Developing research networks in schools: the role of network intentionality and research engagement

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The Anglo-Saxon world has a long history of promoting research engagement with teachers and schools. However, over the years it became evident that building such research engagement in schools is challenging. This study examined factors that may influence the development of research-engaged relationships among colleagues. A survey study, including a social network analysis, was conducted. The findings indicate that both individual educators' intentional network behavior and their perception of research engagement among school colleagues play a role in educators' tendency to seek out school colleagues to engage in and with research. More specifically, analyses revealed that educators' perceived research engagement in school is not mediating the relationship between their intentional network behavior and the size of their research network. This finding could imply that strengthening educators' intentional network behavior may provide a crucial strategy for boosting the collegial interaction around research in schools.

KEYWORDS

evidence informed, school-university research network, research engagement, school development and change, school reform

Introduction

The Anglo-Saxon world has a long history of promoting research engagement (RE) with teachers and schools (e.g., Corey, 1949, 1953; Wann, 1953; Stenhouse, 1975; Elliott, 1976). For many decades, scholars argued that teachers needed to be research-informed and involved in educational research. This was seen as a new way to bridge the perceived gap between educational research and practice and as a promising avenue to improve teaching in schools. However, over the years, it became evident that building such RE in schools is challenging (McIntyre, 2005; Farley-Ripple et al., 2018). The current call for teachers and schools to become more research-engaged is therefore by no means new, but it is now resonating stronger than ever with efforts from school leaders to strengthen research impact and to improve education in schools (Menter, 2013; Brown, 2015; Cornelissen, et al., 2015; Greany, 2015; Coburn and Penuel, 2016; Heinrich and Good, 2018; Prendergast and Rickinson, 2018; White et al., 2021). Scholars have found that building such RE does not only concern formal structures but also the informal social structures of collegial networks in school (Cornelissen et al., 2014; Brown and Zhang, 2016; Cornelissen et al., 2017; Prendergast and Rickinson, 2018). They observed that in many cases, the knowledge and ideas from research flow informally through interpersonal relationships among colleagues and found that 'the process of transferring research into practice occurs in a multidimensional, complex way that is social and interactive

… it unfolds within a social ecology of relationships' (Finnigan and Daly, 2014, p. 3). Consequently, we need to better understand, intentionally navigate, and foster these informal social networks where research-based knowledge is shared and used for improving school practices (Cornelissen et al., 2014, 2017; Brown and Zhang, 2016). Although the importance of this social (network) dimension for developing RE in schools has been acknowledged recently, the literature still offers little empirical insight into the factors that may influence it. This study focuses on contributing to bridging this empirical gap and examines factors that may influence the development of research-engaged relationships among colleagues. The study took place at eight secondary schools in the context of a school–university research partnership in the South East of England. The study seeks to answer the main research question: *"In what ways and to what extent are educators' intentional network behavior and their perceptions of research engagement in their school related to the number of school colleagues they seek out to collaboratively interact with when engaging in and with research?"* A cognitive social network approach was adopted that investigates people's perceptions of their social networks and the factors that influence network interaction in their own right (Tasselli et al., 2015). This study is intended to inform research and (leadership) practice in the field of school–university research partnerships and gain more empirical insight into factors that play a role in strengthening collegial research networks in schools.

Social network perspective

Social network theory (SNT) provides insight into the social structures and processes involved in educational change, which are distributed across individuals and levels of the educational system (Daly, 2010). Generally speaking, SNT is concerned with the pattern of social relationships that exist between people in a social network (Scott, 2000). The SNT perspective extends the primary focus on individuals to understand their interaction with the larger social infrastructure in which they reside (Cross et al., 2001; Borgatti and Foster, 2003). Social network studies in education (e.g., Coburn and Russell, 2008; Cole and Weinbaum, 2010; Frank et al., 2011; Moolenaar et al., 2011) investigate the way relationships in networks are formed and may facilitate or constrain the flow of 'relational resources' (e.g., advice, knowledge, support, and collaboration). The nature, processes, and outcomes of social networks are studied on several levels. Three common levels are the personal ('ego') networks of the individual network members, the dyad networks of certain pairs of network members, and the whole network, which includes all network members (for example, all teaching staff in a school) (Borgatti and Foster, 2003; Daly, 2010). This research focused on the personal network level since the study is concerned with examining factors that influence the tendency of individual educators to seek out school colleagues for engaging in and with research.

Research engagement

A recent scholarly study on building RE in schools considers that social networks epitomize educators' collaborative interactions when engaging in and with research (Leat et al., 2015; Cornelissen et al., 2017). In the study of RE among school colleagues, two types of research interactions can be distinguished (Cornelissen et al., 2013,

2017; Prendergast and Rickinson, 2018): (1) "Being Informed by Research," i.e., discussing and collaboratively using research findings with colleagues and (2) "Doing Research," i.e., discussing and collaboratively using research methods with colleagues (*cf.* Leat et al., 2015; Brown and Zhang, 2016). The interactions in the "Being informed by Research" network typically involve "content knowledge" about the topic that was investigated (e.g., jointly experimenting with research findings about new ways to support pupils' writing skills). The interactions in the "Doing Research" network involve "procedural knowledge" pertaining to the research design and methods used (e.g., discussing how to conduct a specific kind of interview). In SNT, it is argued that individuals may be influenced by their relationships in the network structure (Moolenaar, 2012). For example, research shows that educators' number of collegial interactions in which new ideas for teaching are shared is related to their view of their school's innovative climate (Moolenaar et al., 2014). Recent research indicates that there may exist a positive relationship between educators' perceptions of RE among school colleagues and the number of colleagues who collaboratively engage in and with research (Cornelissen et al., 2017). As such, we posit that an individual educator's perception of the level of RE among colleagues in school is positively associated with the number of school colleagues with whom this educator seeks to interact regarding research (Hypothesis 1).

Network intentionality

We argue that individual factors also play a role in educators' tendency to seek out school colleagues for collaborative engagement in and with research. Research shows that individuals have varying degrees of "intentionality" in forming their social networks (Moolenaar et al., 2014). This means that individuals have a level of intentionality for actively seeking relationships, serving as a source of advice, and actively brokering relationships between disconnected others (Moolenaar et al., 2011). While some educators may be very explicit in forming relationships with school colleagues and developing their personal networks, other educators may be less intentional in shaping their networks. Previous study suggests that educator's network intentionality (NI) and the number of colleagues that educators interact with to improve education in their schools may be related (Moolenaar et al., 2014). As such, we expect in this study that an individual educator's NI is positively associated with the number of school colleagues that this educator seeks to interact with around research (Hypothesis 2).

Individual educators' networks may be influenced by their perceptions of the larger social environment in their school (i.e., their view of RE among school colleagues) and by the intentionality of their network behavior. However, scholars also argue that there is a relational interdependence between individual behavior and the social world in ways that the social environment and individual behavior are mutually shaping each other (Lasky, 2005; Billet, 2006; Datnow, 2012). Implying in this context that when teachers perceive that colleagues in their school context are not very 'research-minded' this may diminish their tendency to seek out colleagues to interact with around research. As such, we expect that educators' views of RE in their school environment mediate the relationship between their individual level of NI and the number of colleagues they seek out in their school for collaboratively interacting in and with research (Hypothesis 3). Figure 1 summarizes the hypothesized relationships.

Method

Overview

The study took place in the context of the Schools–University Partnership for Educational Research (SUPER). This is a long-standing collaboration between the Faculty of Education at the University of Cambridge and local schools. It was established in 1997 with the primary purpose of examining "whether, and if so how, the Faculty and a group of schools could work effectively as a partnership to serve the research interests of all members" (McLaughlin et al., 2006: 14). At present, the SUPER network comprises eight secondary schools, a lower school, and a consortium of eight primary schools together with the Faculty of Education. The eight secondary schools took part in this research. A total of 526 educators with a response rate of 56.2% participated in the study by completing a survey on demographics, NI, social networks, and RE. Participants who did not complete at least 50% of the survey items were removed from the dataset prior to analysis. This resulted in a final sample size of 358 participants. Patterns of missing data were analyzed using a multiple imputation pattern analysis of all variables pertaining to the mediation analysis. The results revealed that 3.02% of values were missing. As a result, missing data were left as is. The sample comprised 32.1% male, 67.9% female, 51.1% teachers, and 48.9% in other roles (often combinations of teaching and leading, e.g., department head or year group leader). In the analyses, we controlled for educators' experience in school since this may influence the number of colleagues they seek out in school (Tymon and Stumpf, 2003). Table 1 summarizes the sample educators' characteristics.

Instruments

Dependent variable: personal research network size (PRNS)

To gain insight into the size of educators' personal research networks, school staff were asked to assess the frequency of interaction

(1 = most days; 2 = weekly; 3 = termly) for four types of research-engaged interactions that related to the two types of research networks that were distinguished in the theoretical framework:

1 The first two referred to "Being informed by research":

  1 How often do you discuss new ideas/findings from educational research that could improve your classroom practice with this person?
  2 How often do you collaborate in applying new ideas/findings from educational research to improve your classroom practice with this person?

The other two are referred to as "Doing research":

  1 How often do you discuss methods or tools of educational research with this person?
  2 How often do you collaborate in applying methods or tools of educational research in your practice with this person?

Respondents were then able to select names from a complete roster of school staff. Such an approach is considered to provide high response rates and strengthen the validity of results (Scott, 2000). Social network data obtained from the questionnaires were entered into the network software 'UCINET' (Borgatti et al., 2005) to calculate network measures. Following the approach of the Cornelissen et al. (2017), we dichotomized the data for these four research networks, i.e., we focused on the presence or absence of the most frequent interactions (weekly or most days). For the four networks, each educator's out-degree (the number of school staff educators turn to for discussing/collaborating about research findings/methods) was calculated and averaged. This measure reflects the tendency of individual educators to seek out school colleagues for engaging in and with research.

Independent variable: network intentionality (NI)

We used a NI scale (14 items on a 5-point Likert scale ranging 1 = strongly disagree to 5 = strongly agree) that was developed and
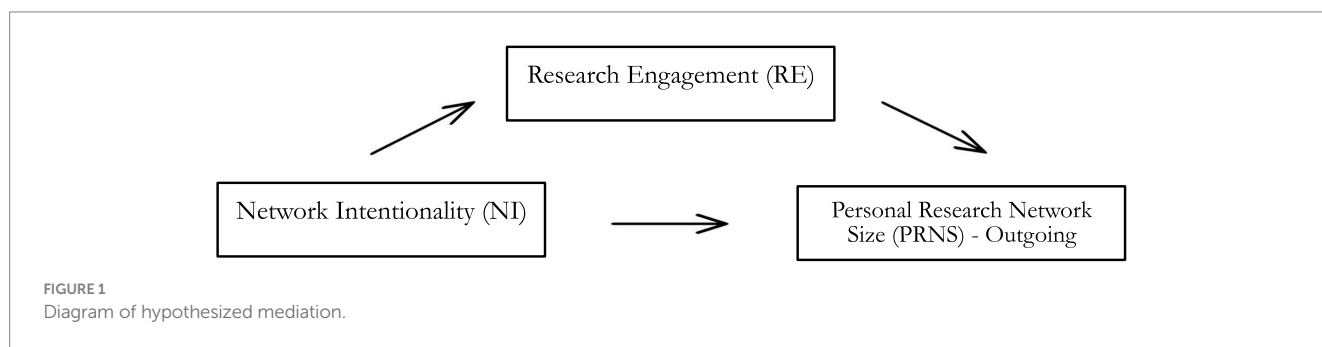

FIGURE 1
Diagram of hypothesized mediation.

TABLE 1 Descriptive statistics of educators' characteristics.

	N	Min.	Max.	*M*	Sd
Years of experience at school	299	1	29	7.10	5.78
Research engagement	323	1	5	3.38	0.77
Network intentionality	358	1.21	4.93	2.92	0.67
Personal research network size	358	1.75	5.00	3.93	0.72

used in earlier studies (Moolenaar et al., 2011, 2014). The NI scale evaluated the degree to which network members intend to create, broker, maintain, and assess social relationships. Example items are: "I like to be a source of advice and counsel for many others" and "I actively plan out what I want my network to look like." Exploratory factor analysis (EFA) indicated that 54.98% of the variance was explained, with sufficient overall scale reliability ($\alpha = 0.88$).

Mediator variable: research engagement (RE)

We used a RE scale (4 items on a 5-point Likert scale ranging 1 = strongly disagree to 5 = strongly agree) that was developed in previous research in school–university research partnerships (Cornelissen et al., 2017). It captured perceptions of sharing and using research findings among school colleagues as well as the school leadership's role in supporting such interactions. Example items are: "Staff members apply research findings to improve classroom practices" and "Management creates opportunities for staff to discuss research findings." EFA indicated that 62.04% of the variance was explained, with sufficient overall scale reliability ($\alpha = 0.87$).

Testing the hypotheses

The data have been collected within a nested dataset (educators within eight partnership schools), meaning that differences in the relationship between NI and PRNS may be influenced by differences in their school context (other than their perception of RE in school). Therefore, we checked for school differences in staff's level of NI. An analysis of variance showed that the effect of "school" on NI was not significant ($\alpha = 0.05$), $F_{(7,313)} = 1,836$, $p = 0.08$. As such, we proceeded with examining the relationships in the mediation model (Figure 1) by testing the proposed hypotheses, i.e., (1) Hypothesis 1 (RE => PRNS) and Hypothesis 2 (NI => PRNS) through correlation analyses and (2) Hypothesis 3 (RE mediates NI => PRNS) through mediation analysis using Hayes (2013) PROCESS Macro in SPSS. One thousand bootstrapped samples were used to assess the presence of mediation.

Results

Outcomes of Pearson's correlation analysis indicated that experience in school had no significant or low correlations with educators' level of NI, perceived level of RE in the school environment, and PRNS (see Table 2). Thus, the results for the tested relationships (Figure 1) are presented below.

Relationship between research engagement and personal research network size

Our first hypothesis assessed to what extent RE correlates with PRNS. Consistent with our hypothesis, Pearson's correlation showed a significant, small positive correlation between the two variables (see Table 2), indicating that educators who perceive their school colleagues as research-engaged seek out more colleagues to interact with around research.

Relationship between network intentionality and personal research network size

Our second hypothesis assessed to what extent NI correlates with PRNS. Consistent with our hypothesis Pearson's correlation showed a significant and small-to-medium positive correlation between the two variables (see Table 2), indicating that educators who are intentional in their network behavior seek out more colleagues to interact with around research.

Mediating role of perceived research engagement in school

Our third hypothesis examined the mediation effect of perceived RE in school in the relationship between NI and PRNS. The results indicate that both NI ($B = 1.02$, $p < 0.001$) and RE ($B = 0.63$, $p = 0.009$) significantly predict PRNS ($F_{(2, 320)} = 10.76$, $p < 0.001$, $R = 0.25$). However, the bootstrapped 95% confidence interval for the indirect effect ($B = 0.03$) included zero (CI $_{Lower} = -0.05$, CI $_{Upper} = 0.15$); thus, the mediation effect was not statistically significant. The ratio of indirect to total effect was 0.03, indicating that the mediation effect explained only 3% of the total relationship between NI and PRNS. This means that, in contrast with our third hypothesis, educators' perception of RE in their school has little effect on the relationship between the extent to which they are intentional in their network behavior and the number of school colleagues they seek out to interact with around research.

Discussion and conclusion

This study aimed to explore the relationship between educators' intentional network behavior, their perceptions of RE in their school, and the number of school colleagues with whom they seek to engage

TABLE 2 Correlations.

	1	2	3	4
Years of experience in school		0.07	0.11	0.01
Research engagement			0.04**	0.15**
Network intentionality				0.24**
Personal research network size				

**$p < 0.01$; *$p < 0.05$.

in research. The findings indicate that both individual educators' NI and their perception of RE among school colleagues play a role in educators' tendency to seek out school colleagues to engage in and with research. These results resonate with findings from previous studies on NI (Moolenaar et al., 2014) and RE (Cornelissen et al., 2017). More specifically, analyses revealed that the perceived RE in their school does not mediate the relationship between their NI and PRNS. This finding was unexpected since scholars argue that people's agency (in this study, their intentionality in developing their personal research network) is influenced by the social context in which they reside [in this study, their (perceived) RE in school] (Lasky, 2005; Billet, 2006; Datnow, 2012). We consider this an important observation because it reveals that higher levels of educators' NI may foster collegial interaction around research even if educators do not view their colleagues in schools as research-engaged. This finding could imply that strengthening educators' intentional network behavior may provide a crucial strategy for boosting collegial interaction around research in schools. We consider that this could serve school leaders as part of a strategy for strengthening RE in the vast majority of schools in which staff is not yet engaged in and with research. It also points to the importance of developing networking capacities that staff in schools may need to become effective 'research brokers' among their colleagues, connecting research and practice through interaction with colleagues. Farley-Ripple et al. (2018) reckon that such research brokering is one of the key mechanisms to bridging the gap between research and practice. We consider that developing intentional network behavior could become part of teacher education programs. If the future generation of teachers develops such NI, we believe that it will be more likely that efforts to promote RE among school staff will flourish.

Limitations and further study

This study shed empirical light on factors that matter in building RE among colleagues in schools. Although the evidence of this study can inform the rapidly growing number of new initiatives aiming to build research engagement in schools, we realize that the schools in our study were part of a unique context. We need to consider what Godfrey (2016) identified as the "systemic connectivity" of research-engaged schools and interpret our findings with some caution. The research partnership in which the examined schools were embedded has fostered RE in their partnership schools for many years. Our findings may deviate from those of schools that are in the earlier stages of growing RE or have a different approach (*cf.* Farley-Ripple et al., 2018). The exploratory nature of this study implies that the generalization of the results will require follow-up studies in which our findings can be further explored in other school contexts. In particular, we would recommend further exploring the relationship between educators' NI and the development of RE in different types of schools. Ultimately, understanding this relationship could provide

a new social angle and inform future strategies of school leaders to promote the RE in schools that we have been striving for in the past century.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The study involving humans were approved by University of Cambridge, Faculty of Education. The study were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

FC: Writing – original draft, Writing – review & editing. RM: Writing – review & editing. AD: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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