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Connecting teacher collaboration to inclusive practices using a social network approach

Abstract

This study focuses on the link between teacher collaboration on the one hand and teachers' beliefs towards inclusion and differentiated instruction on the other hand, using a social network approach. Multilevel analysis on data from teachers (N = 441) in primary schools (N = 24) shows that teachers in highly dense school networks are more positive towards inclusion and implement more differentiated instruction. Teachers in highly centralized school networks differentiate less. This centralization was not significantly related to teachers' beliefs towards inclusion. Finally, school external support did not have a significant impact on teachers' beliefs towards inclusion and differentiated instruction.

Keywords: teacher collaboration; inclusive education; beliefs towards inclusion; differentiated instruction; social network approach

Word count: 9092 (excl. tables and references)

1. Introduction

Including all learners in education is worldwide a major topic in the policy reform agenda (OECD, 2015; UNESCO, 2017). Despite the globally accepted importance of inclusive education, there are various interpretations of this concept, ranging from the inclusion of certain groups who share a history of segregation (e.g., students with a disability) in mainstream education, to a broader view of inclusion as a reform that appreciates and responds to the diversity of all learners (Ainscow & Miles, 2008). In this study, inclusive education is defined as the inclusion of students with special educational needs (SEN) in mainstream education by improving and adapting the learning environment to the individual needs of the learner (Coates & Vickerman, 2008; de Boer, Pijl, & Minnaert, 2010; Lindsay, 2007), in order to include these students not only physically but also socially and academically (Author et al., 2018a).

In realizing inclusive education teachers are central agents, by ensuring that the learning environment addresses the SEN of all students. Two aspects are vital in realizing an inclusive learning environment. Firstly, teachers' positive beliefs towards inclusive education are argued to be critical in ensuring the success of inclusive practices since these beliefs are likely to affect their commitment to implementing it (Forlin, 1995; Norwich, 1994). Teachers' belief in the possibility and added value of including all children in their classroom is essential to realise inclusion. Plenty of studies have therefore examined teachers' beliefs towards inclusion and have supported their importance (e.g., Avramidis & Norwich, 2002; de Boer, Pijl, & Minnaert, 2011; Sharma & Sokal, 2016; Soodak, Podell, & Lehman, 1998). Secondly, it is essential that teachers adjust their teaching approach to the individual needs of the learners so that all students are truly included (EADSNE, 2009). Equality of opportunity for educational progress can only be realized if students receive instruction suited to their diverse abilities, backgrounds, interests and learning preferences (George, 2005). Differentiated instruction is a highly promising approach to guide teachers in addressing these diverse educational needs as this approach aims to maximise the learning opportunities of all learners by pro-actively modifying curricula and instructional practices to the student's readiness, interests and learning profile (Broderick, Mehta-Parekh, & Reid, 2005; Tomlinson et al., 2003). Studies suggest that successful inclusion is more likely to be evident in classrooms in which teachers differentiate their instruction relative to their students' needs (Beecher & Sweeny, 2008; Lawrence-Brown, 2004; Strogilos, 2018). Put together, teachers' positive beliefs towards inclusion and differentiated instruction are considered at the heart of inclusive education. Both aspects are needed, on the one hand a teacher who is negative about inclusive education will not be inclined to put much effort into its implementation. On the other hand, being positive about inclusion in itself is not sufficient, their teaching should also be adjusted to the differences among learners. Moreover, both aspects seem to be related, teachers who are more positive about inclusion, tend to use more differentiated teaching methods (Gheyssens, Struyven, Coubergs, & Engels, 2016; Soodak et al., 1998).

Although teachers are central agents in implementing inclusive education, one cannot expect that a single teacher, working alone, is able to meet all students' needs (Carroll, 2009). Teacher collaboration is therefore assumed to be a pivotal factor in realizing inclusive education (e.g., King-Sears, Janney, & Snell, 2015; Mitchell, 2014; Santoli, Sachs, Romey, & McClurg, 2008). However, little is known regarding how collaboration should be shaped to realize inclusive education. This study therefore aims to examine the link between teacher collaboration on the one hand and inclusive education on the other hand. Recently scholars used a social network approach (SNA) to study teachers' collaborative practices (e.g., Coburn & Russell, 2008; Geeraerts, Van den Bossche, Vanhoof, & Moolenaar, 2017; Moolenaar, Sleegers, & Daly, 2012; Penuel, Riel, Krause, & Frank, 2009). A SNA focuses on the patterns of social relationships that result from teachers' (in)formal interactions in daily practice, which reflect whether and to what degree collaboration takes place (Moolenaar, 2012). As such, it offers a fine-grained approach for studying teacher collaboration and how it is realised in daily educational practice. Several scholars have already used this approach and have demonstrated its value by showing the importance of teacher collaboration for school reforms and innovation (Penuel et al., 2009), instructional improvement in mathematics (Hopkins, Spillane, Jakopovic, & Heaton, 2013) and student achievement (Moolenaar et al., 2012). Given that a SNA offers a fine-grained way to study teacher collaboration and the proven value of this approach in other educational domains, we will use a SNA to examine the relationship between teacher collaboration and inclusive education. The latter will be operationalised in teachers' beliefs towards inclusion and in differentiated instruction, as these two aspects are at the heart of inclusive education.

2. Theoretical framework

2.1. Teacher collaboration in inclusive education

In this study, teacher collaboration is defined in a broad sense as "joint interaction in the group in all activities that are needed to perform a shared task" (Vangrieken, Dochy, Raes, & Kyndt, 2015, p. 23). Applied to the context of inclusive education, teacher collaboration covers the joint interaction between all actors engaged in improving and adapting the learning environment to the SEN of the student so that the student is truly included in regular education. This implies the involvement of other and often more actors, including school internal professionals (e.g., teachers, SEN-coordinators), school external professionals (e.g., pedagogical counsellors, special educators, therapists), and parents and pupils (Alquraini & Gut, 2012; Hunt, Soto, Maier, Müller, & Goetz, 2002; Keay & Lloyd, 2011).

On the one hand, teacher collaboration may have a positive impact on teachers' beliefs towards inclusion. By working together, a support network is created, making teachers feel less isolated (Hunt et al., 2002) and more confident in addressing challenges (Messiou et al., 2016; Pugach & Johnson, 1995). Additionally, previous research suggested that teacher collaboration positively influences teachers' attitudes towards inclusive education, such as their acceptance of learners with different needs and their concerns about implementing inclusive education (Malinen, Savolainen, & Xu, 2012; Pugach & Johnson, 1995; Savolainen, Engelbrecht, Nel, & Malinen, 2012; Yada & Savolainen, 2017). Moreover, Soodak et al. (1998) demonstrated that teacher collaboration may compensate for teachers' personal insecurities, as teachers in schools that encourage collaboration were more positive about inclusion, regardless of their self-efficacy beliefs.

On the other hand, teacher collaboration may foster teachers' differentiated instruction. Pettig (2000) proposed teacher collaboration as one of the most important strategies for implementing differentiated instruction: "The very act of discussing your ideas with a peer is as crucial to your learning process as it is to your students' learning. Teachers have spent far too much of their professional lives thinking about, preparing for, and delivering their curriculum in isolation" (Pettig, 2000, p. 15). Moreover, the findings of Smit and Humpert (2012) showed that teachers who are highly engaged in differentiated instruction feel supported by their school team, whereas who implement differentiated instruction less frequently consider their teams to be less collaborative with respect to pedagogical issues, suggesting that team collaboration enhances teachers' differentiated instruction. This is supported by the study of De Neve and Devos (2017) that shows how professional learning communities in which teachers have in-depth conversations on how to use differentiated instruction, can aid teachers in implementing this pedagogical approach.

2.2. A social network approach to teacher collaboration

To understand the facilitating role of teacher collaboration in realizing inclusive education and to argue why a SNA contributes to this understanding, we draw on the concept of social capital, which is defined as "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit" (Bourdieu, 1986; Burt, 1992 as cited in Nahapiet & Ghoshal, 1998, p. 243). At the school team level, high levels of social capital may be reflected by a frequent exchange of resources, which in turn facilitates achieving educational goals and helps to overcome obstacles that occur in daily teaching practices. Translated to this study, a school's high level of social capital may be evidenced by effective teacher collaboration, which in turn contributes to realizing inclusive classrooms. Opportunities for the exchange of resources in the form of social capital are dependent on the pattern and quality of the social relationships in the network (Coleman, 1988). To put it differently, the transfer of resources in a social network, may be facilitated by an optimal configuration of relationships in that network. A valuable framework for studying how this configuration may facilitate or constrain social capital, is social network theory (Degenne & Forsé, 2004). While the concept of social capital offers a lens to think about the potential of social relationships for acquiring resources, the social network theory focuses on the patterns of these social relationships (i.e., the social network structure) and searches for mechanisms that are responsible for social capital outcomes (Burt, 2000). Regarding the aim of this study, the social network theory enables us to study how teacher collaboration should be shaped, or in other words how social relationships in schools should be structured to realize inclusive education.

Previous research on (school) networks yielded some interesting findings regarding the link between the patterns of social relationships and (teacher and school) outcomes. First, patterns of dense and cohesive relationships may support the creation of a safe environment in which teachers can engage in innovative practices and experiment with new instructional strategies without the fear of failure (Moolenaar, 2010). Moreover, in densely connected teams, there are more opportunities to collective learning and resources such as information and didactic material circulate more quickly, which in turn facilitates the implementation of reform

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(e.g., towards a more inclusive approach) with more depth (Daly, 2010; Daly, Moolenaar, Bolivar, & Burke, 2010). Additionally, the denser the networks, the more teachers perceive that they are collectively able to provide maximal learning opportunities for all students (Moolenaar et. al., 2012) and the more positive their beliefs about the profession (Brass, Galaskiewicz, Greve, & Tsai, 2004; Ibarra & Andrews, 1993). Second, a high network centralization (i.e., a network which is described by one or a few highly central actors and many other more peripheral actors) may hamper a school team's adaption to changing environments (Tschannen-Moran, 2009) and the network's robustness (Leonardi & Contractor, 2018). The latter refers to the degree to which the connections in the network can be maintained if you remove actors from it (Leonardi & Contractor, 2018). Third, collaboration with external partners outside the school team may bring in new ideas, information, and expertise, which is important for innovation, and provides the school greater access to helpful outside resources (Leonardi & Contractor, 2018; Penuel & Riel, 2007). So, several scholars already showed the importance of the school's network structure for a variety of (teacher and school) outcomes. However, to our knowledge, there are no studies focusing on the link between the school's network structure and inclusive education. We will add to the literature above by examining how the school's network structure relates to inclusive education, which is operationalized in teachers' beliefs towards inclusion and differentiated instruction.

2.3. Teachers' beliefs towards inclusion

A growing body of educational research studied the concept of teacher beliefs, which has been defined in a variety of ways (Kagan, 1992; Pajares, 1992; Valcke, Sang, Rots, & Hermans, 2010). Based on prior reviews (Kagan, 1992; Pajares, 1992), we define teacher beliefs as the relatively stable understandings, premises and propositions felt to be true by a teacher and which act as a filter through which new knowledge and experiences are screened for meaning. As such, previous research suggested that these beliefs influence teachers' classroom practices,

professional development and enactment of reform (Gregoire, 2003; Nespor, 1987; Pajares, 1992; Woolfolk Hoy, Davis, & Pape, 2006).

Also in the context of inclusive education, teachers' beliefs are considered vital to the successful inclusion of all learners (Avramidis & Norwich, 2002; Norwich, 1994), as it is argued that these beliefs affect teachers' commitment to create an inclusive learning environment (Firestone & Pennell, 1993; Forlin, 1995). Often reform efforts towards more equitable learning environments are hampered by teachers' deficit beliefs. Teachers who hold deficit beliefs locate the problem of failure and underachievement of students with disabilities, or students from low-income, racially or ethnically diverse backgrounds, within the students and are unwilling to look for solutions within their own educational practice (Garcia & Guerra, 2004). These beliefs eventually have a negative impact on students' cognitive outcomes through processes such as the Pygmalion effect (Jussim & Harber, 2005). Contrary, teachers who believe students with SEN are their responsibility tend to use more effective classroom practices for all of their students (Jordan, Schwartz, & McGhie-Richmond, 2009). Therefore, in order to create an inclusive learning environment, teachers' beliefs should be appreciative, considering the diversity present not as a barrier to teaching and learning, but as an opportunity (EADSNE, 2012; Van Avermaet, 2013). To effectively address the SEN of all students, a broad notion, acceptance and appreciation of difference are essential (Kugelmass, 2001). Therefore, in this study we will focus on teachers' professional beliefs about diversity, which concern their thinking towards differences between students and the extent to which these are accepted and appreciated in a schooling context (Pohan & Aguilar, 2001).

2.4. Differentiated instruction

Next to teachers' professional beliefs about diversity, differentiated instruction is considered as a key element of effective inclusive classrooms. Differentiated instruction concerns "an approach to teaching in which teachers proactively modify curricula, teaching methods, resources, learning activities, and student products to address the diverse needs of individual students and small groups of students to maximize the learning opportunity for each student in a classroom" (Tomlinson et. al., 2003, p. 121). Teachers who differentiate instruction expect students to bring a variety of experiences, abilities, interests, and styles to their learning and recognise that these impact students' learning. They are responsive and appreciative to this diversity when planning and delivering instruction. In this way, all can participate successfully as full members of an inclusive classroom (Broderick et al., 2005; Lawrence-Brown, 2004). Multiple studies underpin the value of differentiated instruction for the inclusion of students with SEN in mainstream education. For instance, previous research revealed that this teaching approach fostered student achievement and reduced the achievement gap between low SES-students and high SES-students and among different ethnic groups (Beecher & Sweeny, 2008; Reis, McCoach, Little, Muller, & Kaniskan, 2011; Tieso, 2005; Valiandes, 2015). Additionally instruction and curriculum modifications may reduce students' problem behaviour and increase their task engagement (Kern, Delaney, Clarke, Dunlap, & Childs, 2001; Lee, Wehmeyer, Soukup, & Palmer, 2010).

3. Research aim and hypotheses

Both in research and in recent policy efforts, teacher collaboration is assumed to be a crucial factor in realizing inclusive education. However, there is poor knowledge about how collaboration should be shaped to realize inclusive education. Therefore, the central aim guiding this study is to examine the link between teacher collaboration and inclusive education, by using a SNA. Inclusive education will be operationalised in teachers' beliefs towards inclusion and in differentiated instruction.

First, based on previous research on the patterns of social relationships, we expect that teachers in a highly dense network will have more positive beliefs towards inclusion *(hypothesis*)

Ia). This link is supported by previous findings that the denser the networks, the more teachers perceive they are collectively able to address educational challenges such as addressing the SEN of all students (Moolenaar et al., 2012) and the more positive their perceptions and beliefs about the profession (Brass et al., 2004; Ibarra & Andrews, 1993). Next, as a dense network may create a safe environment in which teachers are willing to engage in innovative practices and experiment with new instructional strategies (Daly et al., 2010; Moolenaar, 2010), a school's network density is assumed to be positively associated with teachers' differentiated instructional practices (*hypotheses 1b*). Additionally, teachers in dense networks may be strengthened to implement more differentiated instruction, because there are more opportunities to learn from colleagues' good practices and experiences (Daly & Finnigan, 2010; Moolenaar, 2010).

Second, we expect that teachers in a highly centralized school network hold less positive beliefs towards inclusion (*hypothesis 2a*). This is based on the premise that a highly centralized network which is dominated by one or a few central actors, may be an indication of a teacher's belief that creating inclusive learning environments is primarily the task of this central person (e.g., the SEN coordinator) and not his/her responsibility. Additionally, since a high centralization may undermine a school's ability to adapt to changing environments (Tschannen-Moran, 2009), we suppose it may also hamper a schools capacity to respond to the growing diversity among students and so will be negatively associated with teachers' differentiated instruction (*hypothesis 2b*).

Third, receiving a high level of school external support is assumed to be positively associated with teachers' beliefs towards inclusive education (*hypothesis 3a*). These external partners may help to explore and question the prevailing beliefs by bringing in another perspective on differences between students, which may lead to more appreciative beliefs. Moreover, collaboration with external partners who have experience in or know-how of

addressing diverse educational needs (e.g., pedagogical counsellors, special education partners), may introduce new ideas and expertise in the school team (Leonardi & Contractor, 2018; Penuel & Riel, 2007) and as such inspire and support teachers in practicing differentiated instruction (*hypothesis 3b*).

4. Method

4.1. Sample

To include a representative sample of primary schools in Flanders (the Dutch-speaking part of Belgium), school selection was based on three important strata: (1) the geographical location of the school in Flanders, (2) rural versus urban school and (3) public versus private school. Within these strata, three random samples were drawn. For each school that was unwilling to participate, a matched school from the next random sample was contacted. Eventually, data were collected in 32 primary schools, of which 24 are included in this study, as they reached a response rate of 70% which is required to reliably analyse whole network data (Kossinets, 2006). The average response rate over the included schools was 81.05%. In total, data of 441 teachers are considered in the analysis, of which 90.02% are women. The age of the respondents varied from 21 to 60 years, with an average age of 38.71 years. On average, a school team counted 26 staff members.

4.2. Variables

All school members were invited to fill out online instruments concerning their social network, beliefs towards diversity and background demographics. Only school members with a teaching function were asked about their differentiated instruction practice. As the latter is one of the main variables, we focus only on teachers in the following analyses. Table 1 and Table 2 provide descriptive statistics and correlations for the school level and individual level variables respectively, which are described below.

4.2.1. School level independent variables

We collected data on teacher collaboration by means of a social network instrument which was developed to assess teacher collaboration in inclusive education and was validated in a previous study (Author et al., 2019a). In this instrument every school member was asked two questions: (1) Who do you usually ask for support to create a powerful and accessible learning environment for one or more student(s) with SEN? and (2) Who do you usually give support to create a powerful and accessible learning environment for one or more student(s) with SEN? and (2) Who do you usually give support to create a powerful and accessible learning environment for one or more student(s) with SEN? Each respondent was presented with a list of their school team members and school external partners to answer these questions and they could indicate an unlimited number of people. The external partners were pedagogical counsellors, special education partners or members of pupil guidance centres. We focus on these partners as they are the most common in the context of inclusive education in Flanders. Since it is difficult to reach these external partners, they did not fill out the instrument themselves. Next, for each person selected, respondents had to indicate the frequency of interaction, with four options ranging from several times a year to (almost) daily. We constructed two networks for each school, one regarding the asking support network (question 1) and one regarding the giving support network (question 2).

To calculate the network variables, we first constructed matrices for each network question for each school. Based on the matrices, the network variables of density, indegree centralization and two measures of school external support were calculated using the sna package (Butts, 2016) in the R programming language (R Core Team, 2018). The network variables were calculated both for the asking support and giving support network. More detailed information on the matrices and network variables is provided in the Appendix.

Density. In this study the density refers to the average frequency of interaction. For example, the more dense the giving support network, the more often school members give each other support. As there is a very high correlation (r = .87, p < .001) between the density of the

asking support network and the density of the giving support network (see also Table 1) which leads to the issue of multicollinearity, we will focus on one of the two densities in the analyses. The density of the giving support network was preferred since this gives us an indication of the support that is actually provided.

Indegree centralization. The centralization of a network refers to the extent to which the network is dominated by one or a few highly central persons (Borgatti, Everett, & Johnson, 2013). For the asking support network, a high indegree centralization means that there are a few school members who are asked for support very often, while there are many other members who are rarely asked for support. For the giving support network, a high indegree centralization means that there are few school members who are given support very often, while there are many other members are many others that are rarely supported.

School external support. To obtain a measure for the school external support, we calculated (1) the number of school external partners and (2) the proportion of team members who ask an external partner for support to the total number of team members. As different partners may have different expertise, the first measure may provide an indication of the diversity in ideas and information available to the school team, which is important for innovation (Leonardi & Contractor, 2018). These ideas and information should also be incorporated in the team, which is why the second measure was taken into account.

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	%	М	SD	Mın.	Max.	1.	2.	3.	4.	5.	6.	7.	8.	9.
School level independent variables														
1. Density asking support		0.71	0.25	0.34	1.22	1.00	.87***	02	.73***	10	.20	69***	17	09
2. Density giving support		0.69	0.25	0.31	1.14		1.00	01	.69***	18	.24	55**	11	16
3. Indegree centralization asking support		.27	.06	.17	.39			1.00	.19	.36	.37	13	18	01
4. Indegree centralization giving support		.11	.04	.05	.20				1.00	.10	.30	58**	.02	06
5. Number external partners		3.88	2.72	0	10					1.00	.32	17	13	.23
6. Proportion team members tie to external partner		.45	.21	.00	.83						1.00	52**	19	27
School level control variables														
7. School size (number of students)		309	148.15	96	630							1.00	.19	.11
8. Location													1.00	.29
Urban	62.5													
Rural	37.5													
9. Socio-economic status (SES) ¹		2.10	1.52	0.36	5.55									1.00

Table 1 Descriptive statistics and correlations for the variables at the school level (N = 24)

Note. Spearman's correlations are used as the school level independent variables are not normally distributed and the sample at the school level is rather small (N = 24). ¹This is the number of extra teaching hours the school receives per 10 students and is based on the SES of the students. *** p < .001, ** p < .01.

Table 2

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Descriptive statistics and correlations for the variables at the individual level (N = 441)

	%	М	SD	Min.	Max.	1.	2.	3.	4.	5.	6.	7.	8.
Individual level dependent													
variables													
1. Beliefs about diversity		2.54	0.39	1.29	3.71	1.00	.22***	19***	10	.05	.05	.15**	.02
2. Differentiated instruction		3.27	1.00	0.00	5.75		1.00	15**	02	.16***	.10*	.15**	.22***
Individual level control variables													
3. Sex								1.00	.00	25***	22***	01	.03

Female	90.02									
Male	9.98									
4. Years of experience in education		15.16	9.85	0	40	1.00	.08	15**	12*	.03
5. Indegree asking support		17.44	10.06	0.00	54.58		1.00	.61***	.02	.24***
6. Indegree giving support		21.14	10.11	0.00	62.42			1.00	.17***	.12*
7. Outdegree asking support		25.13	20.29	0.00	191.07				1.00	.52***
8. Outdegree giving support		18.34	19.74	0.00	171.02					1.00

Note. Pearson correlations are applied since the sample at the individual level is sufficiently large (N = 441). *** $p \le .001$, ** $p \le .01$, * $p \le .05$.

4.2.2. Individual level dependent variables

Teachers' professional beliefs about diversity. To measure teachers' beliefs towards diversity, the Professional Beliefs about Diversity scale of Pohan and Aguilar (2001) was used. We draw on the version of Vantieghem, Van Avermaet, Groenez, and Lambert (2018) as this one is adjusted to the Flemish context. The scale taps into beliefs regarding different dimensions of diversity that teachers encounter in their professional school context (i.e., ethnicity, language, socio-economic status, religion, disabilities, sexual orientation and gender). Items referring to negative beliefs about diversity were reverse coded so the higher the scale's score, the more positive beliefs towards diversity. Scale scores were constructed using the mean scores of all items.

Teachers' differentiated instruction. The Adaptive Teaching scale developed by Coubergs, Struyven, Vanthournout, and Engels (2017) was implemented to assess teachers' differentiated instruction practice. The scale measures the self-reported frequencies of differentiated instruction that copes with differences in readiness, learning profiles and interests. The mean scores of all items were used to construct the scale.

Table 3 provides an overview of the Professional Beliefs about Diversity scale and the Adaptive Teaching scale, including example items, range, number of items and Cronbach's alpha coefficients.

Scale	Example items	Range	Items	α
Professional	- The ethnic-cultural diversity in society is an asset	Completely	14	.70
Beliefs about	for education.	disagree (0) –		
Diversity	- You cannot expect a teacher to support a child	Completely		
	with a disability in general education.	agree (4)		
	- LGBs (lesbians, gays and bisexuals) should not			
	be allowed to teach.			
Adaptive	- I adjust my assessment based on my students (or	Never (0) –	8	.87
Teaching	groups of students).	Always (7)		

Overview of the Professional Beliefs about Diversity scale and the Adaptive Teaching scale

-	During my lessons, different students work on
	different tasks with a different level of difficulty.
-	Based on their learning profile, I let my students
	choose between learning content and teaching
	methods.

4.2.3. School level control variables

We also included school level and individual level (see section 4.2.4) control variables to assess whether associations between school network characteristics on the one hand and teachers' beliefs toward diversity and differentiated instruction practices on the other hand remain when taking into account these variables.

School size. As there is much evidence on the importance and effects of school size (i.e., a school's number of students), both for teachers' instructional practices as for teacher collaboration (e.g., Andrews, Duncombe, & Yinger, 2002; Lee & Smith, 1993; Opdenakker & Van Damme, 2007), this variable was included. Also the social network literature points to the importance of school size for collaboration; in general the network density decreases when the organisation's size increases (Tsai, 2001).

Geographical location. We added the geographical location (i.e., urban or rural) since several studies point to the importance of the geographical location for teachers' beliefs towards including students with SEN. However, the findings are rather inconclusive. While Opdal, Wormnæs, and Habayeb (2001) found that teachers in urban schools were less positive about inclusion than village teachers, Glaubman and Lifshitz (2001) suggest that teachers of large cities had more positive beliefs, relative to those of townships. In line with the latter, Miltenienė and Venclovaitė (2012) showed that teachers of urban schools tend to view collaboration in meeting SEN of their students in a more positive way and initiate more interactions with colleagues. *Extra teaching hours for SES-students.* In Flanders, depending on the school's percentage of students from low-SES background, the government provides extra teaching hours as funds to primary schools. So, these extra teaching hours give an indication of the number of low SES-students in a school. As De Neve and Devos (2016) showed that teachers in low SES-schools tend to engage more in differentiated instruction practices, we included this variable. Moreover, we hypothesize that teachers in schools that serve more low SES-students, may perceive a greater urgency to collaborate and interact with their colleagues resulting in denser school networks.

4.2.4. Individual level control variables

In- and outdegrees. As teachers' beliefs and instructional practice may also be affected by their individual network (e.g., Author et al., 2015a; Bakkenes, De Brabander, & Imants, 1999), we included the in- and outdegrees for individual teachers. We used the data collected by means of the social network instrument to construct these two individual level network variables. The indegree concerns the individual's incoming ties, while the outdegree concerns the outcoming ties. If a teacher has, for instance, a high outdegree for the asking support network, this means he/she asks support very often, to many colleagues whereby more weight is given to the frequency than to the number of colleagues. A teacher will have a high indegree for the asking support network, if he/she is asked for support very often, by many colleagues whereby more weight is given to the frequency as previous studies showed that strong ties are often required to tackle non-routine, complex matters such as creating an inclusive learning environment (Hansen, 1999; Reagans & McEvily, 2003).

Years of experience in education. Based on Hargreaves (2005) and van de Grift, van der Wal, and Torenbeek (2011) we expect teaching experience to affect the implementation of differentiated instruction. Moreover, teachers with less teaching experience held more positive

beliefs towards the inclusion of students with SEN than teachers with more teaching experience (Alghazo & Naggar Gaad, 2004; de Boer et al., 2011; Glaubman & Lifshitz, 2001; Parasuram, 2006). Therefore, we took into account the years of experience in education.

Sex. We also controlled for sex as several studies revealed that beliefs towards students with SEN were influenced by sex. In most studies, female teachers were more positive towards including students with SEN than male teachers (Alghazo & Naggar Gaad, 2004; de Boer et al., 2011; Opdal et al., 2001).

4.3. Data analysis

Given the nested structure of our data (teachers in schools), we applied multilevel analysis to examine our hypotheses. Several multilevel models were analysed using the lme4 (Bates, Maechler, Bolker, & Walker, 2015) and ImerTest (Kuznetsova, Brockhoff, & Christensen, 2017) packages in the R programming language (R Core Team, 2018). First, a random intercept model (null model) was run to estimate the variance of the dependent variables at the individual and school level. Then we estimated the effect of all the school network measures (Model 1). Next, we examined the effect of the individual level (Model 2) and school level (Model 3) control variables on teachers' beliefs about diversity and differentiated instruction. Finally, we tested whether the school network measures added to the prediction of teachers' beliefs towards diversity and differentiated instruction above the control variables (Model 4). By running these separate models, the relative contribution of these clusters of variables (i.e, the school network measures, the individual level control variables and the school level control variables) were explored. A likelihood ratio test was conducted for each model to determine whether the addition of a cluster of variables yielded a significant improvement to the model's predictive ability. As the network measures as well as the extra teaching hours for SES-students differ substantially from the normal distribution, these variables were recoded into a dichotomous variable for the multilevel analysis. In recoding these variables, we used the third quantile as cut-off, since we expect the more extreme networks (e.g., networks with an extremely high density or centralization) in particular to have an impact. For example, if the density measure was lower than the third quantile, the measure was recoded as 'no high density', if the density measure was higher than the third quantile, the measure was recoded as 'high density'. All dependent variables were standardised to improve the interpretability and comparability of the parameter estimates. The assumptions of homoscedasticity, no multicollinearity, linearity, indepedentent errors and normally distributed errors were checked and were all true for the models concerning differentiated instruction. For the models concerning beliefs about diversity (Model 1 and 3, and to a lesser extent Model 4), it was a bit questionable whether the assumption of homoscedasticity was met. We should therefore be careful when generalizing the findings related to the beliefs about diversity.

5. Results

5.1. Beliefs about diversity

5.1.1. Null model

The fist multilevel model, the null model, showed that 90.87% of the variance in beliefs about diversity is accounted at the individual level and 9.13% of the variance occurs between schools. The variance at the school level was significant (p < .05) indicating the need to use multilevel analysis to study the relationship between teacher collaboration and beliefs about diversity. Results for the multilevel models are shown in Table 4.

5.1.2. Model 1

First, we tested the relationship between the school level network variables and beliefs about diversity. The Likelihood Ratio Test shows that including all these school level network variables did not significantly add to the null model ($\chi^2_D(5) = 9.07, p > .05$). However, one of these variables, namely the density of the giving support network, was positively associated

with teachers' beliefs about diversity. The more often school members give each other support, the more positive teachers are towards diversity in the school context. The other school network variables (i.e., centralization of the asking and giving support network, the number of external partners and the proportion of team members who ask an external partner for support) did not significantly affect beliefs about diversity.

5.1.3. Model 2

The predictive effect of the individual level control variables was examined in Model 2. We included sex, years of experience in education, and the in- and outdegrees both for the asking and the giving support network. Results suggest that only sex significantly affects teachers' beliefs towards diversity, male teachers tend to hold less positive beliefs. Since solely sex had a significant relationship with beliefs about diversity, only this variable was taken into account in Model 4.

5.1.4 Model 3

In Model 3 the effect of the school level control variables (i.e., school size, geographical location and extra teaching hours for SES-students) was considered. Only school size showed a statistically significant relationship with beliefs towards diversity. In general, the larger the teacher's school, the less positive he/she is about diversity. As only school size was significantly related to beliefs about diversity, only this variable was included in Model 4.

5.1.5 Model 4

In our last model, the control variables which were significantly associated with beliefs towards diversity in Model 2 and 3, were added to the model with the school level network variables. Including these control variables added significantly to the prediction of beliefs towards diversity ($\chi^2_D(2) = 18.47, p < .001$). When controlling for sex and school size, none of the school level network variables had a significant relationship with teachers' beliefs towards diversity.

Table 4 Multilevel analyses – beliefs about diversity

	Null Model		Moo	del 1	Moo	del 2	Mod	lel 3	Model 4	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Intercept	03	.08	13	.10	.02	.10	17	.11	01	.10
School level independent variables										
Density giving support			.42*	.19					.31	.19
Indegree centralization asking support			.03	.17					02	.16
Indegree centralization giving support			27	.18					35	.18
Number external partners			.22	.16					.18	.16
Proportion team members tie to external partner			.31	.19					.25	.19
Individual level control variables										
Sex					60**	.19			61***	.15
Years of experience in education					09	.06				
Indegree asking support					04	.15				
Indegree giving support					07	.15				
Outdegree asking support					.28	.15				
Outdegree giving support					.09	.15				
School level control variables										
School size (number of students)							24**	.08	12	.08
Location (urban/rural)							.12	.15		
Socio-economic status (SES) ¹							.31	.18		
Likelihood Ratio Test										
Compared against			Moo	del 0	Moo	del 0	Mod	lel 0	Mod	el 1
Difference in deviance			9	.07	17.	.60	8.	55	18.4	47
Changes in degrees of freedom			5		6		3		2	
P value	P value			.11	.01**		.04*		.00***	
Variance partition										
School level	9.	13%	4	.69%	6.	93%	4.	76%	4.	35%
Individual level	90.	87%	95	.32%	93.	07%	95.	24%	95.	65%

Note. ¹This is the number of extra teaching hours the school receives per 10 students and is based on the SES of the students.

*** p < .001, ** p < .01, * p < .05.

5.2. Differentiated instruction

5.2.1. Null model

The null model showed that 92.82% of the variance in differentiated instruction scores can be attributed to the individual level and 7.18% of the variance occurs between schools. The variance at the school level was significant (p < .05) pointing the need to use multilevel analysis to examine the link between teacher collaboration and differentiated instruction. Results for the multilevel models are presented in Table 5.

5.2.2. Model 1

We first examined the predictive effect of the school level network variables on teachers' differentiated instruction. Results indicated that teachers in highly dense networks reported to implement more differentiated instruction. The more often school members give each other support, the more often these members display differentiated instruction. Teachers in a highly centralized asking support network, on the other hand, provide less differentiated instruction. In other words, in a school where there are a few school members who are asked for support very often, while there are many other members who are rarely asked for support, teachers differentiate less. The centralization of the giving support network, the number of external partners and the proportion of team members who ask an external partner for support did not significantly affect differentiated instruction. The addition of the school level network variables added significantly to the null model ($\chi^2_{D}(5) = 11.71, p \le .05$).

5.2.3. Model 2

In Model 2 the effect of the individual level control variables (i.e., sex, years of experience in education, and the in- and outdegrees both for the asking and the giving support network) was considered. Of these variables, only sex and outdegree giving support showed a statistically significant relationship with teachers' differentiated instruction. Male teachers tend to report

less differentiated instruction. A teacher who often gives support to his/her colleagues, showed more differentiated instruction. As only sex and outdegree giving support were significantly related to differentiated instruction, only these two variables were included in Model 4.

5.2.4. Model 3

The effect of the school level control variables was tested in Model 3. Of the three control variables (i.e., school size, geographical location and extra teaching hours for SES-students), only location had a significant relationship with differentiated instruction. Teachers in urban schools are more likely to implement differentiated instruction. In Model 4 we only took location into account as a school level control variable.

5.2.5. Model 4

Finally, we added the control variables which had a significant relationship with differentiated instruction in Model 2 and 3, to the model with the school level network variables. The addition of these control variables (i.e., sex, outdegree giving support and geographical location) added significantly to the prediction of differentiated instruction ($\chi^2_D(3) = 29.81$, p < .001). As in Model 1, the school's indegree centralization of the asking support network was negatively associated with teachers' differentiated instruction. We did not find the predictive effect of density on teachers' differentiated instructional practice (see Model 1) when adding the control variables.

Table 5Multilevel analyses – differentiated instruction

	Null Model		Mo	del 1	Mod	el 2	Mo	del 3	Model 4	
-	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Intercept	.02	.07	00	.09	15	.09	15	.11	06	.14
School level independent variables										
Density giving support			.39*	.17					.18	.19
Indegree centralization asking support			33*	.15					35*	.16
Indegree centralization giving support			10	.17					05	.17
Number external partners			.05	.14					01	.15
Proportion team members tie to external partner			.17	.17					.17	.18
Individual level control variables										
Sex					42*	.19			50**	.17
Years of experience in education					.02	.06				
Indegree asking support					.25	.15				
Indegree giving support					07	.14				
Outdegree asking support					.13	.14				
Outdegree giving support					.51***	.15			.51***	.11
School level control variables										
School size (number of students)							10	.08		
Location (urban/rural)							.36*	.15	.06	.15
Socio-economic status (SES) ¹							27	.18		
Likelihood Ratio Test										
Compared against			Mo	del 0	Mod	el 0	Mo	del 0	Mod	el 1
Difference in deviance			11	.71	28.3	30	8	.17	29.	81
Changes in degrees of freedom			5		6		3	3	3	
P value				04*	.00***		.04*			00***
Variance partition										
School level	7.	18%	2	.64%	3.0	00%	3	.94%	3.	64%
Individual level	92.	82%	97	.36%	97.0	00%	96	.06%	96.	36%

Note. ¹This is the number of extra teaching hours the school receives per 10 students and is based on the SES of the students.

*** $p \le .001$, ** $p \le .01$, * $p \le .05$.

6. Conclusion and discussion

This study explored the relationship between teacher collaboration on the one hand and inclusive education on the other hand, using a social network approach. Inclusive education was operationalised in teachers' beliefs towards inclusion and in differentiated instruction, as these are two vital aspects to the successful inclusion of all students.

First, we investigated whether teachers in a highly dense network will have more positive beliefs towards inclusion (hypothesis 1a) and implement more differentiated instruction (hypothesis 1b). Our results seem to confirm these hypotheses to a certain extent. The more dense the giving support network, or the more often school members give each other support, the more positive teachers are towards diversity and the more they differentiate. This finding is consistent with past research that shows that the denser the network, the more teachers feel collectively able to address educational challenges and the more they are willing to implement innovative practices and to experiment with new educational strategies (Daly et al., 2010; Moolenaar, 2010; Moolenaar et al., 2012). However, we recommend interpreting our results relating to the density with caution, as the network's density is no longer significantly related to teachers' beliefs and differentiated instruction when we include the control variables. One possible explanation for the latter is that the data were collected from a rather small sample of schools (N = 24), which may have reduced the likelihood of finding significant effects of this school level variable once other school level variables are added. Concerning the relationship with differentiated instruction, another possible explanation is that the effect of the school's network density might be outweighed by the individual outdegree measures. This means that for promoting a teacher's differentiating practice, it may be slightly more important that this teacher engages in supportive relationships than that he/she is embedded in a school where support is often provided.

Second, the relationship between the school's network centralization and teachers' beliefs towards diversity (hypothesis 2a) was explored. Unexpectedly, centralization of both the asking support and giving support network was not significantly related to teachers' beliefs towards diversity, which implies that these beliefs are probably not influenced by the dominance of one or a few actors in the support network concerning the inclusion of students with SEN. To better understand this finding, it may be important to take into account the beliefs of colleagues with whom the teacher interacts. For instance, if the central actors hold negative beliefs towards diversity, the network centralization might have an adverse impact on teachers' beliefs, whereas when the central actors hold positive beliefs, the network centralization might have a neutral or positive impact on teachers' beliefs. This hypothesis is based on the theory of peer influence, that is an individual's beliefs, feelings and perceptions adapt toward the beliefs, feelings and perceptions held by the members of his/her social network (Ibarra & Andrews, 1993). Moreover, the study of Author et al. (2019b) shows that a person's beliefs towards inclusion affect the way they talk about students with SEN, which further supports our hypothesis that beliefs may be transmitted through the interactions with colleagues. Put together, it may be that in this study we did not find a relationship between network centralization and teachers' beliefs towards diversity because we did not include the beliefs of the central actors. For future research it would be valuable to first explore whether beliefs towards diversity are contagious, for example by using network autocorrelation models (Doreian, Teuter, & Wang, 1984; Leenders, 2002). If that is true, scholars could examine whether beliefs of central actors moderate the relationship between network centralization and teachers' beliefs towards diversity. However, this was not feasible in this study as principals in our schools did not report on their beliefs, which may bias the results as we suspect that they are often central actors.

Regarding the examination of the link between the school's network centralization and differentiated instruction (hypothesis 2b) it is interesting to note that teachers in a highly centralized asking support network displayed less differentiated instruction. Put differently, in a school where there are a few school members who are asked for support very often, while there are many others who are rarely asked for support, teachers differentiate less. This is in line with De Neve and Devos (2017) who suggest that teachers are more flexible to adapt their classroom behavior when their questions and concerns related to differentiated instruction are discussed with the school team so there is a sense of ownership for all teachers. So, to facilitate differentiated instruction it seems to be important that all team members are engaged and support each other in the search for ways to adapt their classroom practice to the students' needs, rather than it is only a matter for a few central actors. Exploring who these central actors are in the support network concerning the inclusion of students with SEN and how their network position relates to the inclusive practices of teachers would be an interesting area for future research. This would enable educational scholars to provide even more detailed recommendations concerning the (dis)advantages of network centralization. Furthermore, it should be noted that these findings only concern the centralization of the asking support network, the centralization of the giving support network did not predict teachers' differentiated instructional practice. In other words, whether there are some school members who are given support very often, while there are many others that are rarely supported, does not affect the implementation of differentiated instruction. A reason for this is probably that on average the centralization of the giving support network is low compared to the asking support network and there is a smaller variance between schools on this measure. It is therefore likely that the centralization for the giving support network did not have the expected impact as this measure is relatively low for all schools.

Next, when looking at the predictive effect of school external support (hypotheses 3a and 3b), results show that the number of school external partners and the proportion of team members who ask an external partner for support are not significantly related to teachers' beliefs towards diversity and differentiated instruction. While this was unexpected, we do have some suggestions to understand this finding. First, in Flanders the support provided by special education partners and pupil guidance centres still often focuses on the student rather than on the teacher. This implies a deficit thinking in which there is a particular focus on the difficulties of the student, rather than on overcoming barriers in the educational context (De Coninck, Vanderlinde, & Valckx, 2018). This type of support may therefore not foster teachers' positive beliefs towards diversity and the implementation of differentiated instruction. Second, partly due to the amount of time spent on student guidance, these external partners report that they do not have enough time to support teachers and schools (De Coninck et al., 2018; Schraepen, Lebeer, Vanpeperstraete, & Hancké, 2010). Also school staff indicated that the frequency of contact with pupil guidance centres is too low (Author et al., 2015b). This might indicate that although a school has various external partners and although several school members ask support from these partners, this support is not intensive enough to have an impact on their beliefs and instructional practice. Lastly, the focus on teacher support is relatively new in Flanders, so if this is already implemented, teachers are not used to it. Teachers and external partners are still searching for the best way to build their collaboration. Often it is unclear what the role of the external partner is, which may hinder effective collaboration (Author et al., 2012; De Coninck et al., 2018). So it might be that often the external support to teachers and schools is not yet sufficiently developed to positively influence teachers' beliefs and differentiated instruction.

6.1. Limitations and suggestions for future research

Although we believe our results contribute to a better understanding of teacher collaboration in the context of inclusive education, its limitations should be acknowledged. A first limitation concerns the way differentiated instruction and in particular teachers' beliefs toward diversity were measured. To assess differentiated instruction, we relied on self-reported data about their instructional practice, which may be effected by social desirability. Complementing the data with a qualitative research design that relies on actual teaching behaviours (e.g., observations, video-diaries) or that encourages examples (e.g., interviews) might be useful in this regard. However, note that although this research is still in its infancy, there is already some evidence that the score on the Adaptive Teaching scale (Coubergs et al., 2017) may be a good predictor of the actual teacher behaviour (Gheyssens & Struyven, 2018). Likewise, beliefs towards diversity were measured by means of a self-report questionnaire. By using a self-reported questionnaire, we tapped into the explicit beliefs of teachers, these are beliefs of which people are aware of and that can be expressed externally (Kurita & Kusumi, 2009; Wilson, Lindsey, & Schooler, 2000). These explicit beliefs may be influenced by social desirability, especially when it comes to socially sensitive issues such as diversity (Greenwald, Poehlman, Uhlmann, & Banaji, 2009). The assumption that teachers might have provided socially desirable answers to the Professional Beliefs about Diversity scale may also explain why some of our hypotheses related to teachers' beliefs have not been confirmed. Moreover, as Greenwald et al. (2009) assume that implicit beliefs are a better predictor of behaviour than explicit beliefs when it concerns a socially sensitive topic, including implicit beliefs could benefit future research on the relationship between teacher collaboration and their beliefs towards diversity. To measure implicit beliefs, the implicit association test (IAT), which assesses strengths of associations between concepts by observing reaction times in a categorization task, could be used (Greenwald et al., 2009). However, to our knowledge there is not yet an IAT developed which

captures a broad notion of diversity in schools which is needed in the context of inclusive education.

A second limitation involves the broadness of the concept support. In the study of Author et al. (2019a) asking and giving support were identified as important types of interaction in creating inclusive learning environment. Since support is a broad concept, we were able to capture a multitude of interactions. However, this broadness is not only a strength but also a limitation as support can encompass various forms (e.g., providing information or didactic material, super-/intervision, emotional support), which may not all be equally helpful to realizing inclusive education. Moreover, the network structure can differ according to type of support exchanged (Moolenaar, 2012). Future research should explore how the networks look like depending on the types of support and which types are most effective. For instance, a mixed-method approach combining quantitative and qualitative methods may be valuable in this regard. The quantitative methods would enable us to gain more insight into the structure of the network (e.g., density, centralization) depending on the type of support exchanged. The qualitative methods afford us to capture the stories behind the network which makes the networks more comprehensible (Crossley, 2010). For example, ethnographical action research in which teachers together with researchers are searching for ways to develop more inclusive practices and how collaborating with others may support them in this process, may help to gain a deeper understanding of how collaboration and the different types of support can promote or hamper inclusive education (Argyropoulos & Nikolaraizi, 2009). This way, we are able to gain an even more fine-grained understanding of collaboration needed to achieve inclusion allowing us to formulate more concrete recommendations for practice.

Lastly, the network measures as well as the extra teaching hours for SES-students were converted into a dichotomous variable as they differed substantially from the normal distribution. By dichotomising rather than, for example, transforming these variables, the interpretation of the results is more straightforward. However, we do acknowledge the downsides of dichotomisation such as the loss off information about school or individual differences and the potential loss of effect size and power (e.g., MacCallum, Zhang, Preacher, & Rucker, 2002).

6.2. Relevance and implications

A first strength of this contribution can be found in its methodological approach. Educational network studies often rely on binary network data which only provide information on the (non-) presence of interactions (e.g., Geeraerts et al., 2017; Moolenaar, 2010; Struyve et al., 2016; Van Gasse, Vanlommel, Vanhoof, & Van Petegem, 2017). This study, however, drew on weighted network data. In a weighted network the ties among the actors have weights assigned to them, reflecting the strength or intensity (e.g., the frequency, usefulness) of the relationships (Wasserman & Faust, 1994). More specifically, we took into account the frequency of the relationships, which enables us to obtain a more nuanced view on teacher collaboration.

Second, this study adds to the knowledge base of teacher collaboration as we provided empirical support for the importance of collaboration in establishing an inclusive learning environment. Moreover, we have gained a better understanding of how collaboration should be shaped in order to realize inclusive education. These insights are also of great importance for educational practice. First, based on our results, teachers and schools are advised to create a collaborative climate in which members are encouraged to provide each other support in the process of adjusting the learning environment to the SEN of all students. In other words, this study highlights the importance of developing a community of practice in which team members work and learn together to address all students' educational needs (Vangrieken, Meredith, Packer, & Kyndt, 2017). Several scholars (e.g., Botha & Kourkoutas, 2016; Laluvein, 2010; Mortier, Hunt, Leroy, Van De Putte, & Van Hove, 2010) have demonstrated the value of a community of practice for implementing inclusive education. An important feature of a community of practice is that all school team members act as a resource for each other and that the knowledge and expertise of all members are valued equally (Laluvein, 2010). The importance of this feature was also subscribed in our study as the results showed that to facilitate inclusion a low network centralization (i.e., all team members are engaged and support each other in developing inclusive practices, rather than a few central actors) is preferred. A first prerequisite for building a closer network, in which there is more collaboration and connectedness between all team members, is that teachers are given time to work together (Santoli et al., 2008). For instance, principals could assign shared free scheduling time to teachers teaching the same grade or allocate time at a staff meeting to share and reflect on their experiences in addressing diversity in the classroom. Participation in various meetings allows teachers to get different views on creating an inclusive learning environment and enables them to connect with diverse partners, which can be inspiring (Penuel & Riel, 2007). Besides these more formal meetings, informal interactions such as lunch and breakfast meetings to exchange good inclusive practices could be extremely valuable (Spillane, 2005). A second requirement is that there should be a shared space to collaborate (Van Waes et al., 2016), an inviting staffroom may be important in this regard. Additionally, we suggest to invest in teachers' awareness of their support needs, what do I need as a teacher to create an inclusive learning environment. Teachers often tend to focus on the SEN of students rather than making their own support needs the subject of collaboration (Author et al., 2013; Author et al., 2018b). Schools should encourage teachers to discuss their support needs. A single teacher does not have to do and know everything, there should be space to explore and experiment together. A useful method that may help teachers to focus on their own practice and support needs in collaborating with others, is Lesson Study. Lesson study involves teachers working together (usually in trios) to plan a lesson together, teaching the lesson whilst others involved in the planning observe it, and reflecting on and refining the lesson (Messiou, 2019). The aim is to increase teachers'

understanding of how students' learning can be improved so they can fully participate in education (Author et al., 2020; Ylonen & Norwich, 2012). Next, teachers and schools need to be strengthened in their network awareness and in intentionally shaping their network (Author et al., 2018c; Moolenaar et al., 2014). When teachers and schools are aware of their network and the (dis)advantages of their network characteristics, they can actively shape it. Network visualizations may offer a useful tool to increase teachers' and schools' network awareness and intentionality (Cross, Borgatti, & Parker, 2002; Hatala & Fleming, 2007). Moreover, teacher education could play a critical role to make teachers more aware of their networks and how these can help to create an inclusive learning environment, by highlighting the importance of collaboration in addressing the challenges related to inclusive education ahead, by stimulating reflection on their network, for example during their internships, and by fostering the development of their networking and interpersonal skills. In their further professional development, network interventions may be valuable to guide teachers and schools towards more beneficial network configurations (Valente, 2012). In conclusion, this study was a useful first step in demonstrating that in the right configuration, the school's social network is a promising vehicle to create a more inclusive learning environment.

Appendix. Detailed information on the network matrices and variables

	Additional information
Network matrices	Matrices were constructed for each network question for each school. They were weighted from 0 to 4 and for any given pair of school members, cell W_{ij} represents the presence and strength of a relationship between school member <i>i</i> and school member <i>j</i> . For example, $W_{ij} = 0$ if school member <i>i</i> did not nominate school member <i>j</i> , and $W_{ij} = 4$ if school member <i>i</i> reported that he/she asks school member <i>j</i> (almost) daily for support.
Network variables	
1. Density	In a weighted network, network density is a measure of the average strength of a relationship in the network (Wasserman & Faust, 1994). In this study the average strength refers to the average frequency of interaction. The measure was calculated as the sum of the frequencies across the existing relationships, divided by the total number of possible relationships among the school members.
2. Indegree centralization	The indegree centralization pertains the variability in the indegree scores of the school team members (Borgatti et. al., 2013). In constructing the indegree centralization, the indegree score of each school member was calculated as the sum of the weight of the incoming ties. For instance, if a team member has 2 incoming ties, one of a weight of 2 (i.e., monthly) and one of a weight of 3 (i.e., weekly), his/her indegree score is 5. Then we sum the difference between each person's indegree and the highest indegree among the school members. Finally, we divide this score by the maximum possible difference between each person's indegree and the highest indegree among the school members.
3. In- and outdegrees	As both the number of partners as well as the frequency of the interaction may be important to a teachers' inclusive practice, we used the tuning parameter α in constructing the in- and outdegrees (Opsahl, Agneessens, & Skvoretz, 2010). Using this parameter, the in- and outdegree can be measured as: $C_{in}^{W\alpha}(i) = k_i^{in} * \left(\frac{s_i^{in}}{k_i^{in}}\right)^{\alpha}$
	$C_{out}^{W\alpha}(i) = k_i^{out} * \left(\frac{s_i^{out}}{k^{out}}\right)^{\alpha}$
	where k is the number of incoming or outgoing ties and s is the strength, or in this case the frequency, of those ties. In this equation, α can be adjusted so it matches the researcher's theory. Previous studies showed that strong ties are often required to tackle non-routine, complex matters (Hansen, 1999; Reagans & McEvily, 2003). Given the complexity of inclusive education, we assume that strong or in this case more frequent interactions are more effective in enabling the teacher to create an inclusive learning environment. Opsahl et al. (2010) argue that when focussing on complex, non-routine matters, where strong ties are important, an α greater than 1 might be more suitable since this increases the importance of the strength or frequency of the interaction. Therefore, the tuning parameter in this study was set to a value of 1.5

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