

School Staff Advice-Seeking Patterns regarding Support for Vulnerable Students

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Abstract

Purpose

Supporting the learning and wellbeing of vulnerable students is an important yet challenging part of school educators' work. This study investigates advice-seeking patterns around the issue of supporting the learning and wellbeing of vulnerable students, among professional staff in six English secondary schools. The paper focuses on (1) investigating variation in advice-seeking patterns among schools, (2) exploring the association between these patterns and staff perceptions of the school climate for collaboration, and, (3) examining how these informal advice-seeking patterns relate to formal support arrangements in the schools.

Methodology

A mixed methods approach that combined findings from Social Network Analysis (SNA) with in-depth interviews was used.

Findings

It was found that advice-seeking patterns among staff vary substantively, even among similar schools. Furthermore, schools with more cohesive and reciprocal advice networks also showed a stronger climate for collaboration (i.e., mutual respect and distributed leadership). Also, formal organizational structures and informal advice-seeking structures showed coherence in our sample, as formally designated leaders, such as the Headteacher and the

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Special Educational Needs Coordinators (SENCOs), were generally highly central to their schools' advice network.

Originality

This study advances the field as there is little research that examines the social networks of educators in England, and no previous studies that explore teacher advice-seeking networks in relation to supporting vulnerable students, internationally.

Keywords: advice-seeking patterns, social network analysis, mixed methods, vulnerable students.

Article Classification: Research paper

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Introduction

Tackling social inequality has become an imperative in England as research has shown that the country is one of the most unequal societies in the developed world (e.g., Hills et al., 2010). A recent report by the United Nations Children's Fund (UNICEF) comparing inequality in child wellbeing in rich countries along the dimensions of income, health, life satisfaction, and education indicates that England performs worse when it comes to tackling inequality for vulnerable and disadvantaged children in the latter dimension (UNICEF, 2016). In other words, the country is experiencing challenges in meeting the needs of its most disadvantaged children, particularly when it comes to education. When focusing on secondary schooling in England, students with special needs, from deprived backgrounds, and from certain ethnic groups are more likely to show low academic performance (Author, 2017; DCSF, 2009; Kingdon and Cassen, 2010).

Educational inequality has important consequences for vulnerable children as achievement is strongly related to long-term outcomes such as school dropout, access to higher education, employment chances, wages, and anti-social behavior (Boudon, 1974; McIntosh and Vignoles, 2000; Newman *et al.*, 2012). In this context, supporting the learning and wellbeing of vulnerable students becomes an important and challenging part of educators' work. It is an expectation in the standards for all teachers in England that they will meet the needs of all learners, including those who are most disadvantaged (DfE, 2013). We, deliberately, do not refer to the literature on at-risk students in this paper as this involves a multiplicity of vulnerabilities rather than that of the schools' concern which was students not making progress against expected attainment goals.

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When teachers collaborate, they can mobilize and exchange information, knowledge, and resources (Goddard *et al.*, 2007). This, in turn, can help them to improve their practice, overcome difficulties, and achieve their instructional goals (Author *et al.*, 2005; Chapman and Aspin, 2003; Vescio *et al.*, 2008). It follows that collaboration that supports teacher professional development and capacity building in schools around the issue of promoting the learning and wellbeing of vulnerable students should play an important role in improving student outcomes and tackling educational inequality.

However, in their comprehensive review of teacher collaboration, Vangrieken, Dochy, Raes and Kyndt (2015) noted that research has tended to focus on the effects of teacher collaboration rather than gain insight into the phenomenon of teacher collaboration itself. To date, there is little empirical understanding of the patterns of practitioners' collaboration around the issue of supporting disadvantaged children. A more in-depth investigation of school staff advice interactions may uncover important characteristics of the social structures that facilitate or impede their efforts to support the learning and wellbeing of vulnerable students.

The present study examined school professionals' advice-seeking patterns, around the issue of supporting the learning and wellbeing of vulnerable students, in six English secondary schools, with a focus on (1) studying variation in advice-seeking patterns between schools, (2) exploring the association between these patterns and staff perceptions of the school climate for collaboration, and (3) investigating the relationship between the formal peer support structures in place at schools and their informal advice interactions.

While the advance of the field requires the accumulation and contrast of evidence from different context, the issue is also of particular relevance for England's school context of performativity as failure to make expected progress is the primary point of accountability (Ball, Maguire, and Braun, 2012).

Conceptual Framework

The importance and potential of educators working together

In the past two decades, educational researchers, practitioners, and policy makers have become increasingly interested in the potential of professional relationships among school staff and teacher collaboration for improving teaching and learning (e.g. Hargreaves and Fullan, 2012). Advocates of the key role of collaborative structures in schools have placed emphasis on different aspects of collaboration and referred to the phenomenon using different terms. While some authors have referred to communities of practice (Vescio *et al.*, 2008; Wenger, 1998) others have talked about learning organizations (Senge, 2006), professional learning communities (Stoll and Seashore Louis, 2007), distributed leadership (Spillane, 2006), distributed expertise (Brown *et al.*, 1993), or relational agency (Edwards, 2005). Despite the different terminology applied, the significance and impact of collaboration on school improvement and teacher development has been stressed internationally. In the United Kingdom (UK), school social networks, and teacher collaboration in particular, have also been identified as key aspects of successful school improvement (e.g., Brown *et al.*, 2016; Durrant and Holden, 2006; Earl and Katz, 2007; Hargreaves, 2001, 2003; Hopkins and Reynolds, 2001).

The literature suggests that development of a school collaborative structure can improve student performance (e.g., Author *et al.*, 1997; DuFour and Eaker, 1998; Goddard *et al.*, 2007; Leana and Pil, 2006; Louis and Marks, 1998; Pil and Leana, 2009; Yasumoto *et al.*, 2001). Collective efficacy in professional learning communities can enhance the quality of teaching (Lomos *et al.*, 2011), affecting student engagement, teacher quality, and, ultimately, student learning, especially with regard to vulnerable children (Leana, 2011). Furthermore,

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previous research has shown that interventions that involve teachers taking a collective responsibility for students' wellbeing and attainment, through collaboration that is focused on their students' learning, are effective in supporting the progress of vulnerable learners (e.g., Bolam *et al.*, 2005; Goddard *et al.*, 2007).

Despite the agreement on the importance of developing professional learning communities and collaborative structures among teachers within and across school departments, creating collaborative practices and ethos can be problematic. Schools often face barriers such as professional individualism and isolation (Croft *et al.*, 2010; Havnes, 2009). Author *et al.* (2005) demonstrated that effective peer support in schools does not occur spontaneously but instead requires formal training in: the skills of supervision and support; the successful development of a sense of ownership among practitioners; and on-going support and facilitation from leadership teams. This involves a school culture that promotes a high degree of teacher collaboration, openness, and explicitly shared values.

It has been proposed that a school's pattern of interactions among staff is also influenced by the way in which the school is formally organized (Penuel, 2010). The formal organization of arrangements for peer support and leadership encouragement in schools can facilitate and provide the structure for staff to engage in collaborative work. Studying how formal arrangements within schools relate to informal collaboration can significantly advance our understanding of the ways in which staff collaboration takes place.

The current study addresses the impact of social networks that are developed between teachers in schools. We argue that understanding leadership from a distributed perspective involves positing leadership activity as a situated and social process (Hartley, 2009). Therefore, from the perspective of distributed leadership we are interested in how leadership practices are enacted by many stakeholders rather than merely by those in designated leadership roles. Distributed leadership was chosen rather than more individualistic accounts,

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for example, transformational leadership, because our focus was on the social networks in which mutual respect develops. As Bolden (2011) points out distributed leadership is an emergent field with a multiplicity of influences which are made manifest in a variety of different guises. We share Gronn's (2000) view that distributed cognition and activity theory are key concepts in understanding distributed leadership. Our research is heavily influenced by Engeström's (1999) perspective on human action mediated by activity systems. Hence our interest in analyzing the social situations in which activity takes place. Engeström focuses on the rules, community and division of labour in the social situations which he studies. Our primary focus here is on the division of labour in the work of school teachers as they attempt to respond to diverse and complex student needs.

Researching school staff collaboration using Social Network Analysis (SNA)

Over the last two decades, research on school staff collaboration has turned to the analysis of informal collaborative practices and how these interactions can bring upon new knowledge, information, and resources to school communities (Daly and Finnigan, 2010). As noted by Moolenaar (2012), this trend has been supported by the development of Social Network Analysis (SNA), a technique used to quantify and visualize the ties and overall structures of relationships and interactions in organizations. Under this perspective the often-elusive concept of teacher collaboration has been operationalized as the reported patterns of specific interactions among educators. This perspective goes beyond schools' formal roles and structures as it identifies and focuses on informal interactions between professionals. This is the case in previous research on teacher support networks within schools and districts (e.g., Anderson, 2010; Daly *et al.*, 2010; Moolenaar *et al.*, 2011; Penuel *et al.*, 2009).

This body of research suggests that schools can differ considerably in relation to their internal social network structures (Bakkenes *et al.*, 1999; Daly *et al.*, 2010; Dorner *et al.*,

2011; Spillane and Healey, 2010) and, more specifically, in the frequency of teacher interactions and their centralization around influential leaders (Moolenaar *et al.*, 2010). For example, Daly *et al.* (2010) found significant variance in teachers' social networks both between and within schools (at grade levels in primary schools). This is particularly important as access to resources, such as knowledge, expertise, information, and support for effective teaching, has been found to be unevenly distributed within teacher networks (Finnigan and Daly, 2010; Kelchtermans, 2006). Thus, the structure of teacher network relations can serve both to support and constrain opportunities for both resources flow and creation.

Previous studies also suggest that schools' formal hierarchical structures are not always replicated in their informal (social network) structure. Indeed, the patterns of interactions among school staff are often not aligned with the way in which the roles of Headteachers, support staff, and teachers are officially structured (Coburn, 2005; Penuel *et al.*, 2010; Spillane *et al.*, 2010). Staff in leadership roles do not always play their intended central advisory function and are sometimes situated in a peripheral position in their schools' advice network (Atteberry and Bryk, 2010; Coburn and Russell, 2008; Cole and Weiss, 2009; Kochan and Teddlie, 2005; Penuel *et al.*, 2010; Spillane and Healey, 2010).

While abundant research on teachers' advice-seeking networks has been carried out, particularly in the United States and the Netherlands (e.g., Daly and Finnigan, 2010; Friedkin and Slater 1994; Moolenaar *et al.*, 2011; Pitts and Spillane, 2009), little is known about the English context where, to our knowledge, only one study has applied SNA to quantify teachers' professional relationships (i.e., Brown *et al.*, 2016). This previous study focused on general expertise-seeking behaviors of primary school teachers. To date, there is no research on staff collaboration at the secondary school level using SNA in England. Furthermore,

internationally, collaboration networks for supporting vulnerable students, a key aspect of educators' work, have not been studied.

Research aims

The present study investigated the variation in advice-seeking patterns among staff in secondary schools. The focus in this article is placed on professional networks of advice on supporting vulnerable students' learning and wellbeing. Patterns of staff active engagement with colleagues aimed at supporting vulnerable learners in schools are portrayed drawing upon social network methods, in combination with qualitative data.

This study aimed to extend our understanding on the variation of advice-seeking patterns among schools by describing and visualizing their informal (social network) structure. Then, using both quantitative and qualitative approaches, we focused on investigating whether these patterns of teacher advice interaction relate to the schools' institutional climate for collaboration.

Finally, the relationship between the formal structure of roles and informal collaborative practices in schools was also investigated. This is, whether school leaders, according to the schools' formal organization, played a central role in the informal patterns of advice interactions. Thus, the location of Headteachers and Special Educational Needs Coordinators (SENCOs) within the informal advice networks was examined in order to determine whether these networks were centralized around special needs and leadership staff.

The study was guided by the following research questions:

1. Do schools vary in terms of their staff advice-seeking patterns?
2. Is there a relationship between the perceived school culture for collaboration and advice-seeking patterns?

3. Is there coherence between the school's formal organizational structure and their informal advice networks?

Methods

Sample

This mixed-methods exploratory study was conducted in the academic year 2014-15 and examined six state secondary schools in an ethnically mixed small city in the South-East region of England with wide disparities between areas of wealth and poverty. The participant schools reflected the local diversity as they differed in terms of overall levels of academic performance and serve communities with different deprivation levels. The sample schools were involved in a wider local partnership that aimed to raise standards for vulnerable learners and accelerate students' academic progress through the creation of Professional Learning Communities (PLC). The Headteachers of these schools were committed to the idea of fostering greater interaction among staff. In that sense, the participant schools might have been more focused on promoting collaboration than the majority of England's secondary schools. However, despite the establishment of these PLCs, on-going concerns about the well-being and attainment of disadvantaged students remained. There were also concerns expressed by Headteachers in partnership meetings about variation between the schools with regard to vulnerable students' attainment and the implementation of the PLC interventions.

Table 1 provides demographic data, such as size, attainment, attendance and deprivation indicators, for the sample schools, according to official statistics from the UK Department of Education. There is clear variation within the sample, with schools deviating from the county average in both directions for most of the indicators.

[Insert Table 1 about here]

Procedure

This study examined advice-seeking patterns among school staff, in relation to addressing the needs of vulnerable learners, using a mixed method approach to data gathering and analysis. To capture the complexity of professional interactions, the mixed methods approach addressed different aspects of the research questions (Gorard and Taylor, 2004): a quantitative analysis of advice networks within the schools; and both a quantitative and qualitative analysis of the perceptions of the teachers in these schools regarding their schools' climate for collaboration. Social network methods and qualitative research techniques are often used complementarily to study interactions in schools (e.g., Penuel et al., 2009; Daly et al., 2010), as the former provides a valuable detailed picture of the patterns of collaboration that can be further interpreted in the light of in-depth qualitative data.

Social network data collection. Quantitative survey data were collected to portray school advice networks and staff perceptions of school climate for collaboration. To this end, an on-line questionnaire was administered to 484 professionals working in the six participant schools. The instrument covered several background characteristics, including gender, the number of years each spent working in schools in general and in their current school in particular, perceptions of school climate for collaboration, and frequency and impact of collaboration with other colleagues in their school. A very satisfactory survey response rate of 90%, with a range of 81 (for School C) to 98% (for School E), was obtained. However, the response rate for network items was less optimal (ranging from 61 to 91%) as response rates over 80% are recommended in the specialized Social Network Analysis (SNA) literature to ensure valid results from relational data (Kossinets, 2006; Stork and Richards, 1992). Indeed,

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SNA is extremely sensitive to even small percentages of missing data, as they can bias key network properties such as density and centralization, particularly when small organizations (e.g., less than 100 members) are examined (Knoke and Yang, 2008; Wasserman and Faust, 1998). As it is explained below, this issue was addressed by using data reconstruction techniques. Table 2 provides the overall school staff demographics, which are somewhat consistent across schools.

[Insert Table 2 about here]

We examined whole school staff networks, where network boundaries were defined to include all members of staff who worked with students in an educational role. This included teachers but also pastoral support workers, the Headteacher and leadership team, SENCOs, etc. Staff lists of the school members were obtained from the participant schools and used in the on-line questionnaires for staff to identify colleagues who were part of their advice network. A bounded method strategy is favored in social network research as it allows researchers to depict, and obtain valid estimates from, the complete network of interest (Scott, 2000).

Participants were asked about their collaboration with colleagues on supporting vulnerable students in their learning and wellbeing. More specifically, they were asked to identify the colleagues that they had turned to for advice or information on supporting vulnerable learners in their learning or wellbeing over the past school year. In this study, vulnerable learners were defined as those students who fail to meet their attainment targets. This definition was proposed by the participant schools as it is meaningful for the English context where the school accountability system was based on measures of student expected academic progress.

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Respondents were able to nominate from none to up to five colleagues as people that they went to for advice or information on supporting vulnerable learners¹. The inverse question, that is, “who had turned to them for advice or information on supporting vulnerable learners,” was also asked in order to symmetrize and reconstruct data. The former technique consists of calculating a summary statistic (the mean in this case) when answers from pairs of respondents were discordant and the latter is used to impute missing values if only one of the two sides of the relationship responded (Borgatti, Everett, and Johnson, 2013)². Participants were also prompted to indicate, for each of their nominated colleagues, the frequency of the interactions (i.e., “how often you turned to this person for advice?”), on a four-point scale ranging from 1 (a few times a year) to 4 (daily or almost daily) and the impact of the interaction (i.e., “how much did this influence you?”) on a three-point scale ranging from 1 (not at all influential) to 3 (very influential).

Collection of interview data. Qualitative data were collected using semi-structured interviews with a purposive sample of key members of staff (Headteachers, SENCOs, and classroom teachers) in order to triangulate the results obtained from the quantitative analysis, as well as to identify the types of informal collaborative practices that take place in the sample schools and their perceived impact on teacher practice and vulnerable students’ learning and wellbeing. Semi-structured interviews were conducted with four staff members from each school: the Headteacher, the Special Educational Needs Coordinator (SENCO), a long serving classroom teacher, and a recently qualified classroom teacher. The Headteachers were interviewed because of their central leadership role in implementing the PLCs and the SENCOs because of their importance in coordinating staff and activities designed to meet the needs of students with special educational needs. Individual teacher interviewees were selected based on the simple criteria of the long serving teacher having at least five years of service in their school and at least ten years of teaching experience overall,

and the recently qualified teacher in their first year of teaching experience. Table 3 provides details of the teaching experience, gender, and school role of the participants.

[Insert Table 3 about here]

Although this represent a very small sample, the proportion of 62% female and 28% is exactly in line with national data on the schools' workforce (DfE, 2016). A semi-structured interview protocol was developed and used for both school leaders (Headteacher and SENCO) and for teachers. The interviews were on average an hour-long. The interview protocol was designed to elicit the teachers' perceptions of levels of collaboration in their schools and the nature of these interactions. The interview questions are listed in Appendix 1. Data collection of both SNA and interview data took place between January and April of 2015.

Social network data analysis. The relational items were analyzed using Social Network Analysis (SNA), a technique that maps and measures relationships between people. In this study, SNA was used to (1) describe and map the internal social structure of the schools and (2) identify the positions of Headteachers and SENCOs.

The increasing availability of statistical software for SNA has resulted in growing international interest and a rapid increase in the numbers of studies applying this method in the field of education (Carolan, 2014; Lima, 2010). In this study, data formatting, recoding, and descriptive analyses were conducted in SPSS. We then calculated a series of network measures using the R igraph package (Csardi and Nepusz, 2006). School networks are represented using a series of social network measures and sociograms, developed using the graphical capabilities of this package.

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In order to answer Research Question 1 and inform Research Question 2, we were interested in describing and comparing schools through basic social network measures that reflected the cohesion, reciprocity, clustering, and centralization of their staff networks as a whole. To depict network cohesion and compare collaboration levels among schools we focus on the *average number of colleagues nominated* by participants. Network density, calculated as the ratio of existing ties divided by all possible ties, is another measure often used to indicate group cohesion (Blau, 1977). However, this measure is highly sensitive to network size and the staff networks in our sample were of different size, so we report this indicator but do not over-rely on it for interpretation.

The measure of *reciprocity* reflects the proportion of mutual connections in a directed network. Values can range from 0 to 1 and the closer to 1, the reciprocity coefficient, the more reciprocal the network. It is expected for reciprocity in the study's advice-seeking networks to be low, as the nature of this relationship tends to be asymmetrical. However, it is still interesting to observe to what extent these relationships have a higher tendency to be reciprocated in some schools than others. This property is important as networks with higher reciprocity can be described as more "equal", while those with lower reciprocity tend to be more hierarchical.

Another network-level measure of interest is the *clustering* coefficient. This is simply the ratio of the triangles (i.e., groups of three actors that are connected to each other forming a triangle) and the connected triples (i.e., the groups of three actors where an actor is linked to an unordered pair of actors, but this pair of actors are not connected to each other) in the network, and ranges from 0 to 1. The clustering coefficient measures the extent to which colleagues with whom a given teacher interacts with also interact with each other.

Finally, in this study, network *centralization* reflects the variability in the in-degree centrality of individuals in a network, or, in other words, to what extent relations are focused

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on one or a small set of actors (Wasserman and Faust, 1998). The network-level centrality scores were normalized by dividing by the maximum theoretical centrality for a network with the same number of actors. Centralization coefficients range from 0 to 1, with higher scores indicating more centralized networks. In the context of this study, a network that is highly centralized is one in which advice is sought only from a small set of educators. In those cases, central actors are in a position of power and control and are likely to exercise a disproportionate amount of influence on the network.

To address Research Question 3, we focused on comparing the centrality of formal leaders and coordinators (i.e., Headteachers and SENCOs) across schools. For this purpose, we analyzed these actors' degree of centrality, a relevant individual-level SNA measure (Carolan, 2013). In general, actors that are of higher degree centrality are those with a greater number of in/out ties, or, in other words, those who interact with other actors the most (Borgatti *et al.*, 2013). Since advice-seeking was defined as a directed tie in this study, we focused specifically on *in-degree centrality* of formal leaders, that is, the number of ties these actors received, as this provided an indication of how much they were sought after for advice on supporting vulnerable students. The higher the in-degree centrality value, the more incoming ties the actor received and the more popular he/she is in the network. Analyzing the in-degree centrality of Headteachers and SENCOs across schools allowed us to assess whether their position reflected the central role they were expected to play in their school advice network. This, in turn, allowed us to evaluate the coherence between the schools' formal organizational structure and their informal advice networks.

In addition, to answer Research Question 2, we characterized schools using two measures of school climate for collaboration: '*Mutual respect*' and '*Distributed leadership*', collected through the on-line questionnaire administered to the school staff. These scales consist of factor scores calculated from Likert scale items obtained from the Teaching and

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Learning International Survey (TALIS) developed by the Organization for Economic Co-operation and Development (OECD) (2014). The ‘Mutual respect’ index refers to the extent to which there is a respectful and supportive collaborative culture within the school. The ‘Distributed leadership’ index captures the overall degree to which school heads share their responsibilities within their institution. Table 4 lists the items that compose these scales. Items were answered on a four-point scale and the response categories were 1 for “strongly disagree”, 2 for “disagree”, 3 for “agree”, and 4 for “strongly agree”. The scales showed a high internal consistency in our sample (Cronbach’s $\alpha > .80$). The ‘Mutual respect’ and ‘Distributed leadership’ scales were calculated to have a mean of 0 and a standard deviation of 1. Thus, negative values indicated a below average level and positive values an above average level in these scales.

[Insert Table 4 about here]

We hypothesized that school networks characterized by favorable perceptions of climate for collaboration would present more interactions among staff and higher reciprocity and clustering, as well as lower centralization levels.

Analysis of interview data. The 24 interviews conducted with teachers and school leaders were audio-recorded and transcribed. Interview data from each of the six schools were analyzed by four members of the research team using three cycles of data reduction and portrayal. In each cycle, emergent categories of these teachers’ perceptions of the professional learning communities in their school were coded and recoded. In particular, and with the aim of informing Research Question 2, the analysis focused on staff perceptions of school climate for collaboration. These cycles produced the analytical categories of: a

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collaborative learning community (schools A and E); a negotiated professional learning community (schools C and F); and an imposed learning community (schools B and D).

Combining findings from quantitative and qualitative data. The two analytic methods we used in this study were (1) SNA that facilitated the analysis of the schools' social structure, and (2) case studies, conducted through interviews with teachers and school leaders, that gave us insights on specific themes related to the topics of collaboration and support to vulnerable students. Analytically, the two methods were mutually informing as social network data gave context and permitted clear school-to school comparisons that guided the analysis of the case study data, and the case study data helped us to interpret the social network data and propose deeper explanations on how and why the advice networks varied from school to school.

Results

Variation in school advice networks

In this section, we summarize and depict the advice-seeking patterns around supporting vulnerable students in the participant schools. The results are suggestive of considerable variation between the schools in the the extent to which leadership was distributed. Table 5 shows a series of network indicators that are helpful in describing the patterns of interactions for each school individually and in comparing with the rest of the participant schools.

[Insert Table 5 about here]

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Network size refers to the number of nodes (staff) that make up the school network and ranges from 65 to 136. We explored the frequency and impact of informal collaborative exchanges that take place in the sample schools by asking how often teachers approached each of the nominated colleague(s) for advice and what impact the interactions with each of the nominated colleague(s) had on their practice. These aspects were summarized at the school level by indicators average frequency of interactions and the average impact of interactions. Most participants turned to colleagues for advice or information on supporting vulnerable students from “a few times a year” to “once or twice a month”. Also, participants tended to rate these interactions as “somewhat influential” and “very influential”. Statistically significant differences across schools on the average frequency and impact of these interactions were not found.

Table 5 suggests that the 6 participant schools differed somewhat in relation to overall density, reciprocity, centralization, and clustering of interactions. Several of these features are evident in the visual inspection of the network diagrams shown in Figure 1.

[Insert Figure 1 about here]

The average density of the networks in the participant schools was .05, indicating that, on average, only 5% of the potential advice seeking ties was realized (this result might be influenced by the limitation of participants being asked to nominate 0 thru 5 colleagues). School C showed the lowest proportion of advice relationships between school staff members (.02) while School E was the network with the highest density (.07). However, this finding has to be interpreted with caution, as network density is highly sensitive to network size. If we look at the number of colleagues nominated by the participants, we can see that, on average, participants nominated 2.96 colleagues. Using the Kruskal-Wallis test we found that

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the participant schools differed significantly in relation to the number of colleagues they went to for advice on supporting the learning and wellbeing of vulnerable students ($H(5) = 30.30, p < .001$). In a more detailed inspection, it was found that this general variation was driven by staff in School A nominating a significantly higher number of colleagues than staff in Schools C and D.

The average reciprocity level for the sample of schools was .27, indicating that only about a quarter of all ties were mutual. This low value is unsurprising given the asymmetrical nature of advice-seeking relationships. However, there was some variation on this indicator with School D showing the lowest proportion of reciprocated interactions (.20) and School E presenting over a third of mutual ties (.35), which is indicative of a less hierarchical network in the latter case.

There were also differences across schools in terms of network centralization reflecting, for example, that in School B relations were focused on one or a small set of actors (centralization = .34) whereas in Schools C and F, school advice was sought from a larger set of teachers/staff (centralization = .19 and .18, respectively).

The clustering coefficient, indicating the proportion of closed triangles in the network, also differed somewhat across schools, with Schools C and F (clustering = 0.19 and 0.18, respectively) being less likely to show closed advice sub-groups or communities than, for example, Schools A and D (clustering = 0.25 and 0.24, respectively).

Advice-seeking patterns and perceived school culture for collaboration

With regard to staff overall perceptions of climate for collaboration, there were statistically significant differences among schools on the 'Mutual respect' scale, as determined by the Kruskal-Wallis test ($H(5) = 43.56, p < .001$). More specifically, staff in schools A and E showed significantly higher scores in the 'Mutual respect' scale than schools

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B and D. With regard to the 'Distributed leadership' scale, statistically significant differences among schools were also found ($H(5) = 35.88, p < .001$), with schools A and E showing significantly higher scores than all the other participant schools.

When combining these results and the ones presented in the previous section, a trend seems to emerge: schools with a more positive climate for collaboration, such as schools A and E, also showed higher density levels, higher average numbers of outgoing ties (nominations) and larger proportions of reciprocal interactions, whereas schools in which staff reported a more negative climate for collaboration (e.g., schools B and D) presented lower density, fewer nominations per participant, and less reciprocal interactions. At the school/network level, visual inspection of the results in Table 5, showed that there did not appear to be a linear association between school climate for collaboration and centralization, nor between school climate for collaboration and clustering, as schools with a positive climate could be found at different levels of the centralization and clustering scales (e.g., schools A and F).

These results were in line with our qualitative findings. Schools A and E were identified from the coded interview data as being collaborative learning communities with more open and reciprocal interactions regarding vulnerable learners; schools C and F were categorized as negotiated professional learning communities with some interaction but with senior management lead; and B and D were depicted as imposed learning communities where senior management led and controlled discussion. For example, an experienced female English teacher in School C criticized the effectiveness of the role of some senior managers with responsibility for teaching and learning in the school:

We have to show what we can do (in lesson observations). I'm not sure that actually in practice that that's the best model. I think actually we could learn from each other,

and if we divvied up the sorts of roles that those one or two people have I think it would be more interesting and perhaps more useful. I think we actually ignore quite a lot of expertise in the model that we have. (Karen, School C)

This was contradicted by the SENCO in School C, a member of the School Leadership Team (SLT), who felt that change in the school was “not having SLT driving and forcing change, but actually bringing on board staff and saying look you’re the cogs that are moving this machine forward” (SENCO, School C).

Formal versus informal collaboration structures: Central actors

Social network analysis allows us to identify the actors that play critical roles in the advice networks within schools. The sample schools have designated leaders whose formal role is to support the work of, and provide advice to, their colleagues. In this section, we analyze how formally designated leaders were positioned in their schools’ informal advice-seeking networks. To this end, we analyze and compare the set of connections of Headteachers and SENCOs across schools.

In Figure 1, node sizes represent the in-degree centrality of the actors, normalized by the number of actors in the network. As shown in this figure, across the six participant schools, SENCOs were at the center of the advice-seeking network, although the SENCO was more central in schools A, B and E than, for example, in School F. The in-degree centrality coefficients for SENCOs showed that they were nominated very frequently by their peers as someone they went to for advice on supporting vulnerable students. When dividing the in-degree centrality scores of each school network into deciles, SENCOs were consistently located in the highest decile, confirming that, as expected, they occupied a central role in their school advice network.

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Individual data on Headteachers' set of connections also revealed patterns in their ties to other colleagues. Headteachers were less central to these advice networks than SENCOs and their centrality also varied across schools. Whereas in one of the schools the Headteacher's in-degree centrality score was within the highest decile (i.e., School F), in two of the networks the Headteacher's in-degree centrality score was within the seventh decile (i.e., Schools A and B), indicating that they were not always amongst the staff most sought after for advice on supporting vulnerable students. The importance of the support offered by SENCOs and, to a lesser extent, Headteachers, was also frequently mentioned in the interviews.

Finally, at each of the participant schools, all of the other members of staff that were within the 10% most central actors had formal leadership roles (for example, they were Subject Leaders, Year Leaders, Assistant Heads, etc.).

Two case studies

In this section, we illustrate two contrasting cases of school staff communities in our sample. Based on the results presented above, we identified and focused on two schools with similar demographic characteristics yet with very different profiles of staff advice-seeking patterns regarding vulnerable learners.

Schools A and D were both secondary academies (state secondary schools but independent of the local education authority). The Headteachers were both female, in their mid-50s, and had been at their school for several years (School A for 8 years and School D for 10 years). Both had successfully led their school out of a period when they had been judged inadequate by Ofsted (the educational inspectorial body in England). Also, the two schools were comparable in size, and they were not statistically significantly different in terms of teachers' demographics. They had equivalent levels of external public funding and

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served a similar population of students, although School A intake was made up of students coming from slightly more privileged backgrounds. In School A, for approximately 9.2% of the students English was not their first language and 15.1% were eligible for free school meals. In School D, for roughly 4.5% of the students English was not their first language and 22.9% of students were eligible for free school meals.

Despite the important similarities presented above, these schools varied considerably in terms of both their staff advice-seeking patterns and their perceived climate for collaboration. As shown in a comparison using t-test and depicted in Figure 2, School A was characterized by numerous interactions among staff (average number of nominations = 3.50). School D, in turn, showed significantly fewer interactions (average number of nominations = 2.61, $t(125) = 2.97$, $p < .01$, $r = .26$) and more members of staff that were isolated or located at the periphery of the network with only one tie. Furthermore, staff in School A did not only collaborate with more colleagues on average but these interactions were slightly more frequent than in School D, as shown by the thicker arrows in the network graph for School A.

[Insert Figure 2 about here]

A marked difference between these two schools was found in the ‘Mutual respect’ scale. On this measure, when compared using the Mann-Whitney test, the reported perception of ‘Mutual respect’ in School A ($Mdn = .27$) was significantly higher ($U = 1\,008.50$, $z = -3.94$, $p < .001$, $r = .36$) than the one at School D ($Mdn = -.19$), and this difference corresponds to a moderate effect size. Similarly, on the ‘Distributed leadership’ scale, the score in School A ($Mdn = .27$) was significantly higher ($U = 1\,250.00$, $z = -2.55$, $p < .05$, $r = -.24$) than the score in School D ($Mdn = .27$), with an effect size that is small to moderate. The magnitudes of these differences are about a half of a standard deviation or larger. This

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suggest that School A could be described, to a greater extent than School D, as an environment with a positive professional climate.

More specifically, at the item level, when compared using the Mann-Whitney test, staff in School A were significantly more likely to agree with the following statements than staff in School D:

- School staff have an open discussion about difficulties ($U = 1\,324.50$, $z = -2.53$, $p < .05$, $r = -.23$),
- There is mutual respect for colleagues' ideas ($U = 1\,296.50$, $z = -2.77$, $p < .01$, $r = -.26$),
- There is a culture of sharing success ($U = 1\,159.00$, $z = -3.746$, $p < .001$, $r = -.35$),
- The relationships between teachers and students are good ($U = 1\,120.00$, $z = -3.905$, $p < .001$, $r = -.36$),
- There is a collaborative school culture, which is characterized by mutual support ($U = 1\,238.00$, $z = -2.99$, $p < .01$, $r = -.28$),
- This school provides students with opportunities to actively participate in school decisions ($U = 1\,434.00$, $z = -2.23$, $p < .05$, $r = -.21$), and,
- This school has a culture of shared responsibility for school issues ($U = 1\,150.00$, $z = -3.58$, $p < .001$, $r = -.33$).

Thus, when compared to School D, staff in School A were more likely to report that their school was characterized by mutual respect for colleagues' ideas, a common set of beliefs, a culture of sharing success and the capacity to have open discussions about difficulties.

The differences in staff interaction around the issue of supporting vulnerable students presented above were in line with the evaluation of the collaborative work provided by staff in the interviews conducted. In School D, which presented a lower average number of

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nominations and less reciprocal interactions the collaboration was described by an experienced teacher as “top-down, about school improvement rather than focused on vulnerable learners” (David, School D). This was backed up by the Headteacher’s assertion that the learning communities were “pretty top down if I am honest” (Headteacher, School D). All the groups were led by a senior leader in the school and were seen by a recently qualified teacher as being “about being told what to do to help weak kids” (James, School D).

In turn, in School A, featuring the highest average number of nominations and high reciprocity, staff described a focus on a common goal in their learning community discussions. The Headteacher’s assertion that “we have fundamentally a community that is based on collaboration” was strongly backed up by the other members of staff interviewed. For example, a newly qualified teacher said of meetings about vulnerable learners:

I think they’ve been really helpful, especially because every member of staff has to fill out, had to originally provide the information, and then a representative from each department brought it to the group, so that you knew that all the ideas that were being discussed were truly representative of all of the teaching staff...Sometimes I think you failed to see the relevance in other departments in the way that they teach, but I think that made it really clear. (Ella, School A)

The Headteacher summed up the school culture in this way:

Every single person in the school has their own professional learning targets, which are related to improving outcomes for the most vulnerable learners in our school. But what we committed to at the same time is that we will really share the practice – what do we think is making that difference and we set up an engaging learners group,

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people who really wanted to look at the process of learning> they have run staff insets they have shared practice, so instead of being a top down, now we're going to do this, we're all going to work this way because these children are failing we go back to who knows best, groups of teachers know best, not one teacher individually but talking together, shaping together. (Headteacher, School A)

The findings arising from the interviews seem to support the quantitative results. The evidence from both methods showed that schools differed with respect to staff access to expertise on supporting vulnerable students and schools. Also, there was support from both approaches for the idea that where there is a favorable climate for collaboration there is also more cohesion and reciprocity in advice networks at the level of the whole school.

Conclusions

In line with previous research, this study suggests that, despite sharing common context and intake characteristics, schools can vary significantly in their patterns of collaboration (Bakkenes et al., 1999; Daly et al., 2010; Dorner et al. 2011; Spillane and Healey, 2010). We take this as an important index of distributed leadership.

This study also aimed to explore how the patterns of staff advice-seeking interactions related to the perceived climate for collaboration in schools. The findings suggest that a denser and more reciprocal network is associated with positive collaborative school climate, characterized by mutual respect and shared responsibilities. This supports previous literature indicating that school climate is significantly associated with patterns of professional collaboration (Author et al., 2005).

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Furthermore, in our sample, schools' formal organizational structures and informal advice networks showed alignment to a greater extent than in the existent literature (e.g., Coburn, 2005; Penuel et al., 2010; Spillane et al., 2010). Contrary to what has been found in other contexts (Atteberry and Bryk, 2010; Coburn and Russell, 2008; Cole and Weiss, 2009; Kochan and Teddlie, 2005; Penuel et al., 2010; Spillane and Healey, 2010) formally appointed support staff seemed to play the intended central advisory function and were usually situated in a central position in their schools' advice network. Furthermore, staff that had a high degree of centrality were usually part of their School Leadership Team (SLT).

In this study, we explored the social networks of advice among school staff on supporting the learning and wellbeing of vulnerable students. This study advances the field as there is little research that examines the social networks of educators in England, and no previous studies that explore teacher advice-seeking networks in relation to supporting vulnerable students, internationally (to the best of our knowledge). The research contributes to current knowledge and theory in that it shows that schools can vary significantly in their patterns of collaboration despite sharing common contexts and intake characteristics. This suggests that the culture of a school exerts an important formative effect on social networks and patterns of professional collaboration. In schools with denser and more reciprocal networks formal organizational structures and informal advice networks were aligned. In these schools, formally appointed leadership played the intended central advisory function and were usually situated in a central position in their schools' advice network.

We have demonstrated how social network analysis can be used to visualize and analyze the patterns of staff collaboration in schools. The potential of this innovative methodology has implications for leadership, policy and practice. The results highlight the importance of studying and strengthening informal advice patterns as a complementary strategy to the formal arrangements that can be put in place to support teaching and learning.

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The educational implications of this study are that policy-makers and school practitioners should pay more attention to the importance of developing collaborative practices to support vulnerable learners that involve staff at all levels in the school.

The study reported here can be replicated to support educators' work towards vulnerable students. A detailed analysis of patterns of collaboration within schools can inform the design and implementation of teacher support programs, with the aim of ultimately improving the educational outcomes of vulnerable students. Relevant information on the social structure of a school can prove useful as these patterns of interactions can be managed in support of, for example, novice teachers or those struggling with supporting vulnerable students. Reports from staff on who they turn to for advice in relation to supporting vulnerable students also allows schools to identify and encourage the work of actors who play a central role even though they are not formally designated leaders.

As with any piece of research this study is not free of limitations. For example, the large non-response rates for the network items in the questionnaire could have introduced bias to the data. In an attempt to ameliorate the impact of missing data, we used data reconstruction, a technique favored in the specialized SNA literature (e.g., Kossinets, 2006; Stork & Richards, 1992).

Also, this project was informed by evidence that structures of collaboration between teachers enhance the quality of teaching in schools and outcomes for vulnerable learners. However, it was not possible to directly connect staff social interactions to student outcomes. An important avenue for future research is to investigate whether schools whose teachers engage in more informal collaborative practice have a greater impact on the learning and wellbeing of vulnerable learners. This would be an important contribution to the literature on distributed leadership in that it would provide a detailed empirical base for examining the

relationship between a key element of the collaborative work of teachers for outcomes for their students.

In addition, as in the majority of studies in the field, we rely on cross-sectional small-scale data, which limits the possibility to generalize our findings to other contexts and to provide evidence on causal relationships. A large-scale study with a longitudinal design would allow us to explore the mechanisms through which school culture and collaborative practices influence each other.

Finally, in a related article (Authors, 2019), we report on the individual and structural mechanisms that shape the advice networks in these six English secondary schools, using inferential social network models, and find evidence for the importance of mutuality, clustering and individual similarities in advice seeking, among other interesting individual and structural effects.

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Table captions

Table 1. Demographics of the sample schools

Table 2. Demographics of the sample school staff

Table 3. Characteristics of interviewees

Table 4. Items and factor loadings of the scales used in the study

Table 5. Summary of network statistics and school climate for collaboration scales

Figure captions

Figure 1. Advice-seeking networks in participant schools (node size weighted by in-degree centrality of the actor)

Figure 2. Advice-seeking networks in Schools A and D (tie width weighted by frequency of the interaction)

Appendix

Appendix 1. Interview Questions

Notes

¹ 23% of the participants nominated 5 colleagues, the maximum number of colleagues that was possible to nominate in the survey.

² Traditional techniques available to correct for survey non-response in standard sampling designs are not appropriate for network data and, thus, the specialised literature favours data reconstruction (Kossinets, 2006; Stork & Richards, 1992).