth, 2010; Coburn, Russell, Kaufman & Stein, 2012; Daly, Moolenaar, Bolivar & Burke, 2009; Daly & Finnigan, 2010; Finnigan & Daly, 2012; Spillane & Kim, 2012). Failing to implement new programs or policies successfully can lead to failure to produce results which can have negative consequences on a district, its schools, teachers, and staff.

**Literature Search Strategy.** In order to understand the role of communication in school district implementation of various programs and policies, a comprehensive review of the literature was conducted. Through the use of the World Cat library catalog, EBSCO Host Database, Web of Science Database, [www.google.com](http://www.google.com),

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www.academia.edu, and various other websites on implementation and dissemination of information, a total of 37 articles, books, and supporting documents were found. Most searches using the databases focused on published peer-reviewed articles and books, using keywords, such as implementation, social network analysis, education reform, and dissemination. Additional articles were found using the reference lists of articles and books. Additionally, 12 District documents were found by searching the Board of Education archives, Administrative Procedures, county emails and memos, and by holding discussions with district employees.

**Implementation of Initiatives.** Research on the implementation of initiatives in schools is not new. Many studies were conducted in the 1980s on the implementation of initiatives (Loucks & Hall, 1979; Louis & Dentler, 1988; McLaughlin, 1987; Rogers, 1983) with some focusing specifically on the dissemination of new information (Louis & Dentler, 1988; Rogers, 1983). More recently however studies have focused on the success of the actual initiatives with limited focus on the communication or implementation of new initiatives.

The most recent research done on initiatives in the United States has either focused on effective implementation of the initiatives or has measured the outcomes of specific reform efforts. However, little research has focused on how to effectively communicate information and knowledge across large organizations or to groups of teachers to successfully implement a new initiative. Recently, education research studies have been conducted that focus on the pathways through which knowledge and information flow through districts and schools and how these structures impact teachers' implementation of new programs, as well as teachers' perception of their knowledge for

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implementing these new programs (Coburn et al., 2012; Daly & Finnigan, 2010; Daly et al., 2010; Finnigan & Daly, 2012; Spillane & Kim, 2012).

**Barriers against implementing initiatives.** When implementing any initiative, there are many barriers that can impact a school or district. In two studies, teachers shared that having limited or inadequate in-service around the initiative inhibits their ability to implement the initiative well (Frank, Zhao, Penuel, Ellefson & Porter, 2011; Penuel, Sun, Frank & Gallagher, 2012). Additionally, teachers have reported that lack of leadership and support for an initiative impacted how well the initiative was implemented (Johnson, 2006). Kaniuka (2012) also reported the results of a study of teachers' change during school reform indicating that in the beginning of the implementation of an initiative, teachers might doubt the initiative or the results it will produce. However with training and greater understanding, teachers will strive to understand the initiative more, especially if they are able to see the results from the initiative.

Some studies have focused on barriers superintendents and entire districts encounter when attempting to implement an initiative (McDermott, 2000; Stewart, Raskin, & Zielaski, 2012). For example, Stewart et al. noted that the major barriers faced by superintendents as they attempt to implement reforms are often outside of their control, such as mandates, lack of funding, and teacher tenure. Superintendents in large urban districts that are attempting to implement district-wide reforms often face issues with partial implementation of many initiatives and not full implementation of a single initiative (McDermott, 2000). This is due many times to the bureaucracy and an individual's desire to see his or her own initiative implemented which creates push back that works against one single initiative being implemented well (McDermott, 2000).

**Implementation and communication of initiatives.** “The success of the district’s education reform initiative depends on the success of how the plan is communicated” (Council of the Great City Schools, 2009-2010, p. 1). One component that has been determined to increase the likelihood of change occurring or an initiative being implemented successfully is communication (Dannefer et al., 1998). Despite the increase in major educational reforms and initiatives being implemented across the nation, little research had been done on how to successfully communicate the goals and elements of those reforms across a state, district, or even a school.

The communication approach can either impede or promote an initiative’s success. If the communication of the new information is impeded in any way, this can have a negative impact on the success of the change effort. According to Healey and DeStefano (1997), several key factors of communication are necessary when implementing an initiative, which include: identifying how the information is communicated; ensuring the information is available to all stakeholders; identifying the key sources of data when implementing initiatives; and making certain that many perspectives are represented when planning, designing, and implementing initiatives. Each of those components is important to consider when developing an implementation plan for an initiative, but it is also important to determine the best pathway to communicate new information and knowledge to those individuals actually implementing the initiative.

According to Argenti, Howell, and Beck (2005), organizations often develop a plan for implementing and communicating any new program or initiative that focuses on the short-term formal processes for communicating and implementing the reform,

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including such things as what will be communicated, who it will be communicated to, and the formal processes for communicating the new program. However, the plans frequently do not focus on the informal channels that will best facilitate communication. Organizations that have a clearly defined process of communication are more effective at implementing new initiatives (Argenti, Howell, & Beck, 2005). In the district that is the focus of this study, each department responsible for implementing a specific initiative often creates a formal plan for implementation. However, these plans are not informed by knowledge of how informal social networks or pathways may promote better communication and facilitate implementation.

**Informal Social Networks.** Informal Social Networks have been studied historically by social sciences, however studies of these networks have gained popularity in many fields including, biology, economics, business, and more recently, education. Social network analysis has gained popularity by educational researchers in the past 10 years to study relationships and communication within and throughout districts (Chen & Reigeluth, 2010; Spillane & Kim, 2012), to understand how communication networks impact educational change (Daly & Finnigan, 2010), and to understand how relationships among staff impact reform efforts (Coburn et al., 2012; Daly et al., 2010).

Though developing the implementation and communication plan for any reform is important, analyzing and understanding the informal social network through which the information will flow is key to determining the best approach and the key people to involve in communicating the reform. Implementing and communicating systemic reforms successfully appears to be closely tied to the type and quality of informal social network structures in an organization (Finnigan & Daly, 2012). An informal social

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network is a structure or visual that represents the individuals and pathways through which resources such as knowledge and information flow (Haythornthwaite, 1996). Each social network is based on the relationships between different actors in an organization (Borgatti, Everett, & Johnson, 2013). The strength of the relationships or ties between people, where people are located within the network, and the number of people connected to one individual can all influence the flow of information, knowledge, feelings, etc. throughout an organization (Borgatti, Everett, & Johnson, 2013). Once informal social network structures have been determined in an organization, leadership can use these structures to identify the key people or positions and pathways to better facilitate the communication of new information.

Recent research on informal social networks in education has examined how informal social networks are impacted by or impact initiatives, district leaders, and teachers. The research showed that (a) The network structure may impact the implementation of initiatives or change, and (b) Teachers, principals, and formal leaders' within their network may also impact how information and knowledge flows through a district or school (Coburn et al., 2012; Daly & Finnigan, 2010; Daly et al., 2010; Finnigan & Daly, 2012; Spillane & Kim, 2012).

**Informal social network structures impact on change.** Some research suggests that schools or districts under sanction tend to have more centralized network structures which are more beneficial for the flow of non-complex routine information, but do not promote the flow of complex knowledge and ideas (Daly & Finnigan, 2010; Finnigan & Daly, 2012). Also, according to Daly and Finnigan (2010) large districts have established formal and informal networks that are less likely to change over time. This study of 18

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schools used a mixed method approach including an in-depth quantitative study using a survey analyzed using SNA with qualitative follow-up interviews and observations. The study had very high response rates. The study showed that staff communicated less about innovation and more about reform over time. This study focused on whether communication was around reform or innovation, but did not focus on a specific initiative. Overall, the studies showed that the central office was disconnected from the principals and the principals were disconnected from each other, which impacted how initiatives were implemented and how information was communicated throughout the districts.

Daly, Moolenaar, Bolivar and Burke (2010) have focused their research on communication networks at the school level. They have utilized a mixed methods approach using a survey analyzed with SNA followed by interviews with individuals who had completed the survey. They conducted research in five schools and explored how different schools' network structures impacted their ability to implement a new initiative. They discovered that a school's network structure, both grade level communication and communication between administrators and teachers impacted its ability to understand and implement an initiative.

### **Network positions' impact on the flow of information and knowledge.**

Additional informal social network research has focused on teachers, principals, and teacher leaders and how their locations within their social network impacted the flow of information and knowledge. For instance, people more central within their network had a greater impact on the flow of information and knowledge (Spillane & Kim, 2012). Those who communicated more frequently with others or sought information from people with



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a higher level of expertise were better able to implement the new initiatives and to continue implementation of the initiatives (Coburn et al., 2012; Daly et al., 2010).

### **Summary**

Disseminating new information around new initiatives throughout large districts can be very challenging. However, limited research has been done on how communication about an initiative occurs among individuals within a school or how the communication flow compares for two different initiatives. In large districts, many initiatives are being implemented each year, and many are complex and require that schools implement them with great fidelity; therefore, it is important that the staff, teachers, and administrators have clear, concise, and consistent information about what is expected and needed for them to implement the program.

Over the past five years, the District has attempted to communicate new policies, programs and other initiatives through the use of a train-the-trainer model, as well as developing new positions such as the PDLT, Instructional Lead Teacher (ILT) and facilitator. At the same time the perception of the effectiveness of communication about system initiatives has declined among District staff.

Recent work with social network analysis in education has focused on how relationships within school networks impact the flow of communication about a specific reform or program and whether a school or district's social network can impact implementation of an initiative. Studies have also focused on how social networks and communication structures are impacted by schools operating under a sanction and how the length of time a school is under sanction impacts the communication structures in a school. Additional research has also focused on the role of principals and lead teachers

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within their informal networks, their impact on new programs, and the communication of these new ideas and knowledge. However, research has yet to be conducted on whether those individuals assigned to disseminate information in their schools or departments are actually those individuals integral for communication of those initiatives.

### **Proposed Investigation**

With the growing number of initiatives in the District, it is important to understand how information is disseminated in schools in order to identify the best people and channels through which to disseminate new information. As the District in this study is implementing many new initiatives annually and has over 15,000 employees who need to understand how and with whom to share the new ideas and knowledge, this research may be helpful to understand and develop the best pathways to communicate new information and knowledge throughout the district. In school year 2013-2014, the District implemented the PDLT position with the intent of disseminating information about new initiatives more thoroughly and similarly throughout all schools. The PDLTs are responsible for ensuring the staff in their building receives information about the initiatives in the county. It is important to identify if these specific individuals or other positions in each school are actually integral for disseminating information.

This study identified the underlying social network structures within four elementary schools in the District that emerged as a means of communicating information in the District around two initiatives, CCSS and Data Wise. Specifically, this study identified and examined the flow of communication among all staff that have a role in disseminating information about an initiative. Additionally, where individuals were located within their social network was identified and examined as well as, how

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influential they were in disseminating information around the initiative. The SNA also allowed the informal network structures in the four schools to be mapped in order to determine the key actors in each underlying social network who aided in disseminating information about CCSS.

## **Section II**

### **Methodology**

#### **Purpose of the Study**

The purpose of the proposed study was to examine the communication pathways and key actors through the use of SNA in four elementary schools who were intended to disseminate information about the CCSS. This exploratory study specifically identified where the key brokers of information were located within a school's communication networks, whether people in positions responsible for disseminating information were centrally or peripherally located in the social network regarding the communication of information, and how the actor's location within the network impacted their perception of their knowledge regarding the CCSS. The study focused on four bounded networks, each of which was a randomly chosen elementary school.

#### **Research Questions**

The research questions that were be addressed by this study were:

1. To what extent does a staff member's position within a school's social network impact his/her perceived knowledge of Common Core State Standards?
2. To what extent does the number of ties a staff member has with other staff impact his/her perceived knowledge of Common Core State Standards?
3. To what extent does a staff member's formal position in a school influence his/her informal position with the school's social network?
4. To what extent do the communication networks among staff in each elementary school support or constrain staff members' perceived knowledge of the Common Core State Standards?

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5. How does the communication network for the implementation of the Common Core State Standards compare to the communication network for the implementation for other initiatives in a school?

### **Design and Methods**

This exploratory study used SNA to identify and quantify the informal communication networks in each school. The use of SNA was most appropriate for this study because it allowed for the informal networks to be explored and to determine how information was communicated and who the integral people were for communicating the information. This exploratory study helped to provide insight into how information flows within the four schools, which was used to define and identify optimal pathways or positions and potential bottlenecks for disseminating information within other schools. Additionally, this study explored how a staff member's position within the network impacted his/her perceived knowledge of the CCSS, which focused on how he/she perceived his/her general knowledge of the CCSS and the degree he/she felt ready to implement the CCSS.

The data about connections and to whom individuals go for information was collected using a secure web-based survey instrument. The web-based survey tool was developed through collaboration with an experienced National Institutes of Health (NIH) scientific programmer, who has extensive experience developing research surveys. The data were then analyzed using the social network analysis (SNA) package in the R open source statistical package (R Development Core Team, 2011).

**Social network analysis.** As noted in Section I, SNA has been used over many decades and its use has increased drastically in the last 20 years to study topics such as,

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social interactions impact on political choice (Krebs, n.d.), the source of tuberculosis in a community (Gardy et al., 2011), and British students' understanding of September 11<sup>th</sup> (Reser & Muncer, 2004).

Within the field of education, SNA has only recently begun to be used to study the diffusion and adoption of innovations (Daly & Finnigan, 2010), change efforts (Daly & Finnigan, 2012), and the impact of a teacher's network on sustaining a reform (Coburn, Russell, Kaufman, & Stein, 2012). Depending on the focus of the particular SNA, different types of relationships can be measured, such as trust, knowledge, and social relationships. SNA also allows researchers to focus on each individual's attributes, such as position, age, and gender, in addition to looking at the social networks within an organization and how information flows within that network. Knowing not only the participants' attributes, but also how information flows can be used to improve communication and to promote collaboration (Cross & Parker, 2004). For the purposes of this study, the relationship focus was on the connections participants used in order to gain information about two specific new initiatives, CCSS and Data Wise that were being implemented by the District.

### **Selection of School Sites**

For the purpose of this study, a SNA was conducted of separate bounded networks of four elementary schools, to determine how information was communicated within each school regarding the CCSS. A bounded network includes all people within the network, a school was the bounded network and all staff members, excluding custodial staff, nurses, and food services staff, at each school (administration, teachers, paraprofessionals, support personnel, specialists, and front office staff) were asked to

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participate in the study. An elementary school was defined as any school with students in grades kindergarten to no higher than sixth. As this study focused predominately on the implementation of the CCSS, only elementary schools were studied. Elementary schools focus primarily on the core content: reading, mathematics, social studies, and science. Secondary schools add additional related arts classes and electives, which become the focus of not only the students but the teachers as well.

With a bounded network, participants are only able to indicate the individuals within their immediate network from whom they receive information. Cresswell (2002) explains that a bounded case study looks at a specific activity, process, individual, group of individuals, and place. This bounded study provided an in-depth look at how information was communicated throughout each school, but is not generalizable to other schools, the entire county, or other counties.

The four schools were randomly chosen from elementary schools K-6 that were within a 10% range of the median staff size for elementary schools within the county. Gay, Mills, and Airasian (2006) describe simple random sampling as, “the process of selecting a sample in such a way that all individuals in the defined population have an equal and independent chance of being selected for the sample (p. 101).” Previous SNA studies have focused on schools under sanction (Finnigan & Daly, 2012), while others have purposively chosen their schools within counties from various areas and with varied backgrounds (Coburn et al., 2012; Daly et al., 2010; Spillane & Kim, 2012). According to research, the size of a network can have an impact on comparison across networks; therefore schools with similar staff size were chosen for this study (Faust & Skvoretz, 2002; Stevens, 2010; Weinbaum, Cole, Weiss, & Supovitz, 2008).

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In order to identify the four elementary schools using simple random sampling, the following process modeled after Gay et al. (2006) was followed:

- Schools within the 10% range from the median school based on staff size were listed alphabetically in an Excel spreadsheet.
- Each school was then be assigned a number beginning with zero.
- Using an online random number generator, four numbers were drawn to identify the schools.
- If one of the schools selected declined participation in the study, the school was removed from the list of schools, all schools were then renumbered and the process was repeated to identify a new school. This process was repeated until all four elementary schools were identified.

### **Data Collection Procedures**

Data used in SNA can be collected through questionnaires, surveys, direct observations, written records, experiments, or derivation (Gretzel, 2001). For this study, a web-based survey was developed to collect data. (See Appendix A for the survey).

**Survey instrument.** In order to assess the social networks of the four elementary schools, a web-based survey created specifically for this study was developed and administered to all of the eligible staff. The survey for the study was comprised of three sections. The first section of the survey asked demographic questions, followed by social network or communication pathway questions adapted from other social network surveys, with questions to determine the participants' perception of their knowledge level and trainings they participated in regarding the CCSS at the end (See Appendix A for the survey). The survey was estimated to take around 10 minutes to complete.



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Part A of the survey included five demographic questions. The five demographic questions asked the participant's gender, position, years in education and years in the county. This information was used to analyze the social network maps to determine if a particular position, length of time in the county, or length of time in education impacted a person's position in the school's network or strength of their ties.

Part B of the survey included social network or communication pathway questions adapted from previous SNA surveys (Cross & Parker, 2004; DeLange, Agneessens, & Waeye, 2004; Durant-Law & Milne, n.d). The questions in Part B used a branching format with skip patterns. At the beginning of Part B, participants were asked to identify all of the staff members in their building to whom they go to most often for information regarding the CCSS and another county initiative, Data Wise. Part B of Appendix A shows a sample of what the first page of the survey looked like for each school. On the first page of the survey, the names of the staff for the participant's school were prepopulated and participants were prompted to select the names of individuals from their school whom they go to for initiatives.

Though the focus of this study was on the communication of information regarding the CCSS, information was also collected regarding another initiative, Data Wise, implemented throughout the county. These questions helped to determine if the communication pathways for CCSS were similar or different Data Wise. Data Wise was chosen as a comparison to CCSS, as it is an initiative that is being implemented in all schools throughout the county and impacts all staff. Data Wise is a continuous systemic improvement approach developed by Harvard University that the District adopted so that

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all schools and offices would have a common approach for using data to inform instruction (District, 2015).

Once participants had chosen the staff members they went to for all initiatives, participants answered how frequently they sought information and how informative they found the information provided for each individual they selected. Participants answered both of these questions for CCSS and Data Wise (see Part B in Appendix A). Both questions used a five-point Likert scale ranging from one to five. The first question ranged from “never” to “daily or almost daily” and the second question ranged from “not informative” to “very informative.” The five-point Likert scale was appropriate for this survey because the data could then be analyzed to not only determine the ties between individuals, but also to determine the strength of the ties between different individuals. If a participant selected “never” for the first question for a staff member for either initiative, the answer choices were not available for the second question because participants could not indicate how informative the information was that they received from a person if they did not go to that individual for information (See Part B in Appendix A).

The final part of the survey, Part C, contained seven questions that asked participants about the trainings they have received regarding CCSS and their perceived knowledge level of CCSS. The questions in Part C included one dichotomous question and six Likert questions and used a branching format with skip patterns. The first question asked participants if they had heard of the CCSS or not. If participants had not heard about the CCSS, they had completed the survey. All other participants completed six additional questions about the CCSS. These questions asked participants to rate their knowledge of the CCSS in general and for reading and mathematics, and used a four-

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point Likert scale ranging from 1 (no knowledge) to 4 (very knowledgeable). The four-point Likert scale was chosen to force participants to choose one level of knowledge and not always choose level three, the midpoint of a five-point Likert scale (see Part C in Appendix A).

**Survey pilot testing.** The survey was pilot tested on at least 10 individuals who were serving in similar roles as the target staff in elementary schools. Individuals chosen to pre-test the survey represented all age groups, races, and both sexes from elementary schools not within the 10% range of the median. The 10 individuals included administrators, teachers, support personnel, specialists, and front office staff. Each individual was administered the survey and asked to provide feedback regarding clarity of questions and overall ease of use of the survey tool. Once the survey tool had been tested on five individuals, edits were made and an additional five individuals were asked to assess the tool and questions again. The feedback was then used to create the final survey.

**Administration procedures.** Once the four schools were selected, each principal was contacted via email (see Appendix C for a copy of the email to principals) and telephone to determine if they were interested in participating in the study. The email included an introduction to the study as well as the approval letter to conduct the study in the District. Once a principal confirmed participation in the study, a meeting was organized to present the study to the staff and answer any questions. The meeting occurred either at the beginning or end of a staff meeting and staff members eligible for participation in the study (administrators, teachers, support personnel, front office staff) were invited to this meeting. The meeting included a brief 10 minute presentation to

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inform all participants of the purpose of the study and how the data would be collected. Light refreshments were provided at each of the meetings. During the presentation, the research was explained to all participants including the purpose, benefits, possible risks, and the consent process. Additionally, next steps for the participants and the timeline were shared. Participants were also reminded that their personal data would not be shared and that the data would be coded and all personal identifying information would be removed. Participants were given a hard copy of the cover letter for the research study and an information sheet with bullets about the study (see Appendix D for a copy of the cover letter). At the end of the presentation, attendees were given the opportunity to have their questions answered.

After the information session at the school, the participants in each school received an email asking them to participate in a quick survey. The email provided them with a copy of the cover letter and a link to the survey (see Appendix F for a copy of the email to participants, and see Appendix D for a copy of the cover letter, and Appendix E for a copy of the informed consent). The link sent to participants automatically saved the respondents' data and progress throughout the survey. The survey was available to participants for one month and participants were able to use the link to access the survey as many times as needed until they had completed the survey. In order to get a high response rate, reminder emails were sent to participants weekly and incentives were awarded to individuals who completed the survey (see Appendix F for a copy of the reminder email sent to participants weekly).

Once participants clicked on the link, they were directed to a beginning page with the cover letter of the study (see Appendix D). On the next page, participants were

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prompted to read the implied informed consent form (See Appendix E), which included information about the purpose of the study, procedures, potential risks and benefits, confidentiality, incentive, voluntary participation, and where to go for questions regarding the research. Once the informed consent had been viewed, participants either accepted participation in the study and were forwarded to the survey or declined participation and the survey ended.

After the informed consent had been confirmed, participants were directed to Part A of the survey. For the purposes of this study, participants' and staff members' names were included on the online survey. As this is a bounded network and focused on all members of the school, all names needed to be listed on the survey to improve the study's validity. Other SNA studies allow participants to list a number of people whom they go to most often for information. Problems can occur when asking participants to identify whom they go to for information because participants may: list the same person by a different name, forget someone whom they go to regularly, or only select people from a particular group they associate with. Providing participants with a list of all of the staff members from their building allowed them to choose the people whom they go to the most from a complete list and improved the validity of the study.

In order to promote a response rate of 85% or higher for each school, participants received up to three reminder emails until the survey was completed (see appendix G for a copy of the reminder email). In addition, all participants received an incentive for completing the survey. To be eligible for the incentive, participants must have consented to participate in the survey and completed the survey. Each participant who completed the survey received either a five or 10-dollar electronic Amazon gift card. The first 50%

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of respondents from each school received a 10-dollar gift card. Any additional participants who completed the survey received a five-dollar Amazon gift card. Participants received their gift card electronically via email immediately upon completion of the survey. Due to the fact that participants may have been completing the survey concurrently, they were not informed of whether they received the five-dollar or 10-dollar gift card until completion of the survey.

**Timeline.** The study was conducted according to the following timeline:

- January 1, 2015 – April 25, 2015 – Development and testing of survey
- March 24, 2015 – April 28, 2015 – Identification and confirmation of school's participation in the study
- April 29, 2015 – May 13, 2015 – Meetings with schools to discuss the study and survey tool
- April 24, 2015 – June 10, 2015 – Administration of survey
- Week after initial survey link sent – First reminder sent to participants
- Two weeks after initial survey link sent – Second reminder sent to participants
- Three weeks after initial link sent – Final reminder sent to participants
- May 27, 2015 – August 31, 2015 – Analysis of data

### **Analysis Procedures**

In this section, I first describe SNA as a method followed by the specific process I used to analyze the data obtained from the survey. The data from the survey were exported in an Excel file displaying the data in an adjacency matrix. The rows and columns in an adjacency matrix represent actors and their connections (Borgatti, Everett, & Johnson, 2013). The adjacency matrix not only shows that connections exist and how

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often participants sought information and the value of the information, but also showed the direction in which the information flowed. The direction for adjacency matrices goes from the rows to the columns (Borgatti, Everett, & Johnson, 2013).

For SNA, both binary and valued data can be collected for analysis. For the purposes of this study, both binary and valued data were collected. Binary data, represented as a 0 or 1, show that a relationships or connection exists (Carolan, 2014). The binary question asked participants to identify which staff members they go to for information regarding initiatives. This showed that a relationship existed. Valued data, represented using values from Likert or rating scales, provides more in-depth information about the strength of the ties that exist (Carolan, 2014). Sample valued data questions include how often you go to the person and indicate how informative you found the information provided.

Table 4 provides an example of binary data. An entry in the row for person one and the column for person two in Table 4 represents that person one seeks information from person two about initiatives. Valued data was collected to show how frequently the participant seeks information from staff in her school. For the valued data, participants answered Likert questions from 1-5 for the frequency and 1-4 for the value.

Table 4

*Sample SNA Binary Data Showing Connections That Exist*

	A	B	C	D	E	F
A	-	1	0	1	0	1
B	1	-	1	1	0	1
C	0	1	-	0	0	0
D	1	1	0	-	1	1
E	0	0	0	1	-	1
F	1	1	0	1	1	-

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A 0 on the adjacency matrix indicates that a connection does not exist or that the individual did not respond to the survey. According to Borgetti, Everett, and Johnson (2013), the most common reason for missing data is due to participants not completing the survey at all. As this survey included a bounded network and all participants could indicate any other staff member from whom they sought information, individuals who did not complete the survey were likely to be chosen by at least one other individual in the network. The data from the individuals who did not complete the survey were only missing half of their relationship, their out degree data, or the connections that show whom they went to for information. Information regarding who went to them for information, in degree data, was not lost if the missing data remained and gave a more thorough picture of the entire network.

Sometimes the people who did not complete the survey were key people in a social network and multiple people may have chosen them as someone whom they go to for information (Borgetti, Everett, & Johnson, 2013). These individuals remained in the results and those who went to them for information also remained in the final sociograms, however, they were coded with a different color to indicate they did not complete the survey.

With the increased use of SNA, the analysis tools have also advanced and are better able to provide visual representations or sociograms of the networks. Within each sociogram, nodes represent the people or actors in the organization and lines between the nodes represent the ties between the people or actors (see Figure 2). The data exported from the survey in an Excel file were analyzed using R open source statistical package (R



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Development Core Team, 2011). Sociograms were created for questions where the visuals further assisted in understanding the data.

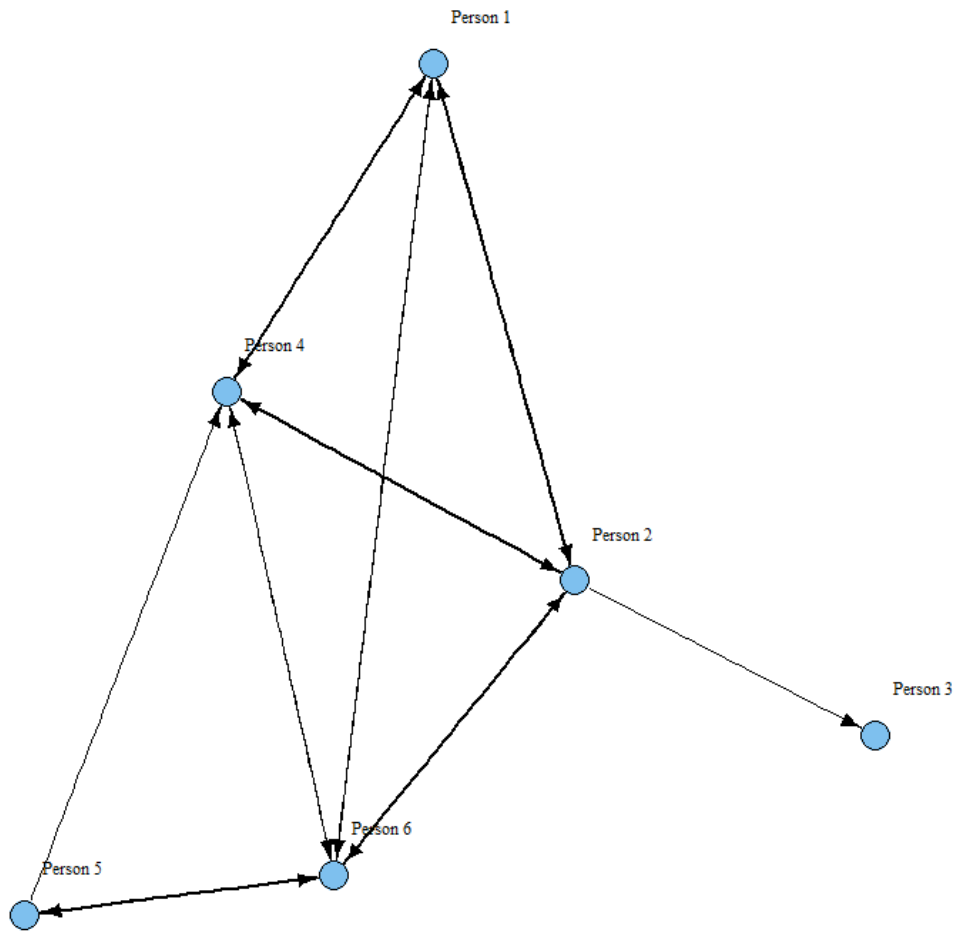


Figure 2. Sample SNA Sociogram

When examining a sociogram, researchers can conduct myriad analyses, such as density, reciprocity, transitivity, clustering, centrality, and core/periphery measures (Borgatti, Everett, & Freeman, 2002). Using the data from the social network or communication questions, an analysis was conducted using R open source statistical package to determine which staff members were central and peripheral to the flow of communication; the maximum number of staff members it took for information to travel from one side of the network to the other; which positions were key to the flow of

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information, among other various analyses. For the purposes of this study, the focus was on centrality and density to answer the research questions (see Appendix B).

Centrality and density measurements were conducted for each of the four networks. Density measurements show how quickly information flows throughout networks. These measurements are defined by the average strength of ties across all ties in a network (Hanneman & Riddle, 2005) and determine how many actual connections there are between nodes out of the total number of possible connections. For this study, the SNA questions measured how often staff members went to other staff members for information. For binary data, the density measure was calculated by  $((n*n-1)/2)$  where  $n$  is the number of possible ties in the network. If information flows between each node in the entire network, the density would be 1.00. The higher the density measurement, the easier it is for the information to flow throughout the network.

There are many centrality measures that can be conducted with an SNA analysis. For the purpose of this study, degree, closeness, betweenness, and eigenvector centrality were measured. Degree centrality refers to the number of ties each person sends or receives and helps to determine those individuals that could be integral in promoting or inhibiting the flow of information. Three main degree measurements can be calculated: degree, in-degree, and out-degree. The degree is the total number of connections, for sending and receiving information. In-degree is the number of people asking for information from that individual in the network and out-degree is the number of people from whom an individual seeks information. For the purposes of this study, all three measurements were conducted to identify which individuals sent the most information (highest in-degree), which individuals received the most information (highest out-

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degree), and which individuals sent and received the most information (highest sum of in-degree and out-degree).

Closeness centrality determines an individual's communication role within a network and helps to determine how long it will take for information to flow from one person to all other people in the network. Individuals with high closeness scores have the ability to disseminate information to other individuals in the network quickly. Individuals with a smaller closeness score disseminate information to others in the network slowly.

Another centrality measure conducted was betweenness centrality, which "measures the degree to which other actors lie on the shortest geodesic path between pairs of actors in the network" (Carolan, 2014, p. 158). This measure was important in determining whether specific individuals control the flow of information in a school. If a person in a network is between multiple pairs of actors, he/she is able to control the flow of information throughout the network. Individual nodes with higher betweenness centrality measures are better able to facilitate or hinder the flow of information throughout their network. There are two measures of betweenness centrality, point betweenness and a normalized calculation. For the purposes of this study, a normalized calculation was used in order to compare the betweenness measures of the four different networks.

Finally, eigenvector centrality was also measured. Eigenvector centrality added more depth to both degree and closeness centrality. Eigenvector centrality determines which nodes are connected to other nodes with the most connections (Borgatti et al., 2013). Individuals with a small degree may in fact have a large eigenvector because they

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may only be connected to a few individuals, but those few individuals are actually connected to lot of other individuals, which gives them a high eigenvector score and makes those particular individuals more connected (Borgatti et al, 2013). Eigenvector centrality helps to determine which individuals are the most popular in the network and may be influential in communicating knowledge throughout the network.

### **Human Subject Review and Confidentiality**

To meet the guidelines of both the University of Maryland Institutional Review Board (IRB) and the county IRB, the following processes were used to protect the participants involved in the study as well as the university and school system.

- All participants were provided a cover letter describing the study (see Appendix D).
- All participants agreed with the informed consent electronically before beginning the survey (see Appendix E for a copy of the informed consent).
- To maintain confidentiality, all responses were coded upon submission of the survey. During the coding process, all participants' names were changed to numbers and participants were only referred to as a number during analysis.
- Results were reported in aggregate form and by id code only (by school, position, gender, etc.) to protect the identity of the respondents.
- All participants were emailed a copy of the results once the study was completed.
- The data from the surveys was retained electronically on an encrypted flash drive and on a computer in the primary investigator's home for a minimum of three years. Only the researcher had access to the data and the programmer encoded the data and all identifying information was removed prior to the researcher analyzing

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the data. Individual data was not shared with any other individuals within the District or any external entities.

### **Summary**

Through this study the researcher hoped to: identify the optimal pathways or positions for communicating initiatives in elementary schools in the county, identify possible bottlenecks in elementary schools that need to be realigned in order to improve communication, and develop a potential tool for school leaders to use to identify their communication pathways for communicating new information. Identifying the optimal pathways, positions, and bottlenecks regarding the flow of information in schools could assist schools and the District with developing a process for communicating new information, as well as develop new positions to improve the communication flow.

Additionally, a tool could be developed to help schools analyze the flow of communication in their schools. If schools are able to use a developed tool to explore their own communication networks, the information gained can assist leadership in identifying key people or positions necessary for communicating information in their building. This analysis will also help school leaders in making personnel decisions and aid in how they communicate information in their school. In addition, county leadership could use data gathered from school networks to develop a countywide communication policy or plan for disseminating information.

Section 2 provided an overview of the methodology for this study that was intended to explore the communication channels for the CCSS initiative in four elementary schools. The participants, setting, and procedures were also discussed.

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Specifics regarding the survey and the interviews were also described. Finally a brief description for how the data were analyzed was also provided.

### **Section III**

#### **Results, Discussion and Conclusions**

##### **Introduction**

In this chapter the findings are presented from the data collected on the informal social networks at four elementary schools regarding the communication of information around two systemic initiatives, the Common Core State Standards and Data Wise. In the first section the general results are discussed followed by a discussion of the findings for each research question. Next, conclusions from the study and recommendations for future use are made.

##### **Results**

###### **General Overview**

In investigating the research questions, 165 staff members from four elementary schools were identified to take the survey. In order to maintain confidentiality of the schools and staff members, the schools were identified as School A, B, C, and D and staff members were identified by their position or random identification number. School A and School B had similar demographics when looking at staff members' qualifications and School C and D also had similar demographics. Table 5 shows an overview of the qualifications of the teachers by school (Maryland State Department of Education, 2015).

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Table 5

*Teachers Qualifications (by percent)*

	Highly Qualified Teachers	Conditional Certificate	Standard Professional Certificate	Advanced Professional Certificate
School A	100	0	27	70
School B	100	0	36	64
School C	88	4	22	59
School D	87	4	30	48

From the 165 staff members surveyed, 118 individuals responded to the 17-question survey for an overall response rate of 71.52%. The response rates per school ranged from 56.52% to 87.18% (see Table 6). School A had the lowest response rate and also was the only school that allowed for their information session to be optional which could have impacted their number of respondents.

Table 6

*Survey Respondents per School*

	Number of Respondents	Number Surveyed	Percent of Respondents
School A	26	46	56.52%
School B	34	39	87.18%
School C	30	39	76.92%
School D	28	41	68.29%
Overall	118	165	71.52%

The majority of the respondents were female, 89.8 percent. The participants' years working in education varied with the highest percentage of respondents having taught for greater than 21 years (see Table 7). The majority of respondents (64.40%) had been working in the District for less than 11 years (see Table 7).



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Table 7

*Years Working in Education and the District (by percent)*

	0 – 5.99	6 – 10.99	11 – 15.99	16 – 20.99	Greater than 21
<b>Years in Education</b>					
School A	23.08	3.84	11.54	23.08	38.46
School B	38.24	17.65	5.88	11.76	26.47
School C	23.33	20.00	23.33	20.00	13.33
School D	21.43	17.86	17.86	7.14	35.71
Overall	27.12	15.25	14.41	15.25	27.97
<b>Years in District</b>					
School A	30.77	11.54	15.38	19.23	23.08
School B	47.06	23.53	8.82	11.76	8.82
School C	36.67	36.67	10.00	10.00	6.67
School D	50.00	17.86	10.71	3.57	17.86
Overall	41.53	22.88	11.02	11.02	13.56

All of the respondents surveyed had heard of the CCSS and about half, 49.15%, had attended between 1-5 trainings for CCSS since 2011. Slightly over two thirds (66.95%) of the respondents had not attended training related to CCSS outside of the District. Appendix I provides the general data for each respondent, including gender, position, years in education and the district, as well as the number of trainings.

### **Results for Each Research Question**

In the following section, the findings related to each research question are presented. The first two questions focused on how a staff member’s position or number of connections with others in the network impacted his/her perceived knowledge of the CCSS. In the survey, participants were asked to rate their knowledge of the CCSS, as well as their confidence with using the CCSS, both using a scale of 1-4. Overall, as well as, for each school, the mean score for participants’ perceived confidence using the CCSS was slightly higher than the mean score for participants’ perceived knowledge of the

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CCSS (see Table 8). See Appendix J for data by participant for their perceived knowledge of and confidence using CCSS.

Table 8

*Perceived Knowledge of and Confidence using CCSS*

	Mean (SD)				
	School A	School B	School C	School D	Overall
Knowledge of CCSS	2.36 (0.49)	2.88 (0.69)	2.7 (0.53)	2.93 (0.65)	2.74 (0.65)
Knowledge of CCSS (Reading)	2.52 (0.65)	2.79 (0.88)	2.73 (0.58)	2.86 (0.71)	2.74 (0.72)
Knowledge of CCSS (Math)	2.52 (0.65)	2.59 (0.92)	2.57 (0.77)	2.54 (0.74)	2.56 (0.78)
Confidence Using CCSS	2.64 (0.91)	2.94 (0.85)	2.96 (0.79)	2.89 (0.70)	2.87 (0.81)

The data for all 118 respondents was analyzed using R (R Core Team, 2013) for each of the 17 questions. Correlations were run on each of the connections between the different social network analysis measures and the questions asked to determine significant correlations for the data using Pearson's R Correlation. Both Pearson and Spearman's Rho correlations were conducted on the measures and the results showed very little variation. While Spearman's Rho tends to be more appropriate for ordinal data, though some of the data analyzed was ordinal, Pearson provided a more conservative estimate and did not change the outcome of the results.

When looking at the correlation between training in the CCSS and knowledge of and confidence in using the CCSS, the strongest positive correlation existed between participants' knowledge of the CCSS and their number of trainings,  $r=.31$ ,  $n=118$ . There were moderate positive correlations when looking at trainings and knowledge of the CCSS for reading and math as well as for participants' confidence with using the CCSS (see Table 9). Additionally, there was a strong positive relationship between participants' perceived knowledge of the CCSS and their confidence using the CCSS,  $r=.64$ ,  $n=118$ .

Table 9

*Correlation between Number of Trainings and Perceived Knowledge*

	Total Trainings in CCSS	External Trainings in CCSS
Knowledge of CCSS	<b>.31***</b>	<b>.33***</b>
Knowledge of CCSS (Reading)	.18*	.26**
Knowledge of CCSS (Math)	.22*	.20*
Confidence using CCSS	.22*	.27**

Note: These correlations are for all of the participants in the study from all four schools. N=117; Correlation coefficients >.30 are in boldface.

\*p<.05

\*\*p<.01

\*\*\* p<.001

**Research Question 1**

The first question examined how a staff member’s position within the network impacted his/her perceived knowledge of the CCSS. To explore the relationship between a staff member’s position within the network and his/her perceived knowledge of CCSS, SNA measures (closeness, eigenvector, and betweenness) were calculated and the Pearson product-moment correlation coefficient was computed and analyzed for each SNA measure. Correlations were calculated collectively and for each school for all measures.

**Closeness.** The closeness score for the CCSS network show how connected an individual is with other individuals in the network. Individuals with high closeness scores are more centrally located in the network and have more direct ties with other individuals in the network. A normalized closeness score was calculated for each individual in each network. There was not a significant relationship between participants’ perceived knowledge of CCSS and their closeness score in any of the four schools. Additionally, there were no significant relationships between participants’ confidence using the CCSS and their closeness scores in any of the schools (see Table 10).

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**Eigenvector.** The eigenvector score adds more depth to the closeness measurement and determines not only which individuals are closest to the most individuals, but also identifies which individuals are closest to the most influential individuals in the network. Overall, there was a weak positive relationship between participants' perceived knowledge of the CCSS and their eigenvector scores. That is, the staff member who was closest to those staff with large numbers of connections in their school seemed to impact the individual's knowledge of the CCSS slightly. School A and School B had the strongest positive relationships between their participants' knowledge of the CCSS and eigenvector scores while Schools C and D showed no relationship. Additionally, School B had a strong positive relationship between their participants' confidence using the CCSS and their eigenvector scores (see Table 10).

**Betweenness.** The betweenness score depicts the brokers or individuals who separate other groups of individuals within the network. Betweenness "captures how actors control or mediate the relations between pairs of actors that are not directly connected" (Carolan, 2014, p. 157). Individuals in the network may need to rely on individuals with high betweenness scores to share information. A normalized betweenness score was calculated for each individual in each network. Across the four schools, there was a weak positive relationship between participants' perceived knowledge of the CCSS for reading, as well as, their confidence using the CCSS and their betweenness scores. Schools A and B had the strongest positive relationships between participants' confidence using the CCSS and their betweenness scores while schools C and D had no or moderate relationships respectively (see Table 10).

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Table 10

*SNA Measures for CCSS Correlated to Knowledge of and Confidence using CCSS*

	Closeness	Eigenvector	Betweenness
School A (N=25)			
Knowledge of CCSS	-.16	.10	.18
Knowledge of CCSS (Reading)	.27	<b>.43*</b>	.07
Knowledge of CCSS (Math)	.16	<b>.40*</b>	.23
Confidence using CCSS	-.17	.24	<b>.41*</b>
School B (N=34)			
Knowledge of CCSS	-.12	<b>.47**</b>	.24
Knowledge of CCSS (Reading)	-.03	<b>.42*</b>	<b>.36*</b>
Knowledge of CCSS (Math)	-.03	.19	-.02
Confidence using CCSS	-.06	<b>.50**</b>	<b>.35*</b>
School C (N=30)			
Knowledge of CCSS	-.22	.25	.19
Knowledge of CCSS (Reading)	-.25	.21	.20
Knowledge of CCSS (Math)	-.15	.14	-.12
Confidence using CCSS	-.23	.19	.15
School D (N=28)			
Knowledge of CCSS	-.01	.14	.05
Knowledge of CCSS (Reading)	.10	.03	.10
Knowledge of CCSS (Math)	-.11	.25	<b>.34</b>
Confidence using CCSS	.12	.11	-.04
Overall (N=117)			
Knowledge of CCSS	.11	.28**	.18
Knowledge of CCSS (Reading)	.04	.29**	.23*
Knowledge of CCSS (Math)	.01	.22*	-.03
Confidence using CCSS	.04	.29**	.22*

Note: Correlation coefficients >.30 are in boldface.

\*p<.05

\*\*p<.01

\*\*\* p<.001

The findings suggest that being close to a lot of people within a network did not seem to be related to an individual’s perceived knowledge of or confidence in using the CCSS. Betweenness seemed to have a moderate impact on either knowledge or confidence scores. Further, the data did suggest that individual’s with high eigenvector scores or people connected to the most influential people in the network were important

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and an indicator for moderate to strong perceived knowledge of and confidence using the CCSS scores.

### Research Question 2

The second question examined the number of ties or connections a staff member had and the impact on his/her perceived knowledge of the CCSS. On average, individuals had 8.70 total connections within their school (SD=8.44; range=0-53). This means that individuals either sought information from or were requested information from 8.7 other individuals within their school regarding the CCSS. Across the four schools, individual staff members had 4.35 in connections or people seeking information from them regarding the CCSS (SD=5.63; range=0-28). Individual schools had aggregate averages of numbers of connections ranging from 2.78 (School A) to 7.10 (School B) (see Table 11).

Table 11  
*Average Connections Between Staff Members per school for CCSS*

	Mean (SD)				
	School A	School B	School C	School D	Overall
In Connections	2.78 (4.48)	7.10 (6.74)	3.87 (5.01)	3.51 (5.14)	4.35 (5.63)
Out Connections	2.78 (3.54)	7.10 (7.88)	3.87 (5.17)	3.51 (3.56)	4.35 (5.58)
Total Connections	5.57 (5.04)	14.21 (11.68)	7.74 (7.15)	7.03 (5.29)	8.70 (8.44)

**In Connections.** There was a weak to moderate positive relationship between an individual's perceived knowledge of and confidence in using the CCSS and the number of in connections or in degree (see Table 11). In connections captures the number of staff who seek information from each individual regarding an initiative. The box blot in Figure 3 shows that as the number of in connections increased, individuals' perceived knowledge of and confidence in using CCSS increased.

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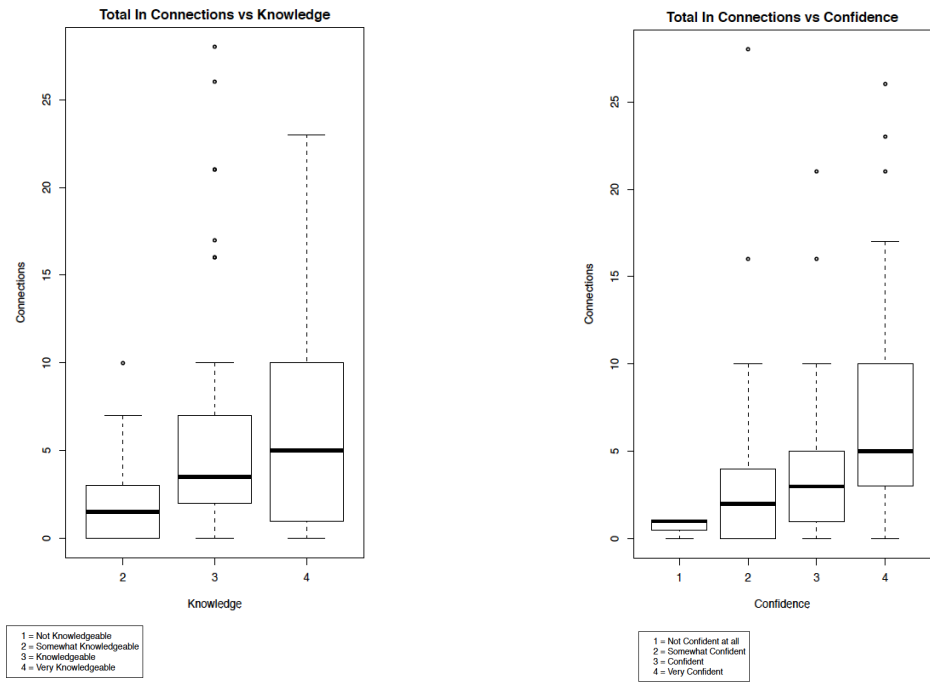


Figure 3. Box Plot – Individual’s In Connections related to Knowledge and Confidence of CCSS scores

All schools showed a positive relationship between in connections and either a perceived knowledge of the CCSS score or confidence using the CCSS. School B, with the highest percentage of responses, and School D had the highest positive relationships between knowledge of the CCSS and an individual’s number of in connections. School A and D had strong positive relationships between participants’ in connections and their perceived confidence of using the CCSS. However, Schools A and D also had the lowest percent of respondents which may have had an impact on the measurement (see Table 12).

**Out Connections.** Out connections refers to the number of individuals a person sought information from. Overall and for three of the schools (A, C and D) there was no relationship between the average number of out connections and perceived knowledge of or confidence using the CCSS. Only School B showed a strong positive relationship

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between the number of out connections a person had and their perceived knowledge of and confidence using CCSS (see Table 12).

**Total Connections.** Total connections refer to the number of people an individual sought information from combined with the number of people who sought information from him/her. Overall, there was a weak positive relationship between an individual's perceived knowledge of CCSS and number of total connections. Schools A, B, and D had moderate positive correlations between perceived knowledge of either CCSS reading or CCSS math and an individuals' total connections. School D's average number of out connections was strongly correlated with participants' perceived confidence using the CCSS and a moderate relationship with participants' knowledge of CCSS in general and CCSS reading (See Table 12).

Table 12

### *Degree Centrality Correlated to Knowledge and Confidence*

		Out Degree	Total Degree
School A (N=25)			
Knowledge of CCSS	.20	-.03	.08
Knowledge of CCSS - Reading	.13	.22	<b>.37</b>
Knowledge of CCSS – Math	<b>.37</b>	.15	.34
Confidence Using CCSS	<b>.46*</b>	-.04	.22
School B (N=34)			
Knowledge of CCSS	<b>.34*</b>	.22	<b>.35*</b>
Knowledge of CCSS - Reading	.26	.20	<b>.36*</b>
Knowledge of CCSS – Math	.07	.11	.12
Confidence Using CCSS	.29	<b>.34*</b>	<b>.41*</b>
School C (N=28)			
Knowledge of CCSS	.26	-.13	.10
Knowledge of CCSS - Reading	<b>.40*</b>	-.27	.10
Knowledge of CCSS – Math	.18	-.12	.04
Confidence Using CCSS	.26	-.15	.08
School D (N=27)			
Knowledge of CCSS	<b>.39*</b>	-.16	.21
Knowledge of CCSS - Reading	.22	-.07	.14



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Knowledge of CCSS – Math	<b>.32</b>	.06	<b>.33</b>
Confidence Using CCSS	<b>.43*</b>	-.17	.24
Overall (N=117)			
Knowledge of CCSS	<b>.34***</b>	.09	<b>.28**</b>
Knowledge of CCSS - Reading	<b>.26**</b>	.14	<b>.27**</b>
Knowledge of CCSS – Math	.16	.06	.14
Confidence Using CCSS	<b>.31***</b>	.11	<b>.27**</b>

Note: Correlation coefficients >.30 are in boldface  
 \*p<.05  
 \*\*p<.01  
 \*\*\* p<.001

The findings suggested that the number of people that came to an individual for information, in connections, were correlated with their knowledge of and confidence using the CCSS scores, however the number of people a person went to did not seem to be a factor on the CCSS scores. Additionally, the number of total connections an individual had, which includes both in connections and out connections, seemed to be only moderately related or a moderate indicator of an individual’s perceived knowledge of and confidence using the CCSS. It is important to note, however, that the relationship of total connections to knowledge and confidence was not consistent for all schools. More importantly, the data did suggest that the number of people who sought information from an individual regarding CCSS, high in connections, was a strong indicator of that individual’s knowledge of and confidence using the CCSS.

### Research Question 3

The third research question explored how a staff member’s formal position (principal, classroom teacher, reading specialist, PDLT, etc.) in his/her school influenced his/her informal position (e.g., in connections, betweenness, eigenvector, etc.) within the school’s social network. To explore this relationship, various SNA measures were calculated. The in degree, total degree, betweenness, and eigenvector measures were

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calculated for each individual to determine which formal positions had the highest scores for each of the four measures. Table 13 shows the individuals who ranked the highest (indicated in bold) for each of the four SNA measures. See Appendix K for additional data for the CCSS network for the participants listed below as well as for each participant from the study.

Table 13  
*SNA Network Measures for CCSS – Key Positions*

Formal Position (Additional Position) – ID Number	In Degree	Total Degree	Betweenness	Eigenvector
School A (N=25)				
<b>Unknown</b> - 678	<b>24</b>	<b>24</b>	0	<b>1</b>
<b>Unknown</b> - 648	<b>13</b>	<b>13</b>	0	<b>.613</b>
<b>Classroom Teacher (PDLT)</b> - 684	<b>10</b>	<b>13</b>	<b>.013</b>	<b>.677</b>
Special Ed. Teacher (DC) - 654	4	9	<b>.012</b>	.494
<b>Classroom Teacher</b> - 690	0	<b>18</b>	0	<b>.839</b>
<b>Classroom Teacher</b> - 656	2	<b>11</b>	<b>.012</b>	.580
School B (N=34)				
<b>Administrator</b> - 774	<b>28</b>	<b>31</b>	.029	<b>.630</b>
<b>Reading Specialist (STC)</b> - 778	<b>26</b>	<b>53</b>	<b>.280</b>	<b>1</b>
<b>Administrator (STC)</b> - 786	<b>23</b>	<b>49</b>	<b>.214</b>	<b>.934</b>
ILT (PDLT) - 808	<b>21</b>	24	.001	<b>.568</b>
<b>Special Ed. Teacher (DC)</b> - 811	5	<b>34</b>	.060	<b>.672</b>
School C (N=28)				
<b>Administrator</b> - 734	<b>21</b>	<b>27</b>	<b>.263</b>	<b>1</b>
<b>Administrator</b> - 740	<b>17</b>	<b>20</b>	.020	<b>.798</b>
<b>Classroom Teacher (PDLT)</b> - 762	<b>16</b>	<b>18</b>	.063	<b>.761</b>
<b>Special Ed. Teacher (PDLT)</b> - 770	<b>16</b>	<b>21</b>	.095	<b>.790</b>
<b>Specialist</b> - 769	0	<b>30</b>	0	<b>.821</b>
ESOL Teacher (DC) - 738	4	15	<b>.208</b>	.629
School D (N=27)				
<b>Unknown</b> - 693	<b>23</b>	<b>23</b>	0	<b>1</b>
<b>ILT (PDLT)</b> - 694	<b>16</b>	<b>18</b>	.003	<b>.967</b>
<b>Unknown</b> - 732	<b>16</b>	<b>16</b>	0	<b>.843</b>
ILT (STC) - 719	<b>12</b>	12	0	.416
<b>Special Ed. Teacher (DC)</b> - 729	8	<b>13</b>	<b>.029</b>	<b>.781</b>
<b>Classroom Teacher (DC)</b> - 714	1	<b>16</b>	<b>.011</b>	<b>.809</b>
Classroom Teacher - 703	4	12	<b>.019</b>	.751

Note: PDLT – Professional Development Lead Teacher; DC – Department Chairperson; STC – School Test Coordinator; ILT – Instructional Lead Teacher; The top scores for each measurement are bolded.

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In each school, four to five individuals scored the highest for at least three of the SNA measures. The data showed that the individuals with the highest SNA scores had the most individuals coming to them for information (in-degree). In School B and C, the administrators were sought out the most for information. In all of the schools, the PDLT was one of the top four individuals whom others sought information from regarding CCSS (see Table 13).

For each school, the positions varied for the individuals who were connected to the other staff with the most connections in the network (high eigenvector). Individuals with high eigenvector tend to be the most influential individuals in the network and held positions of administrator, reading specialist, ILT, classroom teacher and specialist (see Table 13).

In all of schools, the individual with the highest betweenness score also had SNA measures that were high as well. Individuals with high betweenness scores are able to control or mediate how information or knowledge travels between individuals in the school who are not directly connected with others. The individuals with the highest betweenness scores varied for each school (classroom teacher, reading specialist, administrator, special education teacher). In three of the schools (A, B and D), the individuals with the highest betweenness scores also held an additional position (PDLT, STC, and DC) (see Table 13).

For each of the schools, the formal positions held by the individuals with the highest scores tended to be administrators and individuals who held two positions in their school. The individuals who held two positions tended to be classroom teachers, special education teachers and reading specialists who also often held leadership roles such as

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School Test Coordinator (STC), Department Chairperson (DC), or PDLT. The PDLT in all four of the schools was one of the individuals with the highest SNA scores. In two of the schools (School B and C), all of the individuals with the highest SNA scores also had perceived knowledge of the CCSS scores above their school's average. School A had two individuals with higher averages and School D only had one individual with a higher average. These individuals also reported having attended more training for CCSS than the average for their schools (see Appendix J and K).

In addition to exploring the number of staff who sought information from other staff regarding the CCSS, the frequency with which an individual went to others and the value of the information an individual provided was also collected. Individuals with the highest SNA measures also tended to be rated higher than average for the value of information they provided for the CCSS and also tended to be rated lower than average for the frequency with which people stated they sought information from these individuals (See Appendix K). Additionally, those staff members with direct connections to the key individuals in each network also tended to have higher than average perceived knowledge of the CCSS scores (see Table 14).

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Table 14

*Average Perceived Knowledge of Staff Members Connected to Key Individuals*

Formal Position (Additional Position) – ID #	Number of Observations	Average Perceived Knowledge of CCSS (SD)
School A (N=25)		
Unknown – 678	23	2.39 (.5)
Unknown – 648	12	2.42 (.51)
Classroom Teacher (PDLT) – 684	9	2.33 (.5)
Special Ed. Teacher (DC) – 654	4	2.25 (.5)
School B (N=34)		
Administrator – 774	28	2.96 (.69)
Reading Specialist (STC) – 778	26	3.12 (.59)
Administrator (STC) – 786	23	2.91 (.67)
ILT (PDLT) – 808	21	3.24 (.54)
School C (N=28)		
Administrator -734	21	2.76 (.54)
Administrator – 740	17	2.82 (.53)
Classroom Teacher (PDLT) – 762	16	2.81 (.54)
Special Ed. Teacher (PDLT) - 770	16	2.81 (.54)
School D (N=27)		
Unknown - 693	23	2.91 (.73)
ILT (PDLT)	16	2.88 (.72)
Unknown	16	2.88 (.72)
ILT (STC)	12	3.17 (.72)

The individuals with the highest closeness scores in each network, individuals with the most connections with others in the network, tended to be classroom teachers or specialists. These individuals, though were connected to many individuals in the network, tended not to have many individuals coming to them for information and were not key brokers for communicating information throughout the network.

The sociograms in Figure 4 show a visual picture of each school’s CCSS network. The individuals with the highest in-degree scores have yellow circles. Individuals with high betweenness scores are indicated with a blue circle around the individual’s circle and high eigenvector scores are indicated with an orange circle around the individual’s circle. The numbers indicate an individual’s position.

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The sociograms show the key individuals more centrally located in all networks with the individuals more densely clustered in School B, which had the highest percent of respondents and the highest density.

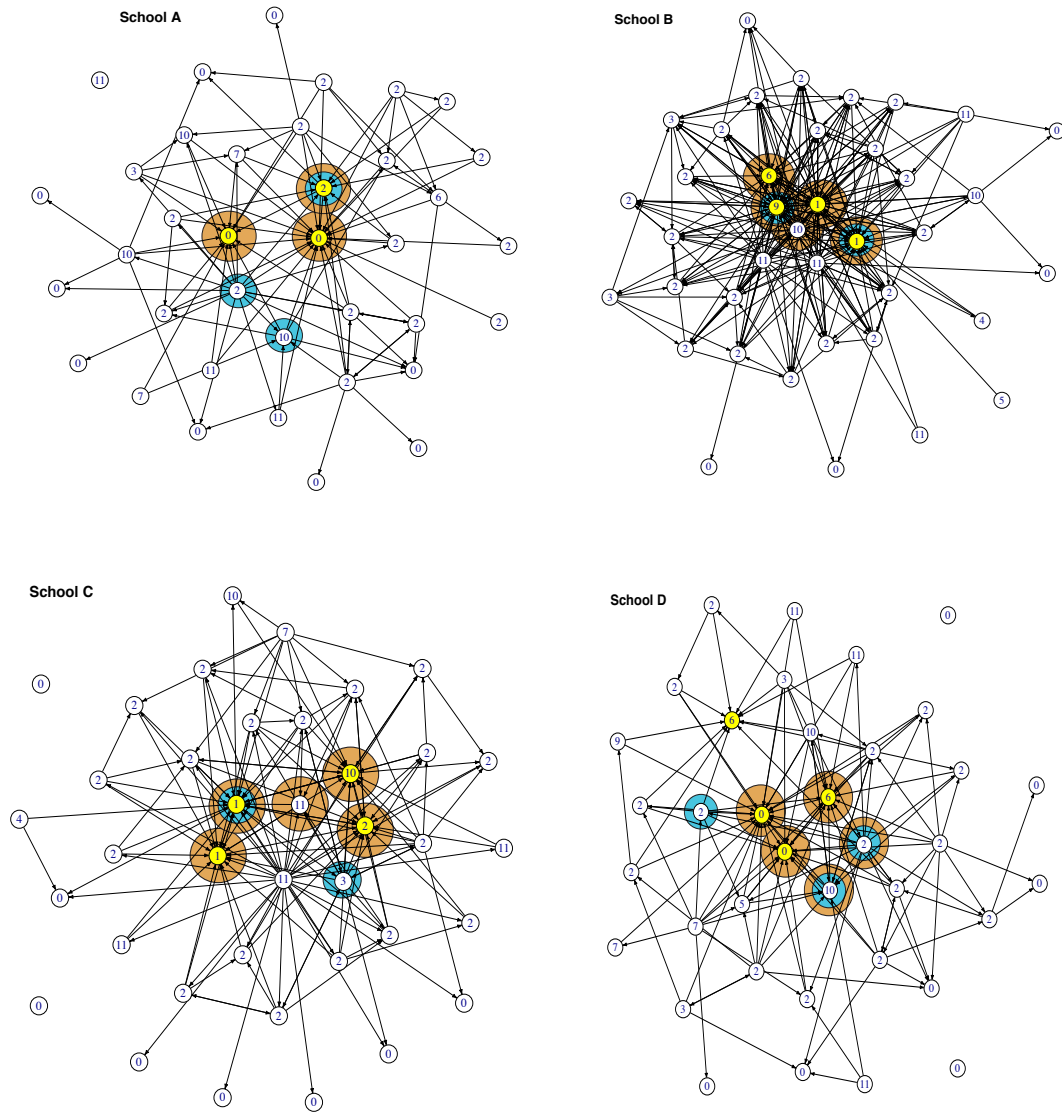


Figure 4. Sociogram for CCSS Networks by School. Note: Yellow indicates individuals with high in-degree; blue indicates individuals with high betweenness scores; orange indicates individuals with high eigenvector; Positions: 1 – administrator; 2 – classroom teacher; 3 – ESOL teacher; 4- front office staff; 5 – guidance counselor; 6 – ILT; 7 – paraprofessional/aide; 8 – parent liaison; 9 – reading specialist; 10 – special education teacher; 11 – specialist; 0- unknown

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The findings suggested that schools relied on a few key individuals to communicate information regarding the CCSS and the individuals tended to be administrators or individuals who held multiple roles in the school. A person can go to an individual for information for many reasons, such as trustworthiness, personality, proximity, etc. (Spillane and Kim, 2012). The data suggest that the people whom individuals went to for information the most were also seen as more knowledgeable about the CCSS than others in the network. It seemed as if staff were going to individuals because of their knowledge of CCSS. However, individuals may not have gone to them as frequently because they provided richer information or because they often tended to be administrators or individuals with leadership roles, they may have been busier than other individuals in the network.

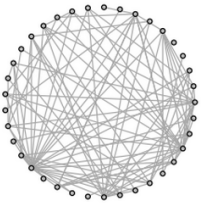
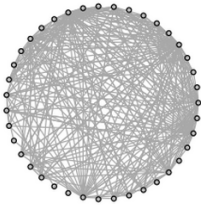
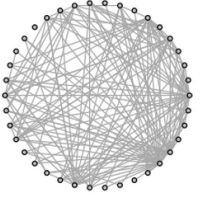
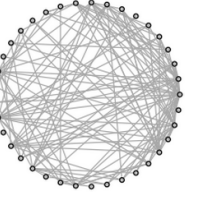
### **Research Question 4**

The fourth research question examined how a school's overall communication network supported or constrained staff's perceived knowledge of the CCSS. To compare each school's overall network for the CCSS, a density and aggregate centralization measure was calculated for each school. Density is the total number of actual ties in a network in proportion to the total number of possible ties in a network. The centralization measure determines whether one or a few people dominate a network. Table 15 shows the sociogram for the density measure for CCSS, the density and centralization measures, and the average knowledge of and confidence using CCSS scores for each school. Though the sociograms change shape, the nodes or circles still represent the staff members in each building.

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Table 15

*Summary Characteristics of the Five Elementary Schools for CCSS Network*

School	Network	Density	Centralization	CCSS Knowledge	Confidence Using CCSS
School A (n=37)		.077	26.3%	2.36 (.49)	2.64 (.91)
School B (n=39)		.187	52.4%	2.88 (.69)	2.94 (.85)
School C (n=38)		.105	30.9%	2.70 (.53)	2.96 (.79)
School D (n=37)		.098	22.8%	2.93 (.65)	2.87 (.81)

School B had the highest density, which means that communication about the CCSS was occurring among many staff members. School B also had the highest centralization score, which means that a few key individuals in the school could be essential in either promoting or hindering the flow of information about the CCSS. School B had the second highest average perceived knowledge of and confidence using the CCSS.



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School A on the other hand had the lowest density and centralization scores, which indicates that communication about the CCSS was not occurring among as many staff members, and many individuals were essential for distributing information, not just a few key individuals. School A also had the lowest average scores for perceived knowledge of and confidence using the CCSS.

The data suggests that density and centralization may have an impact on staff members' perceived knowledge of and confidence using the CCSS. Schools with higher density and centralization tended to also have higher perceived knowledge of and confidence using the CCSS.

### **Research Question 5**

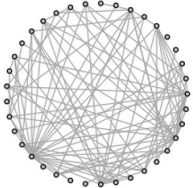
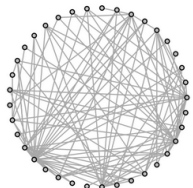
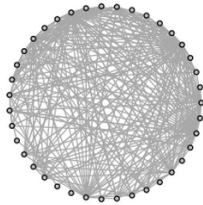
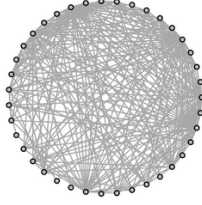
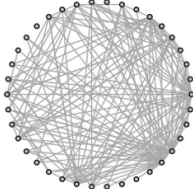
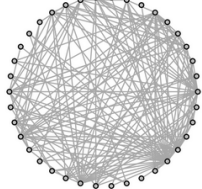
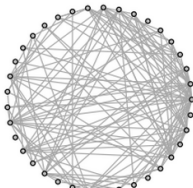
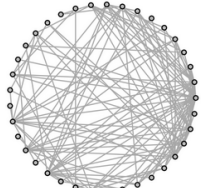
The fifth research question examined how the communication networks for the implementation of the CCSS compared to the communication networks for the implementation for Data Wise. The same SNA measures that were calculated for the CCSS network were also calculated and analyzed for the Data Wise networks for each school.

Table 16 shows the density and centralization measures for both the CCSS and Data Wise networks for each school. The data comparing CCSS and Data Wise show that schools had similar or almost exactly the same density and centralization scores for both networks. Looking at the sociograms for both the CCSS and Data Wise network, they are also almost identical.

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Table 16

*Summary Characteristics for Five Elementary Schools for CCSS and Data Wise Networks*

School	CCSS Network	Data Wise Network	CCSS Density	Date Wise Density	CCSS Centralization	Data Wise Centralization
School A (n=37)			.077	.082	2.36 (.49)	25.8%
School B (n=39)			.187	.185	2.88 (.69)	49.9%
School C (n=38)			.105	.116	2.70 (.53)	29.7%
School D (n=37)			.098	.094	2.93 (.65)	23.2%

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Table 17 shows the SNA measures for the Data Wise network with the individuals with the highest SNA scores bolded. See Appendix L for additional measures for Data Wise for the individuals listed as well as for all participants of the study. When compared with the key positions and SNA measures for the CCSS network, the key individuals were almost identical for both networks. Though the individuals with the highest scores for different SNA measures may have changed slightly, the top people remained the same in both networks.

The data suggests that despite the type of information being shared, CCSS and Data Wise, the network structures remained the same. Additionally, the key people in each network also stayed the same and were essential to the flow of information in their school's network for both CCSS and Data Wise.

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Table 17

*SNA Measures for Data Wise network - Key Positions*

Formal Position (Additional Position) – ID Number	In Degree	Total Degree	Betweenness	Eigenvector
School A (N=25)				
<b>Unknown - 678</b>	<b>24</b>	<b>24</b>	0	<b>1</b>
Unknown - 648	<b>15</b>	<b>15</b>	0	.606
<b>Classroom Teacher (PDLT) - 684</b>	<b>11</b>	<b>13</b>	.004	<b>.664</b>
<b>Classroom Teacher - 689</b>	4	10	.003	<b>.709</b>
<b>Classroom Teacher - 690</b>	0	<b>18</b>	0	<b>.755</b>
<b>ILT - 677</b>	3	<b>16</b>	<b>.040</b>	<b>.697</b>
Classroom Teacher - 656	3	12	<b>.028</b>	.657
Special Ed. Teacher (DC) - 654	3	8	<b>.012</b>	.443
School B (N=34)				
<b>Administrator - 774</b>	<b>28</b>	<b>31</b>	.007	<b>.660</b>
<b>Reading Specialist (STC) 778</b>	<b>24</b>	<b>51</b>	<b>.257</b>	<b>1</b>
<b>Administrator (STC) - 786</b>	<b>24</b>	<b>50</b>	<b>.250</b>	<b>.980</b>
ILT (PDLT) - 808	<b>20</b>	22	.001	<b>.525</b>
<b>Special Ed. Teacher (DC) - 811</b>	5	<b>34</b>	.061	<b>.703</b>
School C (N=28)				
<b>Administrator - 734</b>	<b>19</b>	<b>25</b>	<b>.281</b>	<b>1</b>
<b>Special Ed. Teacher (PDLT) – 770</b>	<b>18</b>	<b>23</b>	<b>.103</b>	<b>.870</b>
<b>Classroom Teacher (PDLT) – 762</b>	<b>17</b>	<b>20</b>	.069	<b>.844</b>
<b>Administrator - 740</b>	<b>15</b>	<b>18</b>	.017	<b>.755</b>
<b>Specialist - 769</b>	0	<b>30</b>	0	<b>.828</b>
ESOL Teacher (DC) - 738	4	15	<b>.265</b>	.638
School D (N=27)				
<b>Unknown - 693</b>	<b>23</b>	<b>23</b>	0	<b>1</b>
<b>ILT (PDLT) - 694</b>	<b>16</b>	<b>18</b>	.003	<b>.953</b>
<b>Unknown - 732</b>	<b>16</b>	<b>16</b>	0	<b>.815</b>
<b>ILT (STC) - 719</b>	<b>12</b>	<b>15</b>	<b>.015</b>	.701
Special Ed. Teacher (DC) - 729	10	13	.003	<b>.754</b>
Classroom Teacher (DC) - 714	0	<b>15</b>	0	<b>.725</b>
Classroom Teacher - 703	3	9	<b>.012</b>	.531

Note: PDLT – Professional Development Lead Teacher; DC – Department Chairperson; STC – School Test Coordinator; ILT – Instructional Lead Teacher; The top scores for each measurement are bolded.

### **Discussion**

The focus for this study was to explore if the informal communication pathways in four elementary schools impacted the flow of information regarding initiatives. From exploring the informal communication pathways, the findings suggested several key conclusions common among the schools. First, a few key individuals in each school were essential to the flow of information and tended to be administrators or individuals holding multiple positions. Second, the key individuals in each network whom others sought information from also tended to be the best sources for information as they had higher than average perceived knowledge of CCSS scores. Third, each of the four schools had more of a centralized than decentralized network structure. Finally, regardless of the initiative, the network structures were almost identical and the key people remained almost the same for both the CCSS and Data Wise networks.

### **Key Individuals for Each Network**

The findings from questions 1, 2, and 5 showed that there were a few key individuals in each school who were central to the distribution of information. There were 19 individuals who had the highest social network scores across the four schools. Each school had five people who had the highest social network scores and whom others sought information from regarding CCSS and Data Wise. In each school, these individuals were either administrators (n=3) or those who held a leadership role (STC, DC, or PDLT) in addition to their primary position (n=10). These findings are consistent with those of Moolenaar et al. (2010) and Daly et al. (2009) that indicated principals or administrators were essential to the implementation of new initiatives and were key individuals in their social networks.

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Additionally, Spillane and Kim (2012) showed that principals and other individuals in leadership roles within schools tended to be more centrally located in their networks. This was also observed in the networks studied. In three of the four schools, a PDLT was one of the key individuals in the networks for CCSS. As the PDLT position was created with the purpose of sharing information regarding new initiatives, the data seem to support that other individuals within a school are seeking information from the PDLT and that the PDLT is a key person or link to the distribution of information regarding CCSS.

According to Daly and Finnigan (2009), the few key people who are centrally located in a network have increased access to resources and knowledge and can promote or hinder how information gets from them to the rest of the network. As both the CCSS and Data Wise networks are more centralized and have a few key people whom others seek information from, it is important that these individuals are trained and have the necessary information to share with the rest of the network.

### **Knowledgeable Key People**

Not only were the key people in each network administrators or individuals in leadership roles, but also tended to be individuals whose perceived knowledge of and confidence using the CCSS scores were higher than average. These individuals also indicated that they had attended more trainings than other individuals in their networks. In addition, those individuals who indicated that they went directly to the key people in their respective networks also tended to perceive themselves as having higher than average perceived knowledge of the CCSS.

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Also, the correlations showed that there was a strong positive relationship between participants' knowledge of the CCSS scores and their confidence using the CCSS. A positive relationship also existed between the number of trainings an individual reported attending with their perceived knowledge of the CCSS.

### **Centralized Network Structures**

All four schools tended to have a more centralized network structure, meaning that the school relied on a few key people in the center to share information about the CCSS and Data Wise. Centrality measurements do not necessarily help to determine if a network is good or bad, but they help to determine which individuals are most influential and who others go to the most for information (Deal, Purinton, & Waetjen, 2008). According to Cummings and Cross (2003), centralized networks are more effective for the diffusion of routine non-complex knowledge and information. Additionally, more centralized networks aid with coordination and integration throughout the entire network (Provan & Milward, 1995). However, centralized networks have been found to impede how groups engage in high-level communication and knowledge sharing.

School B had the highest centralization score (52.4%) with the other three schools having centralization scores around 25%. Centralized networks rely on their central actors to disseminate information or resources. If one of the key actors leaves or is removed, the networks could fall apart (Xu and Chen, 2005). Decentralized networks on the other hand are more resilient to change as the majority of members in the network share equal responsibility for sharing resources and information (Xu and Chen, 2005). While centralized structures can help in the initial dissemination of routine information about an initiative such as CCSS or Data Wise, it may be necessary for schools to

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develop more decentralized informal communication structures in order for staff to develop deeper knowledge and confidence with new initiatives.

### **Comparison of SNA for CCSS and Data Wise**

This SNA found that, regardless of the initiative being implemented, the networks and key people in each school were almost identical. The density scores, centralization scores, and density maps were very similar for both CCSS and Data Wise for all four elementary schools. When comparing the key people in the networks for both the CCSS and Data Wise for each school, the top two or three people stayed the same in each school. This suggests that each school had either determined who their key knowledge brokers were or the individuals who were expected to serve the role were in fact sharing the necessary information.

The Pearson Product Correlations also indicated moderate to strong positive relationships between the SNA measures for the CCSS and Data Wise. The correlations for in connections, out connections, total connections, closeness, betweenness, and eigenvector were equal to or almost 1.0, which implied that the networks for both the CCSS and Data Wise and their measures were almost identical. Additionally, the average frequency of information provided and the average value of information provided for both the CCSS and Data Wise also had a strong positive correlation. Taken together, the findings showed that both the CCSS and Data Wise networks were almost identical for every school.



### **Successes and Limitations**

A few key successes were noted during the implementation of this study. First, all but one participant who began the survey completed it. The survey was built on a platform that was easy to use on any device (computer, phone, tablet, etc.) and only took the participants about ten minutes to complete. Second, though the researcher believed that participants might have seemed reluctant or anxious about choosing other staff members by name and indicating who they went to most frequently, it was actually the not the case. At the information sessions held before distribution of the survey, participants were excited about the research and often predicted whom they thought was going to be centrally located in their network. Finally, it seemed almost essential to have both the information session for staff to better understand the study as well as the incentive to ensure participation. One of the schools with the lowest percent of participants allowed their information session to be optional. Though information sessions were only 10 minutes long, it gave participants an opportunity to hear about the study and ask questions. Additionally, the tiered incentive created a fun competitive environment and participants were heard telling each other as they left the information meeting that they were getting that survey done first thing because they wanted the 10-dollar gift card not the five-dollar one.

Some of the limitations of the survey were its lack of generalizability and identification of non-completers. Due to the fact that only four schools were used in this study, it is not generalizable to all elementary schools or other similar districts. Additionally, due to confidentiality of participants, the researcher was unable to identify the position of the non-completers, which would have been helpful in filling in some of

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the missing data. Furthermore, data for the schools with the lowest response rate may not show an accurate picture of how information flows in the network or key individuals may be missing. If all participants had responded, the overall network structure might have changed slightly or additional key individuals might have been identified. In future studies it would be helpful to have individuals taking the survey not only identify the people they go to for information but the position those people hold. This information could then be used to help fill in missing data.

Additionally, as a survey tool was the only measure used to explore the social networks, it would be beneficial to consider observing teachers in a school during collaborative planning to see which individuals they ask questions of the most regarding new initiatives. It could also be beneficial to explore staff members' emails to each other focusing on discussions of the initiatives being explored. This data would provide a more in-depth and clearer picture of the informal social networks in schools. Despite these limitations, the findings did reveal information about how information is communicated in schools around initiatives and which positions are most influential in disseminating information about initiatives.

### **Implications for the District**

The purpose of this study was to examine, through the use of SNA, the communication networks and key actors in four elementary schools in the District intended to disseminate information about the CCSS. Additionally, how an individual's formal position in a school was tied to their informal position within their communication network was explored. Below are some observations and suggestions to consider as implications for the District:

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1. The PDLT seems to be functioning as intended in the four elementary schools studied. In each of the four schools, a staff member holding the position of PDLT was influential in distributing information for not only the CCSS, but also for Data Wise. As the District continues to develop and improve upon the PDLT position, it would be important for them to not only ensure these individuals are receiving the resources necessary to share with their schools, but also to ensure that they have the designated time to meet with or provide support for the staff in their schools.

With the District using the PDLTs in addition to administrators as the key people who receive training on key initiatives and then share this information with their schools, it is essential that they have the necessary knowledge and skills to share the information with their schools. As the PDLTs are essential to the flow of information, it puts a lot of pressure on the District to ensure they are up to date with the most relevant information and it also puts a lot of pressure on the PDLTs themselves to stay up to date with relevant information on their own.

2. In addition to the PDLT in each school, additional key people were also influential to the dissemination of information about the CCSS and Data Wise. Other key people held positions of Administrator, Reading Specialist, ILT, Classroom Teacher, STC, Special Education Teacher, Department Chairperson, and Specialist.

As more than just the PDLT are influential in disseminating information about key initiatives, it is essential that the key people in each building are kept up to date and receive the necessary trainings to share new information with staff in

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the schools. The District's OTD shared that they were aiming to ensure that all schools were receiving the same message with the implementation of the PDLT. After the first year, they were also beginning to train both the PDLT and the administrators using the same training.

With many initiatives being implemented at the same time and staff seeking clarification from multiple people, it is essential that key people are provided the necessary information to share with their staff. It is also essential that the information is shared in a timely fashion so that all individuals have the same information at the same time.

3. Recently, the District created a tool, the Coherence Framework, which is intended to provide a common language and visual for all staff in the District to use to make improvements in academics and operations. Each of the four elementary schools had a more centralized structure with just a few key people central to the distribution of information. Centralized structures are best suited for smaller organizations and tend to allow more formal information to flow easily throughout the organization (Surbhi, 2015). Additionally, centralized structures put the burden on a few key people to make decisions and share information.

Decentralized structures are more common in larger organizations and allow information to flow more quickly and spread in all directions. Additionally, with decentralized structures more individuals carry the burden of decision making and ensuring all individuals have the necessary information to implement initiatives (Surbhi, 2015).

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In order to create a more decentralized structure in schools, the District could consider adding additional PDLTs in each school. As there are only two PDLTs in each elementary school, one or two additional PDLTs could be added to make the school structures more decentralized, as more individuals would be responsible for sharing the information. Moving towards a more decentralized structure could help the school to move from distributing more routine knowledge to providing more in-depth information and knowledge around new initiatives. With additional PDLTs, it could also help to reduce the burden and stress on a few key individuals who must ensure they share information with their entire staff. Additional PDLTs would allow for more people to share the responsibility of sharing new information.

In addition to the PDLTs, there were other individuals in leadership positions who were also influential in sharing information throughout the school. To help make the schools more decentralized, more professional development might be necessary for various groups. Administrators and department chairpersons for different departments (Special Education, ESOL, Reading) were also key people in disseminating information throughout the District. It is essential that all departments are receiving the same message (Reading, ESOL, Special Education, etc.) to ensure that when they train their teachers in leadership positions, it is the same message given to administrators and PDLTs. This would help to increase the key people who are able to share information regarding initiatives and help these key people to assist staff in their schools to gain deeper

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knowledge of various initiatives instead of just providing surface level routine information.

4. Finally, it would be beneficial for the district to develop a social network analysis tool for schools and departments to use to identify the key distributors of information in their building or department. This study only focused on four average-sized elementary schools, it would be beneficial to see if large and small schools have similar structures. It would be beneficial as a district to explore if all elementary schools have the same centralized structure. It would also be useful to confirm that the PDLT is in fact central for distributing information in the majority of schools in the district.

Though the district has asked a few questions regarding communication in climate and employee satisfaction studies in the past, developing a SNA tool to identify how information flows will help the district to not only identify whether staff perceive the communication to be effective in the district, but also to show actual patterns of communication in the district. Previous studies that have included communication components have focused on attitudes or perceptions about communication, but an SNA tool would be able to show actual behavior for how communication flows in the District. This tool could be used for schools, offices, specific positions, etc.

### **Recommendations for Future Research**

This exploratory study provides a starting point for looking at whether positions intended for disseminating information are actually integral to the implementation of an initiative. It also shows how networks for different initiatives rely on the same people to

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disseminate information. The use of social network analysis in education is still in its infancy especially when exploring formal versus informal positions as well as the implementation of multiple initiatives. Below is suggested research to help add to the body of literature using SNA.

### **Recommendation 1**

This current study was limited to four elementary schools located in one large urban district. A broader sampling that includes all elementary schools in a district or adds middle and high schools may provide more information about dissemination of information around initiatives, as well as allow for generalizations about communicating initiatives, key positions in schools, and similarity of networks for different initiatives.

### **Recommendation 2**

Due to the small sample size, correlations were unable to be conducted exploring the connections between position and other network variables. With a larger sample size and more individuals representing like positions, correlations would be able to be conducted to explore whether certain positions are statistically more influential or essential in distributing information about an initiative throughout a school.

### **Recommendation 3**

This study explored the implementation of two system-wide initiatives. It might be beneficial to explore the implementation of a district-wide initiative and another initiative implemented by the administration at the school to see if the information networks remained the same.

### **Recommendation 4**

The study showed that there were three to four key people in each school whom individuals went to for information. A case study could also be conducted at the schools to explore the key individuals in each school and identify why staff members are going to them for information.

### **Summary**

This chapter presented an overview of the findings and conclusions. Additionally, recommendations for the district, limitations to the research, and recommendations for future research were presented.



**Appendices**

**Appendix A – Survey Tool**

**Part A – Demographics**

**Demographics**

1. Gender

Male

Female

2. Of the following, which position best describes your position in the county?

Administrator

Classroom teacher

ESOL Teacher

Front Office Staff

Guidance Counselor

Instructional Lead Teacher (ILT)

Paraprofessional/Aide Specialist

Reading Specialist

Special Education teacher

Specialist

3. Do you hold any of these additional positions? Check all that apply.

Department Chairperson/ Elementary Chairperson (DC/EC)

Professional Development Lead Teacher (PDLT)

School Test Coordinator (STC)

**Appendix A – Survey Tool (Continued)**

**Part A – Demographics (Continued)**

4. Years in Education

- 0 – 5.99 years
- 6 – 10.99 years
- 11 – 15.99 years
- 16 – 20.99 years
- greater than 21 years

5. Years in the county

- 0 – 5.99 years
- 6 – 10.99 years
- 11 – 15.99 years
- 16 – 20.99 years
- greater than 21 years

**Appendix A – Survey Tool (Continued)**

**Part B – Social Network Analysis Questions**

**Who do you go to for information?**

The second section of this survey is composed of the social network analysis questions, which will help to determine how information flows throughout your school. For this section, you will be answering questions based on the Common Core State Standards and another county-based initiative, Data Wise.

**From the Sample Elementary School staff list below, check the box next to all of the people you go to for Data Wise OR the CCSS.** Select individuals even if you go to them for only one of the initiatives listed above. After identifying the key people, you will be asked to indicate the frequency of your contact with the people and how informative the information is that they provide for each initiative (Data Wise and CCSS).

LastName1,  
FirstName1

LastName6,  
FirstName6

LastName11,  
FirstName11

LastName16,  
FirstName16

LastName2,  
FirstName2

LastName7,  
FirstName7

LastName12,  
FirstName12

LastName17,  
FirstName17

LastName3,  
FirstName3

LastName8,  
FirstName8

LastName13,  
FirstName13

LastName18,  
FirstName18

LastName4,  
FirstName4

LastName9,  
FirstName9

LastName14,  
FirstName14

LastName19,  
FirstName19

LastName5,  
FirstName5

LastName10,  
FirstName10

LastName15,  
FirstName15

LastName20,  
FirstName20

**Appendix A – Survey Tool (Continued)**

**Part B – Social Network Analysis Questions**

**Who do you go to for Data Wise?**

For the next two questions, think specifically about your interaction with staff in your building around **Data Wise**.

1. For each person you have identified, **indicate how often you go to the person to gather information regarding Data Wise.**

	Never	A few times a year	A few times a month	Once or twice a week	Daily or almost daily
LastName15, FirstName15	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName19, FirstName19	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName2, FirstName2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName7, FirstName7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName8, FirstName8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. For each person you have identified, **indicate how informative you found the information provided regarding Data Wise.**

	Not informative	Rarely informative	Sometimes informative	Informative	Very Informative
LastName15, FirstName15	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName19, FirstName19	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName2, FirstName2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName7, FirstName7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName8, FirstName8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Appendix A – Survey Tool (Continued)**

**Part B – Social Network Analysis Questions (Continued)**

**Who do you go to for Common Core State Standards?**

For the next two questions, think specifically about your interaction with staff in your building around the **Common Core State Standards**.

1. For each person you have identified, **indicate how often you go to the person to gather information regarding Common Core State Standards.**

	Never	A few times a year	A few times a month	Once or twice a week	Daily or almost daily
LastName15, FirstName15	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName19, FirstName19	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName2, FirstName2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName7, FirstName7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName8, FirstName8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. For each person you have identified, **indicate how informative you found the information provided regarding Common Core State Standards.**

	Not informative	Rarely informative	Sometimes informative	Informative	Very Informative
LastName15, FirstName15	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName19, FirstName19	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName2, FirstName2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName7, FirstName7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
LastName8, FirstName8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Appendix A – Survey Tool (Continued)**

**Part C – Knowledge of Common Core State Standards Questions**

**Your knowledge of the Common Core State Standards**

1. Have you heard of the Common Core State Standards (CCSS)?

- Yes     No

2. How many trainings about the CCSS have you attended since August 2011?

0

1-5

6-10

more than 10

3. How many trainings about the Common Core State Standards outside of the county have you attended since August 2011?

0

1-5

6-10

more than 10

4. Rate your knowledge of the Common Core State Standards.

not knowledgeable about

somewhat knowledgeable about

knowledgeable about

very knowledgeable about

5. Rate your knowledge of the Common Core State Standards for Mathematics.

not knowledgeable about

somewhat knowledgeable about

knowledgeable about

very knowledgeable about

**Appendix A – Survey Tool (Continued)**

**Part C – Knowledge of Common Core State Standards Questions (Continued)**

6. Rate your knowledge of the Common Core State Standards for Reading/Language Arts.

- not knowledgeable about
- somewhat knowledgeable about
- knowledgeable about
- very knowledgeable about

7. Rate your confidence with using the Common Core State Standards to plan lessons and guide instruction.

- not confident at all
- somewhat confident
- confident
- very confident
- N/A

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

**Appendix B – Research Questions and SNA Measures**

*SNA Measures Related to the Research Questions*

Research Question	SNA Measure(s)
To what extent does a staff member’s position within a school’s social network impact his/her perceived knowledge of the Common Core State Standards?	Degree Centrality
To what extent does the number of ties a staff member has with other staff impact his/her perceived knowledge of Common Core State Standards?	Degree Centrality
To what extent does a staff member’s formal position in a school influence his/her informal position with the school’s social network?	Closeness Centrality Betweenness Centrality Eigenvector Centrality
To what extent do the communication networks among staff in each elementary school support or constrain staff members’ perceived knowledge of the Common Core State Standards?	Density
How does the communication network for the implementation of the Common Core State Standards compare to the communication network for the implementation for other initiatives in school?	Centrality and Density



**Appendix C – Email to Principals**

Re: Communication of Systemic Initiatives Survey Invitation  
From: Melissa Kochanowski (mkochano@umd.edu)  
To: Principal Email Address

Dear Principal,

I am writing to ask if your school would be willing to participate in a study exploring how communication flows regarding initiatives. This study will be conducted through a brief 10-minute survey that will be sent out to your staff electronically.

The study will explore how information flows throughout your school regarding county Common Core State Standards and another county based initiative, Data Wise. The goal is to identify key positions that promote and hinder the flow of information in schools. This information could assist school leaders such as yourself in developing communication plans for implementing initiatives.

If you are willing to have this study conducted in your school, I would like to set up a time to discuss the study with you either in person or over the phone and then present the study to your staff in a 10 minute meeting where I would provide an overview of the study and discuss the timeline and expectations. During the presentation with your staff, I would also provide light refreshments and answer any questions the staff might have. At the end of the study, I also plan on sharing the aggregate results with you and your school.

I have been approved by the University of Maryland and the county, Institutional Review Board (IRB) to conduct this study. Please find a description of the study (cover letter) and IRB approval from UMD and the county attached to this email.

Thank you for considering conducting this study at your school and I look forward to hearing from you soon. Please note your employment status in the county will not be affected by your participation or non-participation in this study. This study is for my dissertation.

Thanks,  
Melissa  
mkochano@umd.edu  
(240) 554-5719

**Appendix D – Study Cover Letter**

This exploratory study is focusing on the communication of systemic initiatives in large urban districts. The focus for this study is four elementary schools and how information regarding initiatives flows throughout the schools with regards to the implementation of the Common Core State Standards and another county-based initiative, Data Wise.

The survey will take approximately 10 minutes to complete and asks questions about communication, knowledge of Common Core State Standards, and demographics. The survey will be available to staff for a month with the hopes of getting at least 85% of staff in each elementary school participating in the study.

I have approval to conduct this study through the County Research Office and the University of Maryland Research Office. If you have any questions about the survey before you begin or while taking it, please contact Melissa Kochanowski (mkochano@umd.edu) to set up a meeting or a time to talk by phone. I would welcome the opportunity to meet with you and discuss the survey in more length if needed.

## **Appendix E – Implied Informed Consent**

### **Informed Consent Form**

#### **Purpose**

This study attempts to identify how information regarding initiatives is communicated throughout an elementary school.

#### **Procedures**

Your participation in the Communication Survey would include a 10-minute web-based questionnaire. The survey asks questions about communication, knowledge of Common Core State Standards, and demographics. For the communication questions you will be asked to identify the people on your staff that you go to most often for Common Core State Standards and another county-based initiative, Data Wise. After identifying the individuals you will be asked to rate how often you go to each of the individuals you selected and the value of the information they provide.

#### **Risks/Discomforts**

There are no more than minimal risks known to participants. In order to prevent breach of confidentiality, your responses will be coded and anonymous.

#### **Benefits**

There are no direct benefits for individual participants. However, it is hoped that through your participation, researchers will learn more about the flow of communication in elementary schools.

#### **Confidentiality**

All data obtained from participants will be kept confidential and will only be reported in an aggregate format (by reporting only combined results and never reporting individual ones). All questionnaires will be concealed, and no one other than the primary investigator listed below will have access to them. The data collected will be stored in the HIPPA-compliant, secure database until it has been deleted by the primary investigator.

#### **Incentive**

All participants will receive either a \$5 or a \$10 Amazon Gift Card. The first 50% of participants to complete the survey will receive a \$10 Amazon Gift Card electronically. All remaining participants that complete the survey will receive a \$5 Amazon Gift Card.

**Appendix F – Implied Informed Consent (Continued)**

**Participation**

Participation in this research study is completely voluntary. You have the right to withdraw at anytime or refuse to participate entirely without jeopardy to your employment status in the county. If you desire to withdraw, please close your Internet browser.

**Questions about the Research**

If you have questions, concerns, or complaints, or if you need to report an injury related to the research, please contact the investigator:

Melissa Kochanowski, at 240-554-5719 or [mkochano@umd.edu](mailto:mkochano@umd.edu)

**Questions about your Rights as Research Participants**

If you have questions you do not feel comfortable asking the researcher, you may contact (Dr. Margaret McLaughlin, Mentoring Professor), 301-405-2337, 3119 Benjamin Building, [mjm@umd.edu](mailto:mjm@umd.edu).

I have read, understood, and printed a copy of, the above consent form and desire of my own free will to participate in this study.

Yes

No

**Appendix G – Email to Participants**

Re: Communicating Systemic Initiatives Survey  
From: Melissa Kochanowski (mkochano@umd.edu)  
To: Participant Email Address

Dear Participant,

Thank you for attending today's information session regarding my study on communication pathways in elementary schools. I am inviting you to participate in this study that will explore how information flows throughout your school regarding Data Wise and Common Core State Standards. Your participation could assist the county in developing communication plans for implementing these types of initiatives.

The survey should take you no longer than 10 minutes and upon completion, **you will immediately receive an electronic Amazon gift card**. The first 50% of participants will get a \$10 gift card and the remainder of participants will receive a \$5 gift card. Your participation in this study is greatly appreciated and will be kept completely confidential. All data obtained from participants will be kept confidential and will only be reported in a group format and will not identify you individually. In addition, all names in the survey are immediately replaced with a unique number identifier and no identifiers will be reported.

Your employment status in the county will not be affected by your participation or non-participation in this study. The data collected will be used for my dissertation.

**Use this link to access the survey:**

This link is uniquely tied to this survey and your email address. Please do not forward this message.

If the above link does not work, try copying the link into your web browser.

Thanks,  
Melissa  
mkochano@umd.edu  
(240) 554-5719

**Appendix H – Reminder Email to Participants**

Re: Communicating Systemic Initiatives Survey Reminder  
From: Melissa Kochanowski (mkochano@umd.edu)  
To: Participant Email Address

**REMINDER: Survey Communicating Systemic Initiatives Survey**

Dear Participant,

You should have received an email regarding my study on communication pathways in elementary schools. In this study, I will explore how information flows throughout your school regarding Data Wise and Common Core State Standards. Your participation could assist the county in developing communication plans for implementing these types of initiatives.

The survey should take you no longer than 10 minutes and upon completion, **you will immediately receive an electronic Amazon gift card**. The first 50% of participants will get a \$10 gift card and the remainder of participants will receive a \$5 gift card. Your participation in this study is greatly appreciated and will be kept completely confidential. All data obtained from participants will be kept confidential and will only be reported in a group format and will not identify you individually. In addition, all names in the survey are immediately replaced with a unique number identifier and no identifiers will be reported.

Your employment status in the county will not be affected by your participation or non-participation in this study. The data collected will be used for my dissertation.

**The last day to submit the survey is DATE.**

**Use this link to access the survey:**

This link is uniquely tied to this survey and your email address. Please do not forward this message.

If the above link does not work, try copying the link into your web browser.

Thanks,  
Melissa  
mkochano@umd.edu  
(240) 554-5719

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

**Appendix I – General Data for Each Participant**

User ID	School	Survey	Gender	Position	Additional Positions	Years in Education	Years in District	Total Trainings in CCSS	External Trainings in CCSS
648	School A	No	NA	NA		NA	NA	NA	NA
649	School A	Yes	2	2	1	4	4	2	0
650	School A	No	NA	NA		NA	NA	NA	NA
651	School A	Yes	1	2		2	2	3	0
652	School A	No	NA	NA		NA	NA	NA	NA
653	School A	Yes	2	11		3	2	1	0
654	School A	Yes	2	10	1	5	5	3	1
655	School A	Yes	2	2		1	1	1	0
656	School A	Yes	2	2		5	5	2	1
657	School A	Yes	2	2		1	1	1	1
658	School A	No	NA	NA		NA	NA	NA	NA
659	School A	No	NA	NA		NA	NA	NA	NA
660	School A	No	NA	NA		NA	NA	NA	NA
661	School A	No	NA	NA		NA	NA	NA	NA
662	School A	No	NA	NA		NA	NA	NA	NA
663	School A	Yes	2	2		1	1	2	0
664	School A	Yes	2	3	1	5	3	2	0
665	School A	No	NA	NA		NA	NA	NA	NA
666	School A	Yes	2	7		5	4	2	0
667	School A	Yes	2	2		4	1	2	0
668	School A	No	NA	NA		NA	NA	NA	NA
669	School A	Yes	2	2		5	4	1	1
670	School A	No	NA	NA		NA	NA	NA	NA
671	School A	Yes	2	10	1	5	5	2	0

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Gender	Position	Additional Positions	Years in Education	Years in District	Total Trainings in CCSS	External Trainings in CCSS
673	School A	No	NA	NA		NA	NA	NA	NA
674	School A	No	NA	NA		NA	NA	NA	NA
675	School A	Yes	2	10		4	1	3	0
676	School A	Yes	1	11		1	1	1	1
677	School A	Yes	2	6		4	3	2	0
678	School A	No	NA	NA		NA	NA	NA	NA
679	School A	No	NA	NA		NA	NA	NA	NA
680	School A	Yes	2	2		4	4	2	0
681	School A	Yes	2	2		4	4	2	0
682	School A	No	NA	NA		NA	NA	NA	NA
683	School A	No	NA	NA		NA	NA	NA	NA
684	School A	Yes	2	2	2	5	5	3	1
685	School A	Yes	2	2		5	5	3	0
686	School A	Yes	2	2		1	1	1	0
687	School A	Yes	2	2		1	1	NA	NA
688	School A	Yes	2	7		5	2	1	0
689	School A	Yes	2	2		3	3	2	0
690	School A	Yes	2	2		3	3	1	0
691	School A	No	NA	NA		NA	NA	NA	NA
692	School A	No	NA	NA		NA	NA	NA	NA
693	School D	No	NA	NA		NA	NA	NA	NA
694	School D	Yes	2	6	2	2	2	2	0
695	School D	No	NA	NA		NA	NA	NA	NA
696	School D	Yes	2	3		5	1	2	1
697	School D	Yes	2	2	1	5	5	2	0
698	School D	Yes	2	5		3	3	1	0
699	School D	Yes	2	2	1	1	1	2	1



INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Gender	Position	Additional Positions	Years in Education	Years in District	Total Trainings in CCSS	External Trainings in CCSS
700	School D	No	NA	NA		NA	NA	NA	NA
701	School D	Yes	2	10		3	2	3	2
702	School D	Yes	2	2	1	5	4	1	0
703	School D	Yes	2	2		2	2	1	0
704	School D	Yes	2	2	1	1	1	2	1
705	School D	No	NA	NA		NA	NA	NA	NA
706	School D	Yes	2	3	1	4	1	1	0
707	School D	Yes	1	11		5	3	1	0
708	School D	No	NA	NA		NA	NA	NA	NA
709	School D	Yes	2	9		5	5	3	3
710	School D	Yes	2	7		1	1	1	0
711	School D	Yes	2	2		1	1	1	0
712	School D	No	NA	NA		NA	NA	NA	NA
713	School D	Yes	2	11		5	3	1	0
714	School D	Yes	2	2	1	5	1	2	0
715	School D	No	NA	NA		NA	NA	NA	NA
716	School D	No	NA	NA		NA	NA	NA	NA
717	School D	Yes	2	7		5	5	1	0
718	School D	Yes	2	2		1	1	1	1
719	School D	Yes	2	6	3	4	2	3	1
720	School D	Yes	2	2		2	1	1	1
721	School D	Yes	1	2		3	1	1	0
722	School D	Yes	2	2		3	1	3	3
723	School D	No	NA	NA		NA	NA	NA	NA
724	School D	Yes	2	2		3	1	1	0
725	School D	Yes	2	2		1	1	1	0
726	School D	Yes	2	11		5	5	3	0

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Gender	Position	Additional Positions	Years in Education	Years in District	Total Trainings in CCSS	External Trainings in CCSS
727	School D	Yes	2	2		2	1	1	0
728	School D	No	NA	NA		NA	NA	NA	NA
729	School D	Yes	2	10	1	2	2	3	1
730	School D	No	NA	NA		NA	NA	NA	NA
731	School D	Yes	1	2	1	5	5	1	0
732	School D	No	NA	NA		NA	NA	NA	NA
733	School D	No	NA	NA		NA	NA	NA	NA
734	School C	Yes	2	1		4	4	2	1
735	School C	No	NA	NA		NA	NA	NA	NA
736	School C	Yes	2	2		4	4	3	0
737	School C	Yes	2	11	1,3	1	1	1	0
738	School C	Yes	2	3	1	4	2	3	1
739	School C	Yes	2	2	2	2	1	2	1
740	School C	Yes	1	1		2	2	1	1
741	School C	No	NA	NA		NA	NA	NA	NA
742	School C	Yes	2	2	1	2	1	1	0
743	School C	No	NA	NA		NA	NA	NA	NA
744	School C	Yes	2	2	1	3	3	2	0
745	School C	Yes	2	7		1	1	2	1
746	School C	Yes	2	2	1	5	5	3	1
747	School C	Yes	2	2	1	3	2	1	0
748	School C	No	NA	NA		NA	NA	NA	NA
749	School C	Yes	2	11	1	3	1	1	1
750	School C	No	NA	NA		NA	NA	NA	NA
751	School C	Yes	2	11		2	2	1	0
752	School C	Yes	2	2		1	1	0	0
753	School C	Yes	2	2		4	2	3	1

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Gender	Position	Additional Positions	Years in Education	Years in District	Total Trainings in CCSS	External Trainings in CCSS
754	School C	Yes	2	2		4	1	1	1
755	School C	Yes	2	2		3	3	2	0
756	School C	Yes	2	2	1	3	2	2	0
757	School C	No	NA	NA		NA	NA	NA	NA
758	School C	No	NA	NA		NA	NA	NA	NA
759	School C	Yes	2	10	1	5	2	1	0
760	School C	Yes	2	2		4	4	1	0
761	School C	Yes	2	2		1	1	1	0
762	School C	Yes	1	2	2	2	2	3	1
763	School C	Yes	2	2	1	5	5	1	0
764	School C	No	NA	NA		NA	NA	NA	NA
765	School C	Yes	2	4		2	2	0	0
767	School C	No	NA	NA		NA	NA	NA	NA
768	School C	Yes	1	2	1	1	1	1	0
769	School C	Yes	2	11		5	2	1	0
770	School C	Yes	2	10	2	3	2	3	0
771	School C	Yes	2	2		3	3	1	0
772	School C	Yes	2	2	1	1	1	1	0
773	School C	Yes	2	2		1	1	1	0
774	School B	Yes	2	1		2	2	2	1
775	School B	Yes	2	11		1	1	1	0
776	School B	Yes	1	11		1	1	2	0
777	School B	Yes	2	2		2	1	1	1
778	School B	Yes	2	9	3	4	3	2	1
779	School B	Yes	2	2		1	1	1	0
780	School B	Yes	2	2	1	5	5	3	0
781	School B	Yes	2	2		5	1	3	2

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Gender	Position	Additional Positions	Years in Education	Years in District	Total Trainings in CCSS	External Trainings in CCSS
782	School B	Yes	2	4		1	2	0	0
783	School B	Yes	2	2		1	1	1	0
784	School B	Yes	2	2		5	4	3	0
785	School B	Yes	2	2	2	2	2	1	0
786	School B	Yes	1	1	3	2	2	3	2
787	School B	Yes	2	2		4	4	3	0
788	School B	Yes	2	2		1	1	1	0
789	School B	Yes	2	11		5	2	3	0
790	School B	Yes	2	2	1	5	5	2	1
791	School B	Yes	2	3		3	3	1	0
792	School B	Yes	2	2		1	1	2	0
793	School B	Yes	2	2	1	1	1	3	0
794	School B	Yes	2	10		4	4	1	0
795	School B	Yes	2	2		5	5	1	0
796	School B	No	NA	NA		NA	NA	NA	NA
797	School B	Yes	2	2		1	1	1	0
798	School B	Yes	2	2		2	1	0	0
799	School B	Yes	2	3	1	5	2	1	0
800	School B	No	NA	NA		NA	NA	NA	NA
801	School B	No	NA	NA		NA	NA	NA	NA
802	School B	Yes	2	11	3	5	1	1	1
803	School B	No	NA	NA		NA	NA	NA	NA
804	School B	Yes	2	2		1	1	1	1
805	School B	Yes	2	2	1	2	2	1	0
806	School B	Yes	2	2		3	1	2	1
807	School B	No	NA	NA		NA	NA	NA	NA
808	School B	Yes	2	6	2	4	4	3	2

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

<b>User ID</b>	<b>School</b>	<b>Survey</b>	<b>Gender</b>	<b>Position</b>	<b>Additional Positions</b>	<b>Years in Education</b>	<b>Years in District</b>	<b>Total Trainings in CCSS</b>	<b>External Trainings in CCSS</b>
809	School B	Yes	2	5		1	1	1	1
810	School B	Yes	1	2		1	1	1	0
811	School B	Yes	2	10	1	5	3	2	1
812	School B	Yes	1	2	2	1	2	1	0
817	School B	Yes	2	11		5	5	1	0

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

**Appendix J – Knowledge of and Confidence Using CCSS Data**

User ID	School	Survey	Knowledge of CCSS	Knowledge of CCSS math	Knowledge of CCSS reading	Confidence using CCSS
648	School A	No	NA	NA	NA	NA
649	School A	Yes	2	1	1	1
650	School A	No	3	3	3	3
651	School A	Yes	NA	NA	NA	NA
652	School A	No	NA	NA	NA	NA
653	School A	Yes	NA	NA	NA	NA
654	School A	Yes	NA	NA	NA	NA
655	School A	Yes	2	2	2	2
656	School A	Yes	3	3	4	3
657	School A	Yes	NA	NA	NA	NA
658	School A	No	NA	NA	NA	NA
659	School A	No	2	2	2	2
660	School A	No	NA	NA	NA	NA
661	School A	No	NA	NA	NA	NA
662	School A	No	2	2	2	2
663	School A	Yes	NA	NA	NA	NA
664	School A	Yes	NA	NA	NA	NA
665	School A	No	NA	NA	NA	NA
666	School A	Yes	4	2	4	4
667	School A	Yes	2	2	2	2
668	School A	No	3	3	3	3
669	School A	Yes	NA	NA	NA	NA
670	School A	No	2	2	2	2
671	School A	Yes	3	2	2	3
672	School A	No	NA	NA	NA	NA
673	School A	No	NA	NA	NA	NA

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Knowledge of CCSS	Knowledge of CCSS math	Knowledge of CCSS reading	Confidence using CCSS
674	School A	No	NA	NA	NA	NA
675	School A	Yes	2	2	2	NA
676	School A	Yes	NA	NA	NA	NA
677	School A	Yes	2	2	2	3
678	School A	No	2	2	2	2
679	School A	No	3	3	3	3
680	School A	Yes	2	2	2	2
681	School A	Yes	2	2	2	2
682	School A	No	3	3	3	4
683	School A	No	NA	NA	NA	NA
684	School A	Yes	NA	NA	NA	NA
685	School A	Yes	NA	NA	NA	NA
686	School A	Yes	2	2	2	3
687	School A	Yes	2	1	2	3
688	School A	Yes	4	2	4	2
689	School A	Yes	3	3	3	4
690	School A	Yes	2	1	1	1
691	School A	No	3	3	3	3
692	School A	No	2	2	2	3
693	School D	No	NA	NA	NA	NA
694	School D	Yes	NA	NA	NA	NA
695	School D	No	3	3	3	4
696	School D	Yes	3	3	3	3
697	School D	Yes	3	4	3	4
698	School D	Yes	2	3	3	2
699	School D	Yes	3	3	3	4
700	School D	No	2	1	2	2
701	School D	Yes	2	2	2	2

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Knowledge of CCSS	Knowledge of CCSS math	Knowledge of CCSS reading	Confidence using CCSS
702	School D	Yes	NA	NA	NA	NA
703	School D	Yes	4	4	3	4
704	School D	Yes	3	3	3	3
705	School D	No	4	3	3	4
706	School D	Yes	3	3	3	3
707	School D	Yes	NA	NA	NA	NA
708	School D	No	3	1	3	2
709	School D	Yes	NA	NA	NA	NA
710	School D	Yes	3	3	3	2
711	School D	Yes	3	3	3	3
712	School D	No	4	3	4	4
713	School D	Yes	3	3	3	3
714	School D	Yes	NA	NA	NA	NA
715	School D	No	3	3	3	4
716	School D	No	NA	NA	NA	NA
717	School D	Yes	2	3	2	2
718	School D	Yes	NA	NA	NA	NA
719	School D	Yes	3	2	3	4
720	School D	Yes	2	3	3	2
721	School D	Yes	NA	NA	NA	NA
722	School D	Yes	3	4	4	3
723	School D	No	3	3	2	3
724	School D	Yes	2	2	2	3
725	School D	Yes	3	1	3	3
726	School D	Yes	3	3	3	4
727	School D	Yes	3	2	4	3
728	School D	No	3	3	3	3
729	School D	Yes	2	2	2	3



INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Knowledge of CCSS	Knowledge of CCSS math	Knowledge of CCSS reading	Confidence using CCSS
730	School D	No	3	3	3	4
731	School D	Yes	2	2	2	2
732	School D	No	3	3	3	3
733	School D	No	4	4	4	4
734	School C	Yes	4	4	4	4
735	School C	No	3	3	3	2
736	School C	Yes	3	2	2	2
737	School C	Yes	3	1	4	4
738	School C	Yes	2	2	2	2
739	School C	Yes	2	2	2	3
740	School C	Yes	3	2	2	4
741	School C	No	4	4	4	4
742	School C	Yes	3	1	4	4
743	School C	No	4	4	4	4
744	School C	Yes	3	3	3	3
745	School C	Yes	3	3	4	4
746	School C	Yes	2	3	3	3
747	School C	Yes	3	3	3	4
748	School C	No	NA	NA	NA	NA
749	School C	Yes	NA	NA	NA	NA
750	School C	No	2	3	2	2
751	School C	Yes	2	3	2	3
752	School C	Yes	2	2	3	2
753	School C	Yes	3	3	3	3
754	School C	Yes	NA	NA	NA	NA
755	School C	Yes	3	3	3	3
756	School C	Yes	4	2	4	3
757	School C	No	2	2	2	NA

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Knowledge of CCSS	Knowledge of CCSS math	Knowledge of CCSS reading	Confidence using CCSS
758	School C	No	3	3	3	3
759	School C	Yes	3	2	3	3
760	School C	Yes	NA	NA	NA	NA
761	School C	Yes	2	2	3	2
762	School C	Yes	4	4	3	3
763	School C	Yes	NA	NA	NA	NA
764	School C	No	NA	NA	NA	NA
765	School C	Yes	3	3	3	3
767	School C	No	3	4	3	3
768	School C	Yes	2	1	2	1
769	School C	Yes	3	2	3	3
770	School C	Yes	2	2	2	2
771	School C	Yes	3	3	3	4
772	School C	Yes	2	2	2	2
773	School C	Yes	3	2	3	4
774	School B	Yes	NA	NA	NA	NA
775	School B	Yes	NA	NA	NA	NA
776	School B	Yes	3	3	3	3
777	School B	Yes	3	3	3	2
778	School B	Yes	4	3	3	4
779	School B	Yes	2	2	2	2
780	School B	Yes	2	2	2	3
781	School B	Yes	3	3	4	3
782	School B	Yes	NA	NA	NA	NA
783	School B	Yes	3	3	3	2
784	School B	Yes	NA	NA	NA	NA
785	School B	Yes	NA	NA	NA	NA
786	School B	Yes	3	3	2	3

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Knowledge of CCSS	Knowledge of CCSS math	Knowledge of CCSS reading	Confidence using CCSS
787	School B	Yes	2	2	2	2
788	School B	Yes	3	3	2	3
789	School B	Yes	NA	NA	NA	NA
790	School B	Yes	3	3	2	3
791	School B	Yes	2	2	4	3
792	School B	Yes	3	2	3	3
793	School B	Yes	2	3	2	2
794	School B	Yes	3	3	3	3
795	School B	Yes	2	2	2	2
796	School B	No	3	2	3	3
797	School B	Yes	3	4	3	4
798	School B	Yes	3	4	2	3
799	School B	Yes	4	4	4	4
800	School B	No	2	2	2	3
801	School B	No	NA	NA	NA	NA
802	School B	Yes	2	2	2	2
803	School B	No	3	2	3	2
804	School B	Yes	NA	NA	NA	NA
805	School B	Yes	NA	NA	NA	NA
806	School B	Yes	3	3	3	2
807	School B	No	3	3	3	3
808	School B	Yes	NA	NA	NA	NA
809	School B	Yes	2	2	2	1
810	School B	Yes	NA	NA	NA	NA
811	School B	Yes	NA	NA	NA	NA
812	School B	Yes	NA	NA	NA	NA
817	School B	Yes	2	2	2	NA

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

Appendix K – CCSS Network Data

User ID	School	Survey	Total In Conns.	Total Out Conns.	Total Conns.	Closeness Normalized	Betweenness Normalized	Eigenvector	Avg. Val. of Info. Provided	Avg. Freq. of Info. Provided
648	School A	No	0	0	NA	NA	NA	NA	NA	NA
649	School A	Yes	0	0	0	0.027027027	0	0	NA	NA
650	School A	No	0	1	1	0.027777778	0	0.111718436	NA	NA
651	School A	Yes	0	0	NA	NA	NA	NA	NA	NA
652	School A	No	0	0	NA	NA	NA	NA	NA	NA
653	School A	Yes	0	0	NA	NA	NA	NA	NA	NA
654	School A	Yes	0	0	NA	NA	NA	NA	NA	NA
655	School A	Yes	0	6	6	0.036885246	0	0.300853587	NA	NA
656	School A	Yes	0	5	5	0.033271719	0	0.260162445	NA	NA
657	School A	Yes	0	0	NA	NA	NA	NA	NA	NA
658	School A	No	0	0	NA	NA	NA	NA	NA	NA
659	School A	No	0	2	2	0.028571429	0	0.180246961	NA	NA
660	School A	No	0	0	NA	NA	NA	NA	NA	NA
661	School A	No	0	8	8	0.039823009	0	0.421670887	NA	NA
662	School A	No	0	2	2	0.032142857	0	0.123727042	NA	NA
663	School A	Yes	13	0	13	0.027027027	0	0.613403908	4.4615	1.6154
664	School A	Yes	0	0	NA	NA	NA	NA	NA	NA
665	School A	No	0	0	NA	NA	NA	NA	NA	NA
666	School A	Yes	0	7	7	0.073619632	0	0.464378294	NA	NA
667	School A	Yes	0	3	3	0.038014784	0	0.118664595	NA	NA
668	School A	No	0	11	11	0.047306176	0	0.569037244	NA	NA
669	School A	Yes	0	0	NA	NA	NA	NA	NA	NA
670	School A	No	0	10	10	0.04505632	0	0.521101726	NA	NA
671	School A	Yes	0	3	3	0.030277544	0	0.226289456	NA	NA
672	School A	No	0	0	NA	NA	NA	NA	NA	NA
673	School A	No	0	0	NA	NA	NA	NA	NA	NA

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Total In Conns.	Total Out Conns.	Total Conns.	Closeness Normalized	Betweenness Normalized	Eigenvector	Avg. Val. of Info. Provided	Avg. Freq. of Info. Provided
674	School A	No	0	0	0	0.027027027	0	0	NA	NA
675	School A	Yes	0	10	10	0.068139963	0	0.37662989	NA	NA
676	School A	Yes	0	0	NA	NA	NA	NA	NA	NA
677	School A	Yes	4	5	9	0.03125	0.012169312	0.494086015	4.5	1.75
678	School A	No	0	2	2	0.163793103	0	0.052902477	NA	NA
679	School A	No	0	8	8	0.173515982	0	0.193759916	NA	NA
680	School A	Yes	0	25	25	0.231707317	0	0.431999479	NA	NA
681	School A	Yes	0	1	1	0.14559387	0	0.029497173	NA	NA
682	School A	No	3	2	5	0.028571429	0.000396825	0.36509532	5	3.6667
683	School A	No	1	0	1	0.027027027	0	0.047108412	5	3
684	School A	Yes	1	0	1	0.027027027	0	0.064741313	5	2
685	School A	Yes	1	0	1	0.027027027	0	0.064741313	5	2
686	School A	Yes	2	6	8	0.038014784	0.00218254	0.515635818	5	2
687	School A	Yes	1	4	5	0.044499382	0.000793651	0.222121997	5	4
688	School A	Yes	1	3	4	0.030277544	0.000198413	0.303058965	5	1
689	School A	Yes	2	9	11	0.041474654	0.011904762	0.579504289	4.5	3.5
690	School A	Yes	1	2	3	0.142322097	0	0.104806997	5	3
691	School A	No	2	8	10	0.149019608	0.032747409	0.237710944	5	3.5
692	School A	No	3	4	7	0.03030303	0.005555556	0.309527483	4.6667	2
693	School D	No	24	0	24	0.027027027	0	1	4.625	1.7917
694	School D	Yes	5	0	5	0.027027027	0	0.278887547	4.6	2.6
695	School D	No	5	4	9	0.0592	0.00483753	0.4681725	4.6	3.2
696	School D	Yes	2	2	4	0.030252101	0	0.328182898	4.5	3
697	School D	Yes	10	3	13	0.029411765	0.012962963	0.677275572	4.4	2
698	School D	Yes	0	18	18	0.075630252	0	0.838642988	NA	NA
699	School D	Yes	2	3	5	0.029411765	0.003174603	0.216156226	4.5	3.5
700	School D	No	4	4	8	0.035433071	0.003968254	0.562099984	4.5	1.75

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Total In Conns.	Total Out Conns.	Total Conns.	Closeness Normalized	Betweenness Normalized	Eigenvector	Avg. Val. of Info. Provided	Avg. Freq. of Info. Provided
701	School D	Yes	2	5	7	0.034318398	0.001587302	0.525983343	4.5	2
702	School D	Yes	23	0	23	0.027027027	0	1	4.1304	1.4348
703	School D	Yes	4	6	10	0.036809816	0.008531746	0.580694356	4.5	2
704	School D	Yes	2	3	5	0.029411765	0.000396825	0.312897478	4.5	3
705	School D	No	16	2	18	0.028571429	0.003174603	0.967347913	4.3125	1.6875
706	School D	Yes	4	2	6	0.058730159	0.000375375	0.317021612	4.5	3
707	School D	Yes	2	0	2	0.026315789	0	0.108019654	4.5	3
708	School D	No	10	5	15	0.143939394	0.001835529	0.403273898	4.5	2
709	School D	Yes	2	0	2	0.025641026	0	0.041926397	4.5	2
710	School D	Yes	4	8	12	0.034482759	0.019246032	0.751359201	4.5	1.75
711	School D	Yes	1	15	16	0.06185567	0.010714286	0.808540017	5	2
712	School D	No	12	0	12	0.027027027	0	0.415943107	3.5833	1.1667
713	School D	Yes	8	5	13	0.034383954	0.028968254	0.78113031	4.5	1.625
714	School D	Yes	16	0	16	0.027027027	0	0.842770056	4.375	1.5625
715	School D	No	21	6	27	0.060457516	0.262732925	1	4.4286	2.4286
716	School D	No	3	0	3	0.027027027	0	0.195333318	4.3333	2
717	School D	Yes	3	3	6	0.030277544	0.001587302	0.437286634	4.3333	1.6667
718	School D	Yes	3	0	3	0.027027027	0	0.141629231	4.3333	1.6667
719	School D	Yes	3	2	5	0.028571429	0	0.361622466	4.3333	1.6667
720	School D	Yes	3	4	7	0.04109589	0.001190476	0.519461363	4.3333	3
721	School D	Yes	6	0	6	0.027027027	0	0.377445451	4.3333	2.6667
722	School D	Yes	3	3	6	0.036734694	0.007142857	0.242478457	4.3333	1.6667
723	School D	No	3	2	5	0.028571429	0.000793651	0.312482144	4.3333	1.3333
724	School D	Yes	3	24	27	0.158995816	0.039893653	0.499690218	4.3333	2.3333
725	School D	Yes	4	11	15	0.061157025	0.208445946	0.629398087	3.5	2
726	School D	Yes	17	3	20	0.059105431	0.019739932	0.797272973	4.2941	2.2941
727	School D	Yes	16	2	18	0.058917197	0.063138138	0.760836532	4.1875	2.125

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Total In Conns.	Total Out Conns.	Total Conns.	Closeness Normalized	Betweenness Normalized	Eigenvector	Avg. Val. of Info. Provided	Avg. Freq. of Info. Provided
728	School D	No	7	4	11	0.143396226	0.000152266	0.351713608	4.2857	2.1429
729	School D	Yes	4	1	5	0.027777778	0	0.264172712	4.25	2.25
730	School D	No	4	2	6	0.057453416	0.000808501	0.273387455	4.25	3
731	School D	Yes	0	30	30	0.196808511	0	0.821045992	NA	NA
732	School D	No	9	6	15	0.144486692	0.005237266	0.366194931	4.2222	2.1111
733	School D	No	5	9	14	0.147859922	0.000152266	0.404786285	4.2	2
734	School C	Yes	10	6	16	0.144486692	0.002487496	0.436769928	4.2	1.7
735	School C	No	16	5	21	0.059294872	0.095095095	0.790426248	4.25	1.6875
736	School C	Yes	28	3	31	0.142857143	0.029406464	0.629748264	4.2857	1.8571
737	School C	Yes	26	27	53	0.161016949	0.280346764	1	4.4231	2.0385
738	School C	Yes	6	5	11	0.145038168	0.001918458	0.305024262	4.1667	1.6667
739	School C	Yes	7	4	11	0.143396226	0.000270806	0.340612881	4.1429	1.8571
740	School C	Yes	7	4	11	0.143396226	0.000413054	0.346449936	4.1429	1.8571
741	School C	No	23	26	49	0.160337553	0.214285662	0.935890856	4.1739	1.913
742	School C	Yes	8	5	13	0.143939394	0.00079238	0.384299173	4.125	1.875
743	School C	No	8	3	11	0.142857143	0.003363263	0.307536058	4.125	2.125
744	School C	Yes	9	9	18	0.150197628	0.04856399	0.463105811	4.1111	1.8889
745	School C	Yes	9	6	15	0.144486692	0.008460466	0.370730652	4.1111	2
746	School C	Yes	1	2	3	0.030252101	0	0.220993495	4	3
747	School C	Yes	1	3	4	0.031195841	0	0.321862364	4	4
748	School C	No	2	0	2	0.027027027	0	0.130592005	4	3
749	School C	Yes	1	0	1	0.027027027	0	0.036900122	4	2
750	School C	No	1	1	2	0.027777778	0	0.146298362	4	1
751	School C	Yes	1	2	3	0.030252101	0	0.220993495	4	3
752	School C	Yes	3	6	9	0.041237113	0.003042328	0.637320074	4	2.6667
753	School C	Yes	3	2	5	0.034220532	0.000396825	0.368153975	4	1.3333
754	School C	Yes	1	0	1	0.027027027	0	0.049477729	4	1

INVESTIGATING HOW INDIVIDUAL SCHOOL SOCIAL NETWORKS

User ID	School	Survey	Total In Conns.	Total Out Conns.	Total Conns.	Closeness Normalized	Betweenness Normalized	Eigenvector	Avg. Val. of Info. Provided	Avg. Freq. of Info. Provided
755	School C	Yes	1	8	9	0.04494382	0.007142857	0.483537189	4	3
756	School C	Yes	1	2	3	0.028571429	0	0.154965075	4	2
757	School C	No	1	1	2	0.027777778	0	0.144426039	4	3
758	School C	No	3	2	5	0.029387755	0	0.388935282	4	1.6667
759	School C	Yes	1	2	3	0.030252101	0.000793651	0.104893372	4	2
760	School C	Yes	1	0	1	0.027027027	0	0.02302292	4	2
761	School C	Yes	2	7	9	0.036923077	0.004761905	0.495447737	4	1.5
762	School C	Yes	1	6	7	0.067395264	5.00E-05	0.383825212	4	2
763	School C	Yes	1	0	1	0.026315789	0	0.065691885	4	2
764	School C	No	1	0	1	0.026315789	0	0.065691885	4	2
765	School C	Yes	4	4	8	0.059390048	0.003423616	0.407115847	4	2.5
767	School C	No	5	4	9	0.059105431	0.021521522	0.437276265	4	2.6
768	School C	Yes	1	2	3	0.061157025	5.00E-05	0.189808411	4	2
769	School C	Yes	1	2	3	0.062080537	0	0.209491685	4	2
770	School C	Yes	2	4	6	0.059294872	0.000750751	0.287031505	4	2.5
771	School C	Yes	2	9	11	0.060955519	0.02241761	0.529031025	4	3
772	School C	Yes	2	1	3	0.057453416	0	0.173386149	4	2.5
773	School C	Yes	1	4	5	0.066427289	0	0.267837212	4	2
774	School B	Yes	2	0	2	0.026315789	0	0.116050022	4	3
775	School B	Yes	1	0	1	0.026315789	0	0.065691885	4	2
776	School B	Yes	1	3	4	0.062289562	0	0.246950164	4	2
777	School B	Yes	7	4	11	0.143396226	0.003303147	0.310188817	4	2.2857
778	School B	Yes	6	8	14	0.14559387	0.001396932	0.392502531	4	1.8333
779	School B	Yes	2	5	7	0.135231317	0	0.152510339	4	2
780	School B	Yes	10	3	13	0.142322097	0.000397456	0.343824917	4	1.7
781	School B	Yes	6	2	8	0.142322097	0	0.246933941	4	2.3333
782	School B	Yes	2	0	2	0.025641026	0	0.034539595	4	1



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783	School B	Yes	6	6	12	0.146153846	0.000152266	0.372434741	4	2.1667
784	School B	Yes	2	0	2	0.025641026	0	0.020209934	4	2
785	School B	Yes	5	0	5	0.025641026	0	0.158947479	4	2.2
786	School B	Yes	5	9	14	0.147859922	0.01406358	0.393114938	4	1.8
787	School B	Yes	6	4	10	0.142857143	0.004399938	0.265574294	3.8333	1.8333
788	School B	Yes	6	6	12	0.147286822	0.026269926	0.353734983	3.8333	2
789	School B	Yes	4	0	4	0.027027027	0	0.156168546	3.8	1.25
790	School B	Yes	4	7	11	0.060655738	0.013683876	0.53005004	3.75	2.75
791	School B	Yes	4	1	5	0.057187017	0.001376376	0.254009909	3.75	2.25
792	School B	Yes	7	6	13	0.144486692	0.006395158	0.33004915	3.7143	2.1429
793	School B	Yes	3	4	7	0.059294872	0.001208901	0.38437804	3.6667	2.3333
794	School B	Yes	3	5	8	0.059677419	0.000583276	0.456509804	3.6667	2.6667
795	School B	Yes	3	5	8	0.059967585	0.044006507	0.332961418	3.6667	2.6667
796	School B	No	3	2	5	0.062080537	0.000125125	0.261055494	3.6667	2.3333
797	School B	Yes	3	3	6	0.058176101	0.00269789	0.303203847	3.6667	2.3333
798	School B	Yes	21	3	24	0.142857143	0.001114272	0.568197859	4.381	2
799	School B	Yes	5	29	34	0.163793103	0.059520103	0.671932032	4.2	2.4
800	School B	No	5	2	7	0.058637084	0.000875876	0.369818931	3.4	1.6
801	School B	No	3	0	3	0.026315789	0	0.153083457	3.25	2.3333
802	School B	Yes	1	4	5	0.032171582	0	0.363191719	3	3
803	School B	No	1	6	7	0.032258065	0.001190476	0.330295731	3	1
804	School B	Yes	1	0	1	0.027027027	0	0.093691883	3	1
805	School B	Yes	2	0	2	0.027027027	0	0.077052045	3	1.5
806	School B	Yes	1	3	4	0.029411765	0.001587302	0.224420448	3	1
807	School B	No	2	2	4	0.061157025	5.00E-05	0.220518264	3	2.5
808	School B	Yes	1	0	1	0.025641026	0	0.020234694	3	1
809	School B	Yes	1	2	3	0.032142857	0	0.260608835	3	2

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810	School B	Yes	0	0	0	0.027027027	0	0	2	NA
811	School B	Yes	0	0	0	0.026315789	0	0.083614818	1	NA
812	School B	Yes	0	0	0	0.026315789	0	0.117166557	1	NA
817	School B	Yes	0	2	2	0.062080537	0	0.092258201	1	NA

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Appendix L – Data Wise Network Data

User ID	School	Survey	Total In Conns.	Total Out Conns.	Total Conns.	Closeness Normalized	Betweenness Normalized	Eigenvector	Avg. Val. of Info Provided	Avg. Freq. of Info. Provided
648	School A	No	15	0	15	0.027027027	0	0.606451164	4.0667	1.4667
649	School A	Yes	3	2	5	0.028571429	0.000396825	0.328735477	4	2.6667
650	School A	No	0	0	NA	NA	NA	NA	NA	NA
651	School A	Yes	2	2	4	0.029387755	0	0.302291886	4	2
652	School A	No	1	0	1	0.027027027	0	0.045401255	5	1
653	School A	Yes	0	2	2	0.028571429	0	0.170598103	NA	NA
654	School A	Yes	3	5	8	0.03125	0.012169312	0.442745858	3.6667	2.3333
655	School A	Yes	1	3	4	0.059900166	0.00026455	0.324795728	5	1
656	School A	Yes	3	9	12	0.03986711	0.027645503	0.656921409	4	1.6667
657	School A	Yes	1	3	4	0.029411765	0.000529101	0.315179789	5	1
658	School A	No	0	0	NA	NA	NA	NA	NA	NA
659	School A	No	0	0	NA	NA	NA	NA	NA	NA
660	School A	No	1	0	1	0.027027027	0	0.069762187	5	2
661	School A	No	0	0	NA	NA	NA	NA	NA	NA
662	School A	No	0	0	NA	NA	NA	NA	NA	NA
663	School A	Yes	1	3	4	0.030277544	0	0.291800904	3	4
664	School A	Yes	1	2	3	0.028571429	0	0.250729817	3	3
665	School A	No	3	0	3	0.027027027	0	0.181813184	4	1.6667
666	School A	Yes	2	3	5	0.029411765	0	0.366694353	4	1
667	School A	Yes	1	2	3	0.029387755	0.00026455	0.250777322	5	1
668	School A	No	2	0	2	0.027027027	0	0.112050998	3.5	3
669	School A	Yes	1	5	6	0.060100167	0.002645503	0.354143331	5	1
670	School A	No	2	0	2	0.027027027	0	0.06952776	3	1.5
671	School A	Yes	2	3	5	0.029411765	0.000396825	0.343517447	4	1
672	School A	No	0	0	NA	NA	NA	NA	NA	NA
673	School A	No	0	0	NA	NA	NA	NA	NA	NA
674	School A	No	1	0	1	0.027027027	0	0.069762187	5	1
675	School A	Yes	1	6	7	0.032258065	0.001587302	0.300570575	3	1

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676	School A	Yes	0	2	2	0.028571429	0	0.170598103	NA	NA
677	School A	Yes	3	13	16	0.061538462	0.040079365	0.697000446	4.3333	1.6667
678	School A	No	24	0	24	0.027027027	0	1	4.5417	1.75
679	School A	No	2	0	2	0.027027027	0	0.105937689	4.5	1.5
680	School A	Yes	4	4	8	0.03956044	0.001190476	0.597886102	4.25	2.25
681	School A	Yes	1	1	2	0.027777778	0	0.180214041	5	1
682	School A	No	1	0	1	0.027027027	0	0.080131714	3	1
683	School A	No	0	0	NA	NA	NA	NA	NA	NA
684	School A	Yes	11	2	13	0.028571429	0.003835979	0.66446498	4.4545	1.6364
685	School A	Yes	3	1	4	0.027777778	0	0.264840195	3	1.3333
686	School A	Yes	1	2	3	0.029387755	0.00026455	0.250777322	5	1
687	School A	Yes	0	8	8	0.085510689	0	0.427524677	NA	NA
688	School A	Yes	0	2	2	0.032142857	0	0.111420145	NA	NA
689	School A	Yes	4	6	10	0.039647577	0.003174603	0.709208042	4	1.75
690	School A	Yes	0	18	18	0.075630252	0	0.754566925	NA	NA
691	School A	No	0	0	NA	NA	NA	NA	NA	NA
692	School A	No	7	0	7	0.027027027	0	0.446217731	4	1.7143
693	School D	No	23	0	23	0.027027027	0	1	4.1739	1.6522
694	School D	Yes	16	2	18	0.028571429	0.002777778	0.953185434	4.0625	1.75
695	School D	No	0	0	NA	NA	NA	NA	NA	NA
696	School D	Yes	0	4	4	0.031222897	0	0.332733043	NA	NA
697	School D	Yes	1	3	4	0.032142857	0.001587302	0.224020637	5	4
698	School D	Yes	4	4	8	0.03030303	0.000396825	0.55887126	4.5	2
699	School D	Yes	2	2	4	0.030252101	0	0.287674072	4.5	2
700	School D	No	2	0	2	0.027027027	0	0.114844222	4	3
701	School D	Yes	1	5	6	0.03125	0	0.459438892	4	2
702	School D	Yes	2	7	9	0.034449761	0.00244709	0.559135334	5	2.5
703	School D	Yes	1	8	9	0.034482759	0.000992063	0.567321325	5	1
704	School D	Yes	0	8	8	0.036960986	0	0.450514363	NA	NA
705	School D	No	2	0	2	0.027027027	0	0.049498297	2	2

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706	School D	Yes	2	0	2	0.027027027	0	0.096830036	4.5	2.5
707	School D	Yes	0	3	3	0.038135593	0	0.144401351	NA	NA
708	School D	No	6	0	6	0.027027027	0	0.295303284	3.8333	1.5
709	School D	Yes	1	2	3	0.031141869	0	0.184595313	5	2
710	School D	Yes	1	1	2	0.027777778	0	0.150568386	4	3
711	School D	Yes	0	6	6	0.039473684	0	0.317631003	NA	NA
712	School D	No	3	0	3	0.027027027	0	0.124329787	3.6667	1
713	School D	Yes	1	0	1	0.027027027	0	0.069553368	5	1
714	School D	Yes	0	15	15	0.075471698	0	0.725235053	NA	NA
715	School D	No	1	0	1	0.027027027	0	0.018197382	4	2
716	School D	No	0	0	NA	NA	NA	NA	NA	NA
717	School D	Yes	0	10	10	0.043269231	0	0.569981085	NA	NA
718	School D	Yes	2	1	3	0.027777778	0	0.219866671	4.5	2
719	School D	Yes	12	3	15	0.030277544	0.01468254	0.70076023	3.75	1.5
720	School D	Yes	0	4	4	0.033240997	0	0.189744652	NA	NA
721	School D	Yes	3	3	6	0.038054968	0.00952381	0.198489225	2.6667	1
722	School D	Yes	3	6	9	0.038176034	0.012103175	0.531498711	3.6667	1.3333
723	School D	No	1	0	1	0.027027027	0	0.019036027	4	4
724	School D	Yes	1	3	4	0.031195841	0.000793651	0.259515571	2	2
725	School D	Yes	3	3	6	0.031195841	0.00026455	0.409786053	4.3333	3.6667
726	School D	Yes	0	3	3	0.031195841	0	0.254525561	NA	NA
727	School D	Yes	1	7	8	0.038257173	0.004761905	0.426754014	4	1
728	School D	No	0	0	NA	NA	NA	NA	NA	NA
729	School D	Yes	10	3	13	0.029411765	0.003174603	0.753844371	4.5	1.7
730	School D	No	0	0	NA	NA	NA	NA	NA	NA
731	School D	Yes	3	9	12	0.035714286	0.009193122	0.627503062	4.3333	1.3333
732	School D	No	16	0	16	0.027027027	0	0.815471765	4.5	1.75
733	School D	No	1	0	1	0.027027027	0	0.060180422	4	3
734	School C	Yes	19	6	25	0.078389831	0.280837087	1	4.4211	2.3158
735	School C	No	2	0	2	0.026315789	0	0.083614818	3.5	3.5

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736	School C	Yes	1	6	7	0.082774049	5.00E-05	0.379190578	4	2
737	School C	Yes	9	2	11	0.074747475	0.00154321	0.491912062	3.5556	2
738	School C	Yes	4	11	15	0.080434783	0.265346597	0.637743194	3	2
739	School C	Yes	4	3	7	0.07505071	0.000963463	0.332769762	4.25	2.75
740	School C	Yes	15	3	18	0.075510204	0.01668335	0.754645102	4.2	2.3333
741	School C	No	1	0	1	0.026315789	0	0.063169922	4	3
742	School C	Yes	5	4	9	0.075664622	0.004104104	0.468562138	4.2	2.6
743	School C	No	1	0	1	0.026315789	0	0.063169922	4	3
744	School C	Yes	4	4	8	0.075975359	0.004001919	0.407323792	3.75	2.5
745	School C	Yes	0	10	10	0.09273183	0	0.385927535	NA	NA
746	School C	Yes	3	7	10	0.077083333	0.014631298	0.439988731	3	2.3333
747	School C	Yes	6	4	10	0.075510204	0.020733233	0.47790521	3.5	2.3333
748	School C	No	3	0	3	0.026315789	0	0.117166557	3.6667	2.6667
749	School C	Yes	1	2	3	0.078224101	5.00E-05	0.193869781	4	3
750	School C	No	2	0	2	0.026315789	0	0.107771692	4.5	3
751	School C	Yes	1	2	3	0.080434783	0	0.196971976	4	3
752	School C	Yes	2	2	4	0.074747475	0	0.129060025	4	2
753	School C	Yes	2	11	13	0.079913607	0.022069987	0.584895928	3.5	2.5
754	School C	Yes	4	2	6	0.072265625	0.000800801	0.278655174	4.25	2.5
755	School C	Yes	3	9	12	0.078389831	0.024071989	0.49990362	3.6667	2.6667
756	School C	Yes	4	12	16	0.080260304	0.05510302	0.596599203	3.75	3
757	School C	No	7	0	7	0.026315789	0	0.320384665	3.4286	2.5714
758	School C	No	0	0	NA	NA	NA	NA	NA	NA
759	School C	Yes	2	1	3	0.072265625	0	0.172034673	4	2.5
760	School C	Yes	4	1	5	0.072265625	0.001376376	0.259720654	3.75	1.75
761	School C	Yes	1	7	8	0.089371981	0	0.358878275	4	2
762	School C	Yes	17	3	20	0.075819672	0.068991909	0.843873603	4.2353	1.8824
763	School C	Yes	3	5	8	0.077568134	0.050056306	0.290334176	3.3333	2
764	School C	No	2	0	2	0.026315789	0	0.111801608	3.5	2.5
765	School C	Yes	3	0	3	0.026315789	0	0.117166557	3.6667	2.6667

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767	School C	No	1	0	1	0.026315789	0	0.063169922	4	2
768	School C	Yes	1	3	4	0.080786026	0	0.232702607	4	2
769	School C	Yes	0	30	30	0.4625	0	0.828393815	NA	NA
770	School C	Yes	18	5	23	0.075819672	0.102738155	0.870090126	4.2778	1.8889
771	School C	Yes	3	2	5	0.07312253	0.00017	0.268279516	3.3333	2
772	School C	Yes	3	4	7	0.081858407	0.001138639	0.364432731	3.6667	3
773	School C	Yes	3	3	6	0.073412698	0.007476226	0.283397213	3.6667	1.6667
774	School B	Yes	28	3	31	0.142857143	0.006727471	0.659820876	4.2857	1.8571
775	School B	Yes	0	3	3	0.167400881	0	0.103610932	NA	NA
776	School B	Yes	0	8	8	0.173515982	0	0.205561332	NA	NA
777	School B	Yes	7	4	11	0.143396226	0.002665683	0.324256772	3.5714	2.2857
778	School B	Yes	24	27	51	0.161016949	0.257371514	1	4.0833	1.9167
779	School B	Yes	6	4	10	0.142857143	0.000456726	0.302133684	4	1.6667
780	School B	Yes	10	5	15	0.143939394	0.001844337	0.4247663	4.3	2.1
781	School B	Yes	5	9	14	0.147859922	0.000161074	0.426643188	4	1.8
782	School B	Yes	1	2	3	0.142322097	0	0.112068993	5	3
783	School B	Yes	8	9	17	0.150197628	0.048097408	0.462047548	4	1.625
784	School B	Yes	6	5	11	0.145038168	0.006866485	0.303443591	3.8333	1.8333
785	School B	Yes	10	7	17	0.145038168	0.00380024	0.479023279	4.2	1.7
786	School B	Yes	24	26	50	0.160337553	0.250104879	0.979849468	4.25	1.7083
787	School B	Yes	6	8	14	0.14559387	0.001168661	0.41438393	3.6667	1.8333
788	School B	Yes	6	4	10	0.143396226	0.000161074	0.348646927	4.1667	2.1667
789	School B	Yes	0	25	25	0.231707317	0	0.452053808	NA	NA
790	School B	Yes	9	6	15	0.144486692	0.007839936	0.390677969	3.6667	1.6667
791	School B	Yes	2	5	7	0.137184116	0	0.161888312	4	2
792	School B	Yes	10	3	13	0.142322097	0.000397456	0.368192172	4	1.8
793	School B	Yes	9	6	15	0.144486692	0.005032703	0.385124038	4.1111	2.2222
794	School B	Yes	2	8	10	0.149019608	0.032835467	0.252186125	5	3.5
795	School B	Yes	6	2	8	0.142322097	0	0.259832992	3.5	2.3333
796	School B	No	2	0	2	0.025641026	0	0.037224959	4.5	2

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User ID	School	Survey	Total In Conns.	Total Out Conns.	Total Conns.	Closeness Normalized	Betweenness Normalized	Eigenvector	Avg. Val. of Info Provided	Avg. Freq. of Info. Provided
797	School B	Yes	6	2	8	0.141791045	7.74E-05	0.275692593	3.5	2.1667
798	School B	Yes	8	5	13	0.143939394	0.000801188	0.403219044	4.25	1.875
799	School B	Yes	7	6	13	0.144486692	0.005753291	0.341977101	4	1.8571
800	School B	No	2	0	2	0.025641026	0	0.021901518	4	2.5
801	School B	No	1	0	1	0.025641026	0	0.021629098	3	1
802	School B	Yes	3	24	27	0.158995816	0.028935514	0.525825263	4.3333	1.6667
803	School B	No	5	0	5	0.025641026	0	0.167752293	4	2.2
804	School B	Yes	8	4	12	0.143396226	0.000279614	0.379707794	3.875	1.875
805	School B	Yes	7	2	9	0.141791045	0.000338186	0.289527924	4.2857	2
806	School B	Yes	8	3	11	0.142857143	0.002837565	0.320551727	4	1.625
807	School B	No	2	0	2	0.025641026	0	0.043736359	3.5	2
808	School B	Yes	20	2	22	0.141791045	0.001351351	0.524764695	4.2	2
809	School B	Yes	0	3	3	0.165938865	0	0.104524316	NA	NA
810	School B	Yes	6	6	12	0.147286822	0.025926194	0.370995499	3.8333	2
811	School B	Yes	5	29	34	0.163793103	0.060852458	0.702600969	4.4	2.4
812	School B	Yes	5	9	14	0.147859922	0.014030207	0.409232487	3.8	1.8
817	School A	Yes	1	0	1	0.027027027	0	0.080131714	3	2



## Glossary

**Betweenness:** a social network analysis measure that quantifies the number of times a node is in between two other nodes in the network.

**Broker (gatekeeper):** individuals with high betweenness scores who are between groups of people in the network.

**Centralization:** a social network analysis measure that measures how central the most central nodes are when compared with the other nodes in the network.

**Centrality:** social network measures that identify the most central vertices or nodes in a network.

**Closeness:** a social network analysis measure that measures the length of the average shortest distance between a node and all other nodes in the network.

**Density:** is a social network analysis measure that determines the total number of ties divided by the total number of pairs in the network.

**Degree:** is a social network analysis measure that determines the total number of connections that a node is connected with.

**Eigenvector:** is a social network analysis measure that explores how influential a node is within the network.

**Gatekeeper (broker):** individuals with high betweenness scores who are between groups of people in the network.

**In Connections (in degree):** a social network analysis measure that determines the number of nodes that go to another node for information.

**Node:** individuals, people, actors, or things within a network.

**Out Connections (out degree):** a social network analysis measure that determines the number of nodes that one individual node goes to for information.

**Social Network Analysis:** the use of network or graph theories to explore and study social structures (interactions, communication, trust, etc.).

**Sociogram:** a visual or graphic representation of the nodes and ties in a social network.

**Tie:** relationships, interactions, links, or connections between nodes in a network.

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