Ties with potential: nature, antecedents, and consequences of social networks in school teams

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CHAPTER 7

Yes, We Can!
Linking Teachers’ Networks and Student Achievement through Collective Efficacy

ABSTRACT

Background. Educational reform efforts aimed at increasing student achievement have embraced collaborative practice as a means to intensify teacher interaction in support of improved instruction and student learning. While recent studies suggest the importance of strong teacher networks for school conditions that may benefit student achievement, empirical evidence of the direct effect of teacher networks on student learning is weak.

Purpose. The goal of this study was to examine the relationship between schools’ social network structure and student achievement and the potential mediating role of teachers’ collective efficacy beliefs.

Method. Data were collected from 775 teachers of 53 elementary schools in a large educational system in the Netherlands. Student data were obtained at the school level, representing the results of 1383 sixth grade students on a nation-wide standardized final test administered one month after the collection of the teacher data. Using social network analysis and multiple regression analysis, we analyzed data from a quantitative teacher survey in combination with school level student achievement data. The teacher survey consisted of a Likert-type scale on perceived collective efficacy and social network questions on work related and personal advice.

Conclusions. A direct effect of social network structure on student achievement could not be evidenced. Yet, findings suggest an indirect effect of social network structure on student language achievement through collective efficacy. Highly dense teacher networks are associated with strong teacher collective efficacy, and in turn, strong teacher collective efficacy was related to school level student achievement.

1 This chapter is based on:
Moolenaar, N. M., Sleegers, P. J. C., & Daly, A. J. (submitted for publication). Yes, we can!
Linking teachers’ networks and student achievement through collective efficacy.
INTRODUCTION

A typical feature of contemporary educational landscapes of many countries are pervasive and often large-scale efforts aimed at raising student performance. In recent years, educational reforms have been focused on improving instructional quality and student learning through an increased focus on collaborative practices and intensified teacher interaction (Brownell, Yeager, Rennells, & Riley, 1997; Goddard, Goddard, & Tschannen-Moran, 2007; Louis, Marks, & Kruse, 1996). Terms such as ‘professional learning community’, ‘community of practice’, ‘community of learners’ ‘community of continuous inquiry and improvement’ (Barth, 1990; Hord, 1997; Louis & Kruse, 1995; McLaughlin & Talbert, 1993; Mitchell & Sackney, 2000) all promote an atmosphere of collective efforts and shared practice. Motivated by indications that strong professional communities of teachers indeed produce increased student learning (Lee & Smith 1996; Newmann, King, and Youngs 2000), educational policy and practice has seemed to embraced teacher collaboration ‘as a contemporary Zeitgeist’ (Gable & Manning, 1997, p. 219).

Since teacher collaboration takes shape through teacher interaction (Friend & Cook, 1992; Mostert, 1998; West, 1990), recent studies have focused on teacher networks as a lens to study collaborative efforts in schools (Coburn & Russell, 2008; Daly, Moolenaar, Bolivar, & Burke, in press; Moolenaar, Daly, & Sleegers, in press; Lima, 2004; Penuel, Frank, & Krause, 2007b; Penuel & Riel, 2007). Social network research outside education suggests that the configuration of organizational networks may benefit organizational functioning (Balkundi & Kilduff, 2005; Kilduff & Krackhardt, 2008 Nahapiet & Ghoshal, 1998; Tsai & Ghoshal, 1998). In line with this argument, educational social network studies often emphasize the potential importance of teacher networks for school change and educational reform (Coburn & Russell, 2008) and student achievement (Daly & Finnigan, 2009; Moolenaar et al., in press; Penuel et al., 2007a). However, this argument has not yet been subject to extensive empirical study. While recent studies suggest the importance of strong teacher networks for school conditions that may benefit student achievement, empirical evidence of the effects of teacher networks on student learning is limited.

Recent research suggests that the relationship between student achievement and teacher collaboration, while important for instructional improvement, ‘is likely indirect’ (Goddard, Goddard, & Tschannen-Moran, 2007). Meaning, teacher collaboration may benefit teachers’ practice in many ways, which in turn will affect student achievement. As main benefits of collegial relationships that may affect student achievement, scholars refer to
feelings of equally shared responsibility for positive outcomes (Brookhart & Loadman, 1990), alignment of expectations for students, increased feelings of effectiveness (Little, 1987), and raised sense of efficacy (Ashton & Webb, 1986; Bandura, 1993; Johnson et al., 1981; Louis, 1992; Rosenholtz, 1989; Ross, 1995; Ross, Cousins, & Gadalla, 1996). Collective efficacy is a concept that amalgamates these benefits as it expresses shared perceptions of a group’s ability to achieve collective goals (reflected in the motto ‘Yes, we can’). Perceived collective efficacy is both associated with teacher collaboration (Ashton & Webb, 1986) and student achievement (Goddard, 2002, Goddard, Hoy & Woolfolk Hoy, 2000). As such, collective efficacy may be a mechanism that can explain how configurations of teacher networks affect student achievement.

This chapter is aimed at examining teachers’ collective efficacy as a plausible mechanism that explains the suggested relationship between teacher network structure and student achievement. We will argue that teacher networks may be especially important in promoting student learning and increased student performance since connections between teachers may enlarge teachers’ skill sets (Mostert, 1998; Phillips & McCullough, 1990; Trent, 1998) and increase the confidence of teachers in their beliefs about how well they can collectively motivate students and in turn improve their learning. As such, this chapter not only makes a significant contribution to the growing literature base around social networks in education, it also offers important insights potential elements that shape teachers’ collective efficacy. In this chapter, we present the results of an investigation schools social networks, perceived collective efficacy, and student achievement in 53 elementary schools in a large Dutch school district. In the next section, we will review the literature around social networks and perceived collective efficacy, and elaborate the relationships between advice network structure, collective efficacy, and student achievement.

THEORETICAL FRAMEWORK

Teachers’ social networks
Teachers’ social networks are being increasingly studied to understand how policy efforts at reform take shape in teachers’ interactions (Coburn & Russell, 2008; Daly et al., in press). Moreover, scholarly efforts are focusing on the extent to which teachers’ social networks support or constrain teacher and school conditions, such as trust (Moolenaar, Karsten, Sleegers, & Zijlstra, 2009), teacher involvement in shared decision-making, and schools’ innovative climate
(Moolenaar et al., in press). Studies into the effects of teacher social networks all
share an underlying assumption that teacher interactions, as embedded in
teachers’ social networks, ultimately benefit student achievement. Often, this
assumption is supported through using a lens of social capital theory (Coburn
& Russell, 2008; Daly et al., in press; Moolenaar et al, 2009; Moolenaar et al., in
press).

Social capital theory postulates that social relationships provide access to
resources that can be exchanged, borrowed and leveraged to facilitate achieving
goals (Bourdieu, 1986; Putnam, 2000). According to this theory, teachers with
many social relationships can access a multitude of valuable resources through
these social ties, such as advice, instructional materials, social support,
knowledge, or information. At the school team level, high levels of social capital
may evidence a frequent exchange of these resources, which, in turn, may
facilitate in achieving instructional goals and help overcome obstacles that
occur in daily teaching practice. While findings from organizational research
indicate that organizational social capital can enhance organizational outcomes
(Adler & Kwon, 2002; Nahapiet & Ghoshal, 1998; Leana & Van Buren, 1999;
Walker, Kogut, & Shah, 1997), these results have not yet been fully examined in
the context of public education with regard to student achievement.

Crucial to the exchange of resources in the network are the pattern and
quality of the social relationships that form the network (Burt, 1992; Coleman,
1990; Lin, 2001; Putnam, 2000). While patterns of dense and cohesive
relationships may support the transfer of resources such as knowledge and
information through a network, the lack of sufficient relationships can impede
or constrain the network’s capability to facilitate collective action and achieve
desired goals (Daly & Finnigan, 2009; Hite, Williams, & Baugh, 2005). Common
characteristics by which to describe social network structure at the
organizational level are density and the centralization of the network (Daly et
al., in press; Moolenaar et al., in press).

The density of a network refers to the number of existing ties in a
network in relation to the maximum number of possible ties. In a dense
network, many people are connected to one another, while in a sparse network,
there are a few relationships among the actors of the network. Recently, studies
have found that the density of a teacher network is related to the extent to
which teachers are willing to take risks to improve their school, are
continuously learning and trying to improve their teaching (Moolenaar et al., in
press) and perceive that they have a say in the implementation of reform and
decisions around daily instructional practice. In contrast, less dense networks
are well suited for the exchange of non-complex, routine information (Hansen, 1999).

Another informative network characteristic is network centralization. A network is highly centralized when a few actors in the network send and receive many relationships, whereas many other actors only have a few relationships. High network centralization may signify that a few actors are ‘controlling’ the flow of resources in a network in which others are less involved (see also Chapter 4). While more centralized networks may constrain an organization’s flexibility in adapting to change (Daly & Finnigan, 2009), network centralization has also been found to facilitate the exchange of more technical knowledge (Cummings & Cross, 2003).

In addition to the pattern and quality of the social relationships in a network, the content that is exchanged within a social network also matters (Coburn & Russell, 2008; Scott, 2000, see Chapter 2). The structure of a social network can be defined by the content of the resources that flow through its relationships. The nature of these resources may affect the ease and speed with which they are transferred in the network. For instance, the pattern of social relationships that are formed with the purpose of sharing technical information and knowledge may differ significantly from the pattern of relationships that are created around friendship or the discussion of confidential matters (see also Chapter 2). While the ties of both social networks exchange resources (the first being knowledge, the second personal support), the configuration of ties in both networks may look quite different.

In social network literature, studies often make a distinction between instrumental and expressive social networks (Ibarra, 1993). Instrumental networks contain social relationships that are aimed at achieving organizational goals, and may transfer resources such as work related information, knowledge, instructional materials, and task related advice. In contrast, expressive networks encompass social relationships that transfer resources with an affective component, such as social support, friendship, and advice about personal matters that are not directly aimed at achieving organizational goals. Expressive relationships are often more time-consuming to grow, given the level of trust that is involved, than instrumental relationships, but tend to be more stable and often stronger over time (Granovetter, 1973; Ibarra, 1993; Uzzi, 1997).

In line with previous studies on social networks in education (Moolenaar, Daly, Sleegers, in press; Moolenaar, Karsten, Sleegers, & Zijlstra, 2009), we focused on instrumental and expressive relationships related to advice among the educators in the sample schools. Advice relationships are important to student achievement and school improvement as they reflect patterns of
information exchange that were found to be supportive of innovative climates and shared decision-making (Moolenaar et al., in press).

While it is unlikely that the pattern of teacher interactions within a school team will directly affect student achievement (Goddard, Goddard, & Tschannen-Moran, 2007), there are indications that teachers’ social networks may indirectly affect student achievement through various school and teacher level conditions. Recent studies have indicated that dense teacher networks around work related advice support an innovative school climate, in which people are willing to take risks to collectively improve educational instruction (Moolenaar et al., in press). Also, teachers that maintained many connections with colleagues and that were embedded in a densely connected network displayed higher levels of trust in their colleagues (Moolenaar et al., 2009). Both teacher trust and schools’ innovative climates have been associated with student achievement (Bryk & Schneider, 2002; Tschannen-Moran, 2001). While teachers’ social networks may indirectly affect student achievement through these school and teacher level conditions, studies into the mechanisms that may explain the relationship between teacher interaction and student achievement are scarce. In the next section, we will introduce collective efficacy as such a plausible mechanism that may serve as the missing link between schools’ network structure and student achievement.

Building collective efficacy through social networks
Building on earlier work on self-efficacy, Bandura (1997) conceptualized collective efficacy as a group-level phenomenon that links learning and functioning of groups (Bandura, 1997). Collective efficacy ‘represents a group’s shared belief in its conjoint capabilities to organize and execute the courses of action required to produces given levels of attainment’ (Bandura, 1997, p. 477-478). As such, collective efficacy perceptions are future-oriented beliefs about the functioning of a collective in a specific situation or context (Bandura, 1997). Applied to the educational setting, ‘perceived collective efficacy refers to the judgment of teachers in a school that the faculty as a whole can organize and execute the courses of action required to have a positive effect on students’ (Goddard, Hoy, & Woolfolk Hoy, 2004). Research has established collective efficacy as a group-level phenomenon and indicated that collective efficacy affects organizational commitment and group performance (Chen et al., 2002; Lindsley, Brass & Thomas, 1995; Ross & Gray, 2006; Riggs & Knight, 1994). Schools with high collective efficacy have teachers which are more willing to exert extra effort and pro-social behavior for the organization (Somech & Drach-Zahavy, 2000; Ross & Gray, 2006).
Teachers’ collective beliefs about their capacity to realize desired collective results may be dependent on the relationships that can be leveraged and the resources that can be accessed through their school’s social networks. Teacher networks provide the social context in which teachers share knowledge and information, provide and receive social support, and collaborate to achieve collective goals that could not be accomplished by an individual working in isolation (Macinko & Starfield, 2001). By breaking away the isolation of the classroom, collegial relationships among teachers lead to increased feelings of effectiveness and satisfaction (Little, 1987). Several scholars have suggested that the interdependency of teachers contributes to teachers’ collective efficacy beliefs (Bandura, 1993; Kurz & Knight, 2004).

Research has indicated a positive relationship between perceptions of collective efficacy and teacher interaction in the form of collegiality and collaborative work (MacKenzie, 2000). By exchanging knowledge, sharing experiences, and collectively searching for solutions to problems, teachers may build confidence in their team’s collective capability to motivate students, offer a targeted instructional program in support of student learning, and handle difficult situations. Teacher interaction can bring shared sense of purpose and a feeling of collectivity (Barth, 1990; Darling-Hammond, 1997; Lee, Dedrick, & Smith, 1991; Little, 1982; Mostert, 1998). A positive relationship between schools’ social networks and teachers’ perceptions of their collective capability to educate their students is further supported by the idea that teacher interaction offers opportunities to experience the team’s ability to promote student learning and to build consensus around shared goals and expectations for students. For instance, teachers that exchange advice on work related matters, such as the use of new teaching materials, may benefit from the skills and ability of their colleagues. Moreover, they have the opportunity to build consensus on the use and expected benefits of the teaching material, which will shape their future expectations.

Teachers’ social networks around advice relationships may play a substantial role in shaping teachers’ collective efficacy beliefs. The act of asking for advice implies that the advice seeker expects an advice-giver to possess potentially valuable knowledge or information and to have the ability and competence to provide useful advice (Ho, 2005; McAllister, 1995; Zagenczyk et al., 2008). Asking for advice may indicate to the advice-giver a willingness to learn on the part of the advice seeker. Also, the act of giving advice may demonstrate the skills of the advice-giver and increase the advice-giver’s sense of efficacy by sharing expertise and offering personal guidance. As such, densely connected networks that reflect the exchange of shared expertise and
personal guidance may increase teachers' beliefs about their collective competence to solve collective problems, achieve desired goals, and improve school-wide performance.

Besides building collective efficacy through shared experiences, collective efficacy may be influenced by observing successful role-models (Goddard; 2001, 2003b; Goddard et al., 2004; Gorrell & Capron, 1988; Schunk & Zimmerman, 1997). It is therefore plausible to assume that networks in which advice is centralized around a few central individuals are characterized by higher levels of perceived collective efficacy. Taken together, we hypothesize that dense and centralized teacher networks positively influence teachers’ perceptions of collective efficacy (Hypothesis 1).

Collective efficacy in support of student achievement
Throughout the years, different scholars have suggested that teachers’ personal self-efficacy influences students’ motivation and achievement. Although negative correlations between teachers’ sense of self-efficacy and students’ self-concept of ability and self-reliance have been found (Brookover, Beady, Flood, Schweitzer, & Wisenbaker, 1979), most studies have found a positive relationship between teacher efficacy beliefs and several student cognitive and non-cognitive outcomes such as achievement in core academic subjects (e.g. Anderson, Greene, & Loewen, 1988; Ashton & Webb, 1986; Ross & Cousins, 1993), motivation (Roeser, Arbreton, & Anderman, 1993), attitudes toward school (Miskel, McDonald, & Bloom, 1983) and performance and skills (Midgley, Feldlauer & Eccles, 1989; Ross, Hogaboam-Gray, & Hannay, 2001).

Although conceptually different, the relationship between teacher efficacy and student outcomes has been replicated at the collective level. Empirical evidence indicates that teachers’ perceptions of self-efficacy and perceived collective efficacy are strong predictors of school level student achievement (Bandura, 1993; Goddard, 2001; 2002; Goddard & Goddard, 2001; Goddard et al., 2000; Goddard, Hoy & Woolfolk Hoy, 2000, 2004; Hoy, Sweetland, & Smith, 2002; Ross, Hogaboam-Gray, & Gray, 2003; Tschannen-Moran & Barr, 2004). In some studies, collective efficacy has even been found to be a stronger predictor of student achievement than socio-economic status (SES) or ethnicity, even controlled for other factors such as gender and students’ prior achievement (Bandura, 1997). Explanations for the beneficial effect of teachers’ efficacy beliefs on student achievement have been sought among educationally productive elements, such as: level of effort and persistence with students (Tschannen-Moran & Woolfolk Hoy, 2001); classroom strategies that are better planned and organized (Alllinder, 1994); and student-centered and humanistic
approaches (Czerniak & Schriver, 1994; Enochs, Scharmann, & Riggs, 1995; Woolfolk Hoy & Hoy, 1990). In line with these findings, we hypothesize that teachers’ perceptions of collective efficacy will positively affect student achievement (Hypothesis 2).

In sum, the presented literature review suggests that the pattern and content of teachers’ relationships in schools indirectly affects student achievement through increased teacher perceptions of collective efficacy. In order to examine the relationships between social networks, collective efficacy, and student outcomes, we will now describe the method and results of a study conducted in 53 schools of a large educational system in the Netherlands, designed to address these hypotheses.

METHODOLOGY

Context
In the Netherlands, as in many western countries, educational policy-makers, scholars, and practitioners are interested in teacher communities as a means to improve teaching and learning, and ultimately, student achievement. Data for this study were collected in 53 Dutch elementary schools of the Avvansa School District\(^1\), located in the south of the Netherlands, which provides administrative, financial, and professional development support to the schools. The schools were selected as the district engaged in a district-wide monitoring process around school improvement and teacher professional development.

Sample
A total of 53 schools participated in the study by distributing questionnaires on social networks and collective efficacy among all teaching personnel. Data were gathered from 775 educators (teachers and principals), reflecting a response rate of 96.8%. Of the educators, 27.1% of the respondents were male and 72.9% female. These numbers approximately reflect the gender ratio in Dutch elementary education across the country. The average number of educators per school is 15 (M = 14.8, SD = 6.8). Each school level team had a minimum six months of experience in their current configuration, with the majority of teams (62.2%) having had at least two years of shared experience. The average number of students per school is 213 (M = 213.0, SD = 116.6). Additional sample demographics are presented in Table 1 and 2.

\(^1\) All names are pseudonyms
Table 1. Sample characteristics of Grade 6 students (n = 1383) in schools (N = 53).

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>676 (48.9 %)</td>
<td>707 (51.1 %)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>10 years</th>
<th>11 years</th>
<th>12 years</th>
<th>13 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7 (0.5 %)</td>
<td>831 (60.1 %)</td>
<td>516 (37.3 %)</td>
<td>29 (2.1 %)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parents’ country of Birth</th>
<th>Mother</th>
<th>Father</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>1215 (87.9 %)</td>
<td>1167 (84.4 %)</td>
</tr>
<tr>
<td>Turkey</td>
<td>4 (0.3 %)</td>
<td>4 (0.3 %)</td>
</tr>
<tr>
<td>Morocco</td>
<td>17 (1.2 %)</td>
<td>14 (1.0 %)</td>
</tr>
<tr>
<td>Suriname</td>
<td>4 (0.3 %)</td>
<td>4 (0.3 %)</td>
</tr>
<tr>
<td>Netherlands Antilles</td>
<td>8 (0.6 %)</td>
<td>13 (0.9 %)</td>
</tr>
<tr>
<td>Another country, in Europe</td>
<td>62 (4.5 %)</td>
<td>47 (3.4 %)</td>
</tr>
<tr>
<td>Another country, in Africa</td>
<td>7 (0.5 %)</td>
<td>8 (0.6 %)</td>
</tr>
<tr>
<td>Another country, in Asia</td>
<td>28 (2.0 %)</td>
<td>26 (1.9 %)</td>
</tr>
<tr>
<td>Other</td>
<td>10 (0.7 %)</td>
<td>3 (0.2 %)</td>
</tr>
<tr>
<td>Unknown</td>
<td>28 (2.0 %)</td>
<td>97 (7.0 %)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parents’ highest level of completed education</th>
<th>Mother</th>
<th>Father</th>
</tr>
</thead>
<tbody>
<tr>
<td>No school / elementary education</td>
<td>30 (2.2 %)</td>
<td>22 (1.6 %)</td>
</tr>
<tr>
<td>High school</td>
<td>661 (47.8 %)</td>
<td>590 (42.7 %)</td>
</tr>
<tr>
<td>Above high school</td>
<td>607 (43.9 %)</td>
<td>677 (49.0 %)</td>
</tr>
<tr>
<td>Unknown</td>
<td>85 (6.1 %)</td>
<td>94 (6.8 %)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Home language</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dutch</td>
<td>952 (68.8 %)</td>
</tr>
<tr>
<td>Another language</td>
<td>245 (17.7 %)</td>
</tr>
<tr>
<td>Two or more languages concurrently</td>
<td>149 (10.8 %)</td>
</tr>
<tr>
<td>Unknown</td>
<td>37 (2.7 %)</td>
</tr>
</tbody>
</table>
Instruments

**Social networks.** We examined teachers’ advice networks in the sample schools using social network analysis. The respondents were offered two social network questions regarding advice relationships. To assess the work related advice network in the sample schools, the educators were asked to answer the question: ‘Whom do you go to for (work related) advice?’ Following Ibarra (1993), we will refer to this network as the *instrumental network*. To examine the personal advice network in the sample schools, we asked the educators to respond to the question: ‘Whom do you go to for guidance on more personal matters?’. We will refer to this network as the *expressive network*. The social network survey was accompanied by a school-specific appendix that listed the names of the schools’ educators together with a letter combination (e.g., Mr. Allen Driver⁴ = AB). The educators could answer the questions by indicating the letter combinations of the colleagues, with whom they have the relationship as described in the social network question. They could name as many colleagues as they wanted.

**Collective efficacy.** Perceptions of collective efficacy of the school staff were measured with five items of the Collective Efficacy Scale (CE-Scale) developed by Goddard (2002). This instrument was translated and adjusted to the Dutch context of elementary education. The scale was designed to assess faculty perceptions of collective efficacy. For example, in one item teachers were asked: ‘Teachers in this school are able to get through to difficult students’. Respondents could express their agreement with the items on a 4-point scale, ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Principal component analysis provided evidence that the five items contributed to a single factor solution explaining 49.8 % of the variance (α = .73). The items and factor loadings for the scale are presented in Table 3.

Although we measured collective efficacy at the individual level, the concept should be interpreted as a school level variable since ‘perceived collective efficacy is an emergent group-level attribute rather than simply the sum of members’ perceived personal efficacies’ (Bandura, 1997, p. 478). Following previous research (Goddard, Hoy, & Woolfolk Hoy, 2004), we used aggregate measures of individuals’ perceptions of group referent capability. “Group referent” indicates that we changed the object of the efficacy perception – the items are similar to teachers’ perceptions of individual efficacy but all started with “we” instead of “I”. While a claim to assess collective efficacy at the collective level is conceptually justified, empirical evidence is also needed to

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⁴ All names are pseudonyms
Chapter 7

Table 2. Sample characteristics of schools (N = 53)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>M</th>
<th>Sd</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School level student gender ratio</td>
<td>53</td>
<td>50.0</td>
<td>13.6</td>
<td>25.0</td>
<td>83.3</td>
</tr>
<tr>
<td>Socio-economic status (SES)</td>
<td>53</td>
<td>92.1</td>
<td>9.5</td>
<td>52.7</td>
<td>96.6</td>
</tr>
<tr>
<td><strong>School level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School size (number of students)</td>
<td>53</td>
<td>213.0</td>
<td>116.6</td>
<td>53</td>
<td>545</td>
</tr>
<tr>
<td>Team size (number of educators)</td>
<td>53</td>
<td>14.8</td>
<td>6.8</td>
<td>6.0</td>
<td>31</td>
</tr>
<tr>
<td>Gender ratio</td>
<td>53</td>
<td>76.8</td>
<td>10.7</td>
<td>57.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 3. Items, factor loadings and Cronbach’s alpha for Collective efficacy (n = 775)

<table>
<thead>
<tr>
<th>Collective efficacy (α = .73)</th>
<th>Factor</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>At this school…</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Teachers are able to motivate their students</td>
<td></td>
<td>.78</td>
</tr>
<tr>
<td>2. Teachers are able to challenge their students to learn</td>
<td></td>
<td>.78</td>
</tr>
<tr>
<td>3. Teachers in this school are able to get through to difficult students</td>
<td></td>
<td>.70</td>
</tr>
<tr>
<td>4. Teachers in this school really believe every child can learn</td>
<td></td>
<td>.68</td>
</tr>
<tr>
<td>5. If a child doesn’t want to learn teachers here give up (Reversed)</td>
<td></td>
<td>.57</td>
</tr>
</tbody>
</table>

1 SES is calculated as the weighted percentage of students for whom the school does not receive extra financial resources; the lower this percentage, the more students with low SES the school serves.

2 Percentage of female educators
validate aggregation of individual level data (Klein & Kozlowski, 2000). In order to justify the aggregation of individual teacher perceptions of collective efficacy into a school level aggregate, we calculated interrater agreement ($r_{wg[j]}$; James, Demaree, & Wolf, 1984) and interrater reliability (ICC[1] and ICC[2]; cf. Bliese, 2000; LeBreton & Senter, 2008). An $r_{wg[j]}$ higher than 0.70 implies high within-group agreement (LeBreton et al., 2003). The ICC[1] is typically interpreted as an effect size (Bliese, 2000; Raudenbush, & Bryk, 2002). Values of .01, .10, and .25 can thus be interpreted as a small, medium, or large effect. The ICC[2] can be interpreted as a reliability coefficient, with 0.70 as a sufficient value to assume interrater reliability (see LeBreton & Senter, 2008, for a useful review of interrater agreement vs. interrater reliability). The three measures were found to be sufficiently supportive of aggregation ($r_{wg[j]} = .91$, ICC[1] = .11, ICC[2] = .64). Supported by these findings, we therefore aggregated individual teacher perceptions of collective efficacy to a school level variable.

School level student achievement. We included school level student achievement as the school level mean score on a standardized test that was administered to all sixth-grade students of the sample schools (age 11-12). In the final year of elementary education, sixth-grade students participate in a nationwide standardized Final Primary Education Test (CITO). Based on the result of this test and the school’s advice, the students are assigned to different levels of high school to continue their education. We included students’ standardized score on the topics Language (100 items) and Aritmetic / Mathematics (60 items), as these are considered the core competences assessed by the test. The multiple choice questions could be answered by selecting the right answer from three, four, or five options. The test is considered to be a reliable and valid measure of student achievement (Cito, 2009).

Demographic variables. We collected demographic characteristics of students, teachers, and schools to assess the presence of relationships between demographics, advice network characteristics, collective efficacy, and student achievement. With regard to students, we included the school level student gender ratio (percentage of girls) as a control variable because research has repeatedly demonstrated that boys outperform girls in mathematics (Bae, Choy, Geddes, Sable, & Snyder, 2000; Van Schilt-Mol, 2007). We also included school level socio-economic status (SES) of the schools (based on a governmental weighting factor for additional financial support) and percentage of bilingual students since this may influence school level student achievement (Van Schilt-Mol, 2007). The community surrounding the school may directly influence teachers’ perceptions of the abilities, and motivations of the students, and the
level of support they receive from home and the community, which is captured by the task analysis scale of collective efficacy. Research has evidenced that school teams that serve a high proportion of socioeconomically disadvantaged students tend to be characterized by a lower sense of collective efficacy (Bandura, 1997; Parker, 1994).

With regard to school characteristics, we included school size (number of students) and team size (number of educators) as important demographic variables since they are known to be directly related to the social networks (Cole & Weinbaum, 2007; Tsai, 2001). In addition, we included team composition variables such as gender ratio (percentage of female educators) and age, because both have been associated with teachers’ perceptions of collective efficacy (Bandura, 1997). We added years of conjoint team experience because groups with a longer history of shared experiences may have more information to support their perceptions of collective efficacy compared to teams with less shared experience. Also, it provides “a context in which certain team beliefs and processes are likely to evolve” (Chen et al., 2002, p. 385).

Data analysis

Social networks. We examined density and centralization of instrumental (work related advice) and expressive (personal guidance) advice networks among educators within each school (Borgatti, Jones & Everett, 1998). These social network characteristics were calculated using UCINET 6.0 (Borgatti, Everett, & Freeman, 2002). The following paragraphs discuss the school level network characteristics in detail.

Network density refers to the number of relationships in a network, relative to the size of the network. Density of the advice networks was calculated as the proportion of existing relationships to the maximum number of relationships possible in the network. The value of density can vary between 0 (there are no relationships among the actors in the network) and 1 (all actors are connected to each other). For example, the more dense the expressive (personal advice) network, the more team members turn to each other for advice on personal matters. Density can be used to indicate group cohesion (see Blau, 1977; in Wasserman & Faust, 1997, p. 181).

Network centralization is a network characteristic that informs about the relative centrality of a single actor in contrast to the other actors in the network (Wasserman & Faust, 1997). An actor occupies a central position in a network when s/he is nominated by many colleagues as a valuable source for advice. While an individual respondent with high centrality can be regarded as the most central person in a network, a network with a high centralization depicts a
high variability among individual centralities in the network (Wasserman & Faust, 1997). Network centralization was standardized to facilitate comparisons among schools. Centralization will reach the maximum value of 1 when every teacher in a network only asks advice from a single person in the network, while these teachers themselves are not asked for advice at all. The minimum value of 0 indicates that each teacher is nominated as frequently. The more centralized the social network is, the more advice is spread from a single or a few influential source(s) to the rest of the network, in contrast to a decentralized social network, in which advice is much more evenly shared among all members.

Collective Efficacy. For the Collective Efficacy scale and the school level student achievement scores we calculated descriptive statistics and correlations (see Table 4).

Analysis strategy
A four-step procedure was followed to examine the indirect effect of teachers’ social networks on student achievement. Figure 1 graphically represents the proposed hypotheses. First, we studied the influence of demographic variables on the proposed relationships between social network structure, collective efficacy, and student achievement. Second, we examined correlations to analyze the relationships among the study variables. Third, we investigated the influence of teachers’ advice network density and centralization on collective efficacy (Hypothesis 1). Then, we conducted multiple regression analyses to check whether social network structure directly affected student achievement in our sample (the dashed line in Figure 1). Finally, we examined the influence of collective efficacy on school levels of students’ cognitive achievement given schools’ social network structure (Hypothesis 2).

Figure 1. Path diagram of hypothesized relationships
Table 4. Descriptive statistics and correlations at school level (N = 53)

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>Sd</th>
<th>Min</th>
<th>Max</th>
<th>2a</th>
<th>2b</th>
<th>3a</th>
<th>3b</th>
<th>4</th>
<th>5a</th>
<th>5b</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Socio-economic status (SES) (^1)</td>
<td>92.12</td>
<td>9.81</td>
<td>52.70</td>
<td>96.60</td>
<td>.06</td>
<td>.23</td>
<td>.08</td>
<td>.28*</td>
<td>.27</td>
<td>.58**</td>
<td>.71**</td>
</tr>
<tr>
<td>2. Instrumental network</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Density</td>
<td>0.23</td>
<td>0.09</td>
<td>0.07</td>
<td>0.53</td>
<td>.24</td>
<td>.24</td>
<td>.79**</td>
<td>.38**</td>
<td>.41**</td>
<td>.06</td>
<td>-.02</td>
</tr>
<tr>
<td>b. Centralization</td>
<td>0.38</td>
<td>0.13</td>
<td>0.12</td>
<td>0.66</td>
<td>1.00</td>
<td>1.00</td>
<td>.19</td>
<td>.38**</td>
<td>.33*</td>
<td>.08</td>
<td>.14</td>
</tr>
<tr>
<td>3. Expressive network</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Density</td>
<td>0.30</td>
<td>0.11</td>
<td>0.12</td>
<td>0.53</td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td>.45**</td>
<td>.43**</td>
<td>.12</td>
</tr>
<tr>
<td>b. Centralization</td>
<td>0.34</td>
<td>0.12</td>
<td>0.09</td>
<td>0.61</td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td>.37**</td>
<td>.25</td>
<td>.28*</td>
</tr>
<tr>
<td>4. Collective efficacy</td>
<td>3.31</td>
<td>0.24</td>
<td>2.46</td>
<td>3.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td>.29*</td>
<td>.48**</td>
</tr>
<tr>
<td>5. Student achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Mathematics</td>
<td>73.13</td>
<td>8.32</td>
<td>53.30</td>
<td>89.70</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td>.83**</td>
<td></td>
</tr>
<tr>
<td>b. Language</td>
<td>75.66</td>
<td>6.15</td>
<td>54.40</td>
<td>84.40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: ** p < .01, * p < .05

\(^1\) SES is calculated as the weighted percentage of students for whom the school does not receive extra financial resources; the lower this percentage, the more students with low SES the school serves.
There is a methodological challenge to address when employing 'traditional' statistical methods with social network characteristics. This challenge is formed because network data are per definition interdependent. Therefore, violations to the basic assumption of independence underlying regression analysis may occur (see Kenny, Kashy, and Bolger, 1998). Since the two types of advice networks used in this study refer to the same group of individuals, the school level social network measures of our two advice network types cannot be considered independent. This is reflected in the high correlation (.79, p < .01) between the densities of the instrumental and expressive networks. Therefore, using similar network measures in the same regression equation (e.g., density of instrumental and expressive network) would challenge the assumption of independence of the data. To solve this issue, we have decided to separately compare and contrast the influence of both networks on student achievement and collective efficacy.

Another issue is multicollinearity, which arises because of the moderate to high correlations between the school level social network data within and among both network types. While multicollinearity does not affect the predictive power of the model as a whole, it may inflate the standard errors of the individual predictors. To verify whether multicollinearity devalued the stability of our findings, we reran the analyses on different subsets of the data (and alternatively excluding demographics, density and centralization) and found that the results remained largely stable across all models. In addition, the models' variance inflation factors (VIF) and tolerance statistics did not indicate the presence of multicollinearity in the models. When we also take into account the considerable size of the dataset, we may assume that multicollinearity did not pose a significant threat to the robustness of our findings.

RESULTS

The influence of demographic variables on advice networks, collective efficacy, and student achievement

Before testing our hypotheses, we analyzed the influence of various demographic variables on characteristics of advice networks (density and centralization), collective efficacy, and student achievement. Demographic variables included school level student characteristics, such as student gender ratio (the percentage of girls in the target classes), school level socio-economic status (SES), and school characteristics such as school size, team size, team gender ratio, and team experience in current composition. Findings suggest that
subsequent analyses should control for school level SES, which was found to have a strong positive effect on student achievement (see Table 4). Since the other demographic variables did not appear to affect the variables and relationships under study, these demographic variables were excluded from further analyses.

*Advice networks in relation to collective efficacy and student achievement: correlation analyses*

Examination of the descriptive statistics (see Table 4) indicates that expressive advice networks were slightly denser than instrumental advice networks. In general, 30% of the maximum possible personal related advice relationships does exist in reality (as indicated by the educators), compared to 23% of the maximum possible work related advice relationships. On average, work related advice networks are slightly more centralized than personal advice networks (respectively .38 versus .34).

Results from the correlation analyses suggest that social network characteristics of both networks are largely unrelated to student achievement. Only the centralization of personal advice networks in schools appear to be positively related to student achievement in language (r = .28, p < .05). In other words, students on average perform better in these areas in schools where the network of personal advice is centralized around a single or a few educator(s). Also, results suggest that social network characteristics are positively related to collective efficacy. The denser and more centralized the advice networks, the higher educators’ perceptions of collective efficacy. Findings indicate significant correlations between network density and centralization of both types of advice networks and perceived collective efficacy (ranging from r = .33, p < .05 to r = .43, p < .05). In turn, our findings demonstrate that collective efficacy is positively related to student achievement, with the highest correlation between collective efficacy and language test scores (r = .48, p < .01). Meaning, educators that perceive their team capable of motivating students to learn often work in schools that achieve higher student achievement with regard to language. Finally, the social network characteristics are moderately to strongly interrelated (r = .33, p < .05 to r = .79, p < .01) and the school level achievement scores are highly interrelated (r = .83, p < .01).

*The influence of advice network characteristics on collective efficacy*

Then, we tested the first hypothesis concerning the relationship between advice network characteristics (density and centralization) and collective efficacy (see Table 5, Model 1). Results from multiple regression analyses suggest that the
densities of both advice networks have a similar positive and significant effect on teachers’ perceptions of collective efficacy (β = .31, p < .05, and β = .32, p < .05 for the instrumental and expressive networks respectively). The denser the advice networks around both work related and personal matters, the more teachers perceive that they are collectively able to get through to the students, motivate them, and have the skills to deal with even the most difficult students. While network density positively influenced perceived collective efficacy, centralization of the advice networks did not affect teachers’ collective sense of efficacy. In sum, a positive effect of advice network density on collective efficacy was confirmed by the data.

*The influence of collective efficacy on student achievement*
Before testing an indirect effect of schools’ network structure on student achievement through collective efficacy, we first examined whether density and centrality of schools’ advice networks directly affected student achievement. Multiple regression analyses were conducted to test the influence of network density and centralization on mathematics and language achievement (see Table 5, Model 2a). Results indicate that, above the strong positive effect of school level socio-economic status (SES) on student achievement, none of the characteristics of advice networks were directly related to student achievement. While a positive correlation between the centralization of personal advice networks and language achievement was found earlier, a significant direct effect could not be evidenced. On average, SES proved to be the strongest predictor of student achievement, with explained variance ranging from 35.6 % (mathematics) to 52.8 % (language).

Since advice network characteristics did not have a significant direct effect on student achievement, we continued by testing the effect on student achievement through its impact on collective efficacy. Therefore, we analyzed the effect of collective efficacy on student achievement while ‘fixing’ social network structure (Pearl, 2000). In other words, we predicted student achievement by collective efficacy, given the effect of social network structure on student achievement. As such, we could determine the unique contribution of collective efficacy in the prediction of student achievement above the influence of network density and centralization.

Results indicate that, again, school level SES is a strong and significant positive predictor of student achievement in mathematics and language (see Table 5, Model 2b). Above the effect of SES, teachers’ perceptions of collective efficacy were not significantly associated with students’ mathematics
Table 5. Multiple regression analyses of social network characteristics predicting standardized achievement scores (N = 53)

<table>
<thead>
<tr>
<th></th>
<th>Model 1 Collective efficacy</th>
<th>Model 2a Mathematics</th>
<th>Language</th>
<th>Model 2b Mathematics</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>S.E.</td>
<td>β</td>
<td>B</td>
<td>S.E.</td>
</tr>
<tr>
<td>Instrumental network</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(intercept)</td>
<td>2.98</td>
<td>.11</td>
<td></td>
<td>72.46</td>
<td>3.70</td>
</tr>
<tr>
<td>School SES</td>
<td>.05</td>
<td>.03</td>
<td>.21</td>
<td>4.87</td>
<td>1.04</td>
</tr>
<tr>
<td>Density</td>
<td>.80</td>
<td>.34</td>
<td>.31*</td>
<td>9.51</td>
<td>11.53</td>
</tr>
<tr>
<td>Centralization</td>
<td>.41</td>
<td>.26</td>
<td>.21</td>
<td>-3.96</td>
<td>8.86</td>
</tr>
<tr>
<td>Collective efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>5.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sign.</td>
<td>.004</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expressive network</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(intercept)</td>
<td>3.01</td>
<td>.11</td>
<td></td>
<td>68.39</td>
<td>3.56</td>
</tr>
<tr>
<td>School SES</td>
<td>.05</td>
<td>.03</td>
<td>.21</td>
<td>4.42</td>
<td>1.04</td>
</tr>
<tr>
<td>Density</td>
<td>.70</td>
<td>.33</td>
<td>.32**</td>
<td>4.04</td>
<td>10.74</td>
</tr>
<tr>
<td>Centralization</td>
<td>.28</td>
<td>.33</td>
<td>.13</td>
<td>10.67</td>
<td>10.66</td>
</tr>
<tr>
<td>Collective Efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>.23</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>.18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>4.58</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sign.</td>
<td>.007</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: * p < .05, ** p < .01
achievement. In contrast, perceived collective efficacy was positively associated with increased language achievement, above the influence of SES. Thus, teacher teams who perceive that they possess the skills and expertise to collectively influence their students often achieve higher language performance than teachers with less confidence in their team’s collective efficacy. As indicated by earlier findings, the density and centralization of work related advice networks did not directly affect student achievement significantly. However, we found that the density of personal guidance networks in schools had a negative effect on students’ language achievement when collective efficacy was entered into the equation. There are indications that this is a suppression effect due to the addition of collective efficacy to the model, causing the partial correlations between network density (of both the instrumental and expressive network) and students’ language achievement to be higher than the original bivariate correlations as depicted in Table 4.

While a direct effect between advice network characteristics and student achievement could not be evidenced, findings did suggest that being embedded in a dense network around work related and personal advice increased teachers’ perceptions of their group’s efficacy, which in turn was positively associated with school level language achievement. As such, an indirect effect of advice network density on student achievement could be confirmed.

CONCLUSIONS AND DISCUSSION

Since governmental pressure for schools to improve has risen around the world due to increasingly stringent accountability policies, the urge for systematic efforts to increase student achievement is anchored in daily educational practice. Emerging studies on teacher social networks indicate that strong ties among educators are important to the implementation of reform and school elements such as trust and innovative climates (Coburn & Russell, 2008; Moolenaar et al., 2009; Moolenaar, Daly, & Sleegers, in press). While scholars have pointed to the need to examine the relationship between teacher ties and student achievement (Daly et al., in press), until now, empirical studies that focus on the relation between teacher ties and student achievement are scarce. This chapter addresses this gap in our knowledge by examining the link between schools’ social network structure and student achievement as a function of teachers’ collective efficacy.

Grounded in literature around collective efficacy and social networks, we argued that by offering shared experiences and aligning collective goals,
schools’ social networks may enhance teachers’ perceptions of their collective
capacity to increase student learning, which in turn may affect student
achievement. To test our hypotheses, we conducted a survey study on the
relationship between teachers’ social networks, perceived collective efficacy,
and student achievement in 53 Dutch elementary schools. Based on the
findings, we could not confirm a direct effect of teachers’ social network
structure on student achievement at the school level of analysis. Neither the
density, nor the centralization of advice networks was found to directly affect
student achievement in mathematics or language. However, findings suggested
the density of work related and personal advice networks affected teachers’
perceptions of collective efficacy, which in turn was associated with increased
student achievement. As such, collective efficacy served as an intervening
variable that may explain how dense social networks among educators may
ultimately benefit student achievement. We will now discuss three themes that
arise from our findings and offer implications for reform efforts, leadership
practice, and future research.

**Dense networks foster increased efficacy beliefs**

Dense networks appear to support and nurture teachers’ confidence in the
capacity of their team to impact students’ learning and achieve school goals.
The potential to build collective efficacy beliefs is offered by both personal and
work related advice relationships. This finding contributes earlier studies that
emphasized the significance of densely connected teacher teams for school
organizational characteristics, such as teacher trust, innovative school climate,
perceived involvement in decision-making, and the implementation of reform
(see Chapters 5, 6; Coburn & Russell, 2008; Penuel etc, Daly). As previously
suggested (Bandura, 1993; Kurz & Knight, 2004), the social environment that
resulted from teachers’ interdependency on advice exchange seemed to affect
teachers’ beliefs in the capacity of their team. In our sample, network
centralization did not affect teachers’ collective efficacy beliefs, which implies
that these beliefs are more likely influenced by the exchange of advice
throughout the whole team, rather than the centralization of advice around
certain focal individuals.

**Strong collective efficacy beliefs endorse student achievement**

Our findings indicated that teachers’ collective efficacy beliefs supported
student achievement. Teacher teams that felt that they were able to motivate
and challenge their students, and get through even to more difficult students,
were teaching in schools that achieved higher student performance for
language. These findings are the first to partly replicate earlier studies that have
been conducted in the USA (Bandura, 1993; Goddard, 2001; 2002; Goddard &
Goddard, 2001; Goddard et al., 2000; Goddard, Hoy & Woolfolk Hoy, 2000,
2004; Ross, Hogaboam-Gray, & Gray, 2003; Tschannen-Moran & Barr, 2004) in a
Dutch educational setting. However, in this setting the school level socio-
economic background of the students proved to be a more powerful predictor
than teachers’ collective efficacy, in contrast to findings by Bandura (1997).

An interesting find is that teachers’ collective efficacy beliefs appeared to
be beneficial to students’ language achievement, but not to mathematics
achievement. While this was an unexpected find that is perhaps not easily
explained, we do have some suggestions to understand our finding. In the
Netherlands, language instruction is a much debated topic in policy and
practice since students’ reading achievement results have decreased
significantly in the last years (Mullis et al., 2007; Netten & Verhoeven, 2007). As
a result, there is much attention for language instruction, with additional
governmental funding directed at improving reading comprehension results
through teachers’ professional development and, in some cases, increased time
Therefore, teachers’ exchange of advice may have been overly focused on
advice around language instruction, which in turn may have affected teachers’
collective efficacy beliefs specifically with regard to their potential to improve
reading. In schools with high collective efficacy beliefs about language
instruction, students’ language achievement may therefore have been higher
than schools with lower perceptions of collective efficacy. Additionally, gender
stereotyping with regard to mathematics instruction may have played a role in
finding no significant effect of collective efficacy on students’ mathematics
achievement. Teachers’ self-efficacy may be affected by such things as grade
level of students and the subject matter taught (Bandura, 1993; Greenwood,
Olejnik, & Parkay, 1990; Midgley, Feldlaufer, & Eccles, 1988). Given the
predominance of women in Dutch, and probably global elementary education,
lower collective efficacy beliefs may have partly reflected lower self-efficacy
beliefs. Meaning, our study may indeed reflect that collective efficacy beliefs are
potentially subject related – a hypothesis worth exploring in further research.

*Teachers’ advice networks and student achievement*

Scholars have previously suggested that collective efficacy may be the missing
link between social capital and organizational functioning (Sampson, Morenoff,
& Earls, 1999). Results from this study support the potential of strong teacher
relationships for creating a work environment that ultimately benefits student
achievement. While the exchange of advice among teachers may help overcome obstacles of daily practice and facilitate achieving instructional goals, patterns of advice exchange are not directly related to increased student achievement. This finding lends support for the notion that the relationship between teacher collaboration and student achievement is likely indirect (Goddard, Goddard, & Tschannen-Moran, 2007) and, as evidenced in this study, can be explained by increased collective efficacy beliefs. As such, this study resembles school organizational and school leadership studies, in which effects on student achievement are also likely indirect and direct effects are often small or absent (Leithwood & Riehl, 2003). Although collective efficacy beliefs may not be the sole mechanism through which teachers’ networks affect student achievement, it is indeed a significant mechanism, and what is as important, a mechanism that may be affected by educational leadership and policy through fostering strong teacher relationships. It may also be that the limited relationship between networks and achievement has to do with the type of relationship studied in this chapter - meaning that examining patterns of relationships more directly related to achievement, such as interactions around specific mathematics or language instructional practice, would have yielded significant effects on student achievement. In conclusion high collective efficacy beliefs, as supported by teachers’ advice interaction, provides an important route increased student performance.

**Delimiters and future research**

While the contribution of this chapter to literature, policy, and practice is substantial, we acknowledge its limitations. The findings showed that only a small to moderate percentage of the variance in the learning activities was explained by collective efficacy. It is likely that other factors not included in our model may also affect student learning. Research into teachers’ perceived self-efficacy showed that personal self-efficacy not only affects students’ learning directly but also indirectly via the instructional strategies teachers use to create a supportive learning environment (Ashton & Webb, 1986; Dembo & Gibson, 1985; Geijssel, Sleegers, Stoel, & Krüger, 2009; Smylie, 1988; Wheatley, 2002). The connections between collective efficacy beliefs and student outcomes depend in part on the reciprocal relationships among these collective efficacy beliefs, teachers’ personal sense of efficacy, teachers’ professional practice, and teacher’s influence over instructionally relevant school decisions (Goddard, Hoy, & Woolfolk Hoy, 2004; Ross, 1995). In addition, it should be noted that the generalizability of this study to large U.S. school districts may be limited as Dutch elementary schools in general serve less students than elementary
schools in the US. We would therefore encourage a validation of our findings in different countries and at different educational level (e.g., secondary, vocational, and higher education).

Recent studies have emphasized the need to study teachers’ social networks in a multilevel framework (Moolenaaret al., in press). We underline the importance of multilevel studies that take into account the nested nature of student and teacher data within schools. Therefore, we regret that a multilevel examination of our hypotheses was not feasible due to the school level nature of the available student achievement data. While the results in this study are robust, we nevertheless would advise additional multilevel studies to substantiate our findings. Although causality of the proposed relationships is based on a substantial literature base, our cross-sectional design did not serve a validation of the causal nature of these relationships. Future research may be advised to explore multilevel causal models in which the chain of variables that connect teachers’ social networks and student achievement, are conceptualized and tested. These models can contribute to a better understanding of the paths through which social networks and collective efficacy have an impact on teacher and student outcomes.

**Implications for reform efforts and leadership practice**

Through heightening awareness of a school’s capacity for organizing and implementing effective actions to meet desired goals, collective efficacy is a powerful concept for both leadership and the successful implementation of reform. Looking at the school as the significant unit of change in reform efforts (Fullan, 1990), we can see that studying collective efficacy has the potential to enrich our understanding of the complexity of the psychosocial aspects of schools as organizations. A social context that supports the exchange of instructionally valuable advice clearly supports teachers’ perceptions of their schools’ ability to collectively impact student learning. Research on collective efficacy demonstrates that when certain organizational aspects of schools converge – high expectations of student behavior and performance, collaborative interaction and collegial encouragement, and strong principal leadership - student achievement improves (Hoy & Sabo, 1998). Leadership may increase collective efficacy beliefs by increasing teachers’ perceptions of their individual and shared ability to successfully manage tasks by creating the opportunities for teachers to succeed at achieving desired goals (creating mastery experience) and for colleagues to witness and share this success, and acting role modeling (Bandura, 1997).
Chapter 7

Yes, we can!

Increasing student performance through strong professional teacher communities is high on the agenda for educational leaders across the globe. Although the potential of strong linkages among teachers for innovation and policy implementation is supported by emerging studies, few empirical studies address the relationship between teachers’ social networks and student achievement. In this chapter we suggest that the benefit of strong teacher networks for student achievement lies in its potential to foster teachers’ collective efficacy beliefs. By offering shared experiences, creating a feeling of collectivity, and providing the opportunity to exchange expertise, strong teacher networks nurture teachers’ beliefs in the capacity of their team, which in turn was associated with increased student achievement. A potential route to school improvement therefore may be to grow strong ties among teachers, cultivate their collective belief in ‘yes, we can’, and as a result, harvest increased student achievement.