



# Making sense of teacher agency for change with social and epistemic network analysis

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## Abstract

Reference to teachers as agents of change has become commonplace in the education literature, including change toward more inclusive practice in response to the changing demographic of schooling. Yet, little is known about how teacher agency relates to (1) their understanding of, and commitment to any given change agenda and (2) the institutional and social structures through which they are able to access knowledge and resources within and beyond their schools. This study combined social and epistemic network analysis to examine teachers' understanding of change and their sense of agency as they use their social networks to mobilise support for furthering change that matters to them. Our study is the first to apply this learning analytic approach in a real setting context. We used theories of teacher agency and inclusive pedagogy to interpret teachers' social interactions in light of the extent to which they seek to make a difference toward greater inclusion. We collected data with an online log completed by teachers and other staff in two schools in Sweden over 6 months. The findings suggest that teachers understanding of change is embedded in their day-to-day activities such as student support, lesson planning, improvement of programs, and working conditions. Teachers tend to exercise agency toward inclusion when they seek to support student learning and well-being. When teachers act as agents of change, their social networks are bigger, more diverse and more collaborative than in situations in which they act as role implementers. We discuss substantive and methodological implications of these findings.

**Keywords** Teacher agency · Educational change · Inclusive pedagogy · Teachers' social networks · Social network analysis · Epistemic network analysis

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## Introduction

References to teachers as agents of change are commonplace in the education literature (Fullan 1993; Villegas and Lucas 2002). Agency for change is often framed as a matter of implementing some kind of bigger, external change agenda. For example, research has provided useful insights on how teachers exercise agency to implement new national standards (Penuel et al. 2016). However, we also know that teachers sometimes exercise agency to adapt to or resist change (Buchanan 2015; Datnow et al. 2002; Lockton and Fargason 2019), for example when there is a dissonance between their own beliefs and the change they are being asked to make (Buchanan 2015). Whether and how teachers exercise agency depends in part on their commitment to any given change agenda and their understanding of its implications for their practices (Lasky 2005; Sannino 2010; Stillman and Anderson 2015). Few would contest a rights-based principle of education for all in relation to the changing demographic of schooling, but there are variations in how it is implemented (Waitoller and Artiles 2013). Moreover, teacher agency is shaped by the structural and cultural features of schools (Datnow et al. 2002). Teacher agency is achievable to different degrees in different situations (Priestley et al. 2012). Policies, available resources or power relations will at least partly shape teachers' understanding of what it means to be inclusive in specific situations (Nind et al. 2004). However, studies that account for particular purposes of teachers' agency and their understandings of change on the one hand, and for their institutional and relational contexts on the other have been scant.

This study examined the association between teachers' sense of agency for change and their underlying beliefs through the lens of inclusive pedagogy, an approach to teaching diverse learner groups that attends to individual differences between learners but avoids the marginalization that can occur when some learners are treated differently to others (Florian and Black-Hawkins 2011). Further, we consider the social embeddedness of teacher agency for change that is shown to be highly contextualized and interwoven with practices of others (Lane and Sweeny 2019; Daly et al. 2010; Vongalis-Macrow 2007) and exercised through complex interactions between teachers, students, families and others within the structural and cultural environments of schools and the larger policy contexts (Berliner 2002; Priestley et al. 2015). Ainscow (2005, 2015) argued that school communities are powerful levers of change since they have a real effect on peoples' lives and mediate other influences. Our study combines social and epistemic network analysis to examine how teachers' acting as change agents for inclusion relates to the social networks that enable them to access relevant support or resources (Moolenaar et al. 2014; Roth and Lee 2007).

## Theoretical framework

### Teacher agency for change

Teacher agency has been defined as a capacity to shape critically responses to problematic situations (Biesta and Tedder 2007), partly informed by teachers' underlying sense of purpose and beliefs about their professional roles (Biesta et al. 2015; Pantić 2015, 2017). Villegas and Lucas (2002) place these beliefs on a continuum between views of teachers as 'technicians' who implement standard school practices, rules and procedures uncritically, and those of teachers as 'agents of change' who see schools as potential sites for promoting social equality (Villegas and Lucas 2002, p. 54). Other studies point to the dynamic and temporal nature of teacher agency (Biesta and Tedder 2007; Lipponen and Kumpulainen 2011; Vähäsantanen 2015) and suggest that teachers' perceptions of their roles can align with 'change agency' and 'role implementation' simultaneously or in different situations (Lane and Sweeny 2019; Pantić 2017). In this paper, we explore the alignment to these categories in teachers' reflection on their efforts to make a difference in their school. In this context critical (or uncritical), responses might involve both implementation of existing rules and procedures, as well as teachers' attempts to innovate their classroom or school practice.

From a sociocultural perspective, teacher agency is understood in terms of its interplay with the work context (Eteläpelto et al. 2013). Archer suggests that agency is partly determined by actors' commitment to the goals that are important to them (Archer 2000). But it is not enough to care; agents *act* and *interact* with others to take forward what matters to them. A key aspect of teachers' agency is the support they are able to mobilise within their social contexts (Lane and Sweeny 2019; Pantić and Florian 2015, 2017). Here, a sense of professional purpose and relationships with other actors within and beyond schools are key components of *relational agency* defined by Edwards (2017) as a capacity to work purposefully and flexibly with others, and become aware of the resources others could bring to take forward what really matters. For example, such agency manifests itself when teachers work collaboratively with other professionals to give consistent support to children and young people at risk of exclusion (Edwards 2007, 2017).

### Inclusive pedagogy

Inclusive pedagogy is a pedagogical approach that emerged from research into the craft knowledge of teachers who were committed to the principles of educational inclusion in their practice while maintaining high levels of academic attainment (Black-Hawkins and Florian 2012; Florian and Black-Hawkins 2011). Building upon Alexander's (2004) socio-cultural understanding of pedagogy as a set of inter-related ideas about children, learning, teaching and curriculum, as well as the school and policy contexts by which they are legitimized, the inclusive pedagogical approach considers individual differences between students in terms of *interactions*

between many different variables rather than fixed states within individuals, and encourages open-ended views of all children's potential for learning. In so doing, the approach extends the idea that 'children's capacity to learn can change and be changed for the better as a result of what happens and what people do in the present' (Hart et al. 2004, p. 166). It offers an analytical framework for interrogating practice based on three principles: (1) that differences between learners are an ordinary aspect of human development; (2) that teachers are capable of teaching all learners; but (3) this necessitates working collaboratively with others. Actions associated with these principles are specified within an analytical framework so that the enactment of the principles can be discerned across different contexts (Florian and Spratt 2013).

Combining teacher agency and inclusive pedagogy frameworks (Pantić 2015, 2017) has allowed for examining teachers' beliefs and practices underlying (change) agency and the nature of their purposeful interactions in terms of alignment to the ideals of inclusive pedagogy. Previous studies suggested that exercising agency for inclusive pedagogy may involve both implementing and bending school norms and policies; for example, to help students navigate the institutional structures (Kim et al. forthcoming; Pantić 2017). In this study, we consider associations between teacher agency for change and inclusive pedagogy.

### **'Making SENse of teacher agency with social and epistemic network analysis' study**

Following the assumption that change toward more inclusive practices is a socially embedded process, we employed social network analysis (SNA) to examine the associations between teachers' agency, inclusive pedagogy, and their social networks. Social network analysis has been applied because research indicates that frequent interactions with close colleagues fosters an environment conducive to change and improvement by reinforcing constructive school norms of formal support, mutual help, and shared responsibility for students (Bidwell and Yasumoto 1999; Penuel et al. 2010; Spillane et al. 2010). However, the nature of change depends on teachers' underlying beliefs and ways of acting that can reinforce or disrupt the existing norms. For this reason, we utilized a study design that combined SNA with epistemic network analysis (ENA), described in the method section, to examine teacher agency in relation to teachers' underlying beliefs and understanding of change and the social and institutional contexts that shape what teachers see as possible within their practice.

Over the 2018/19 school year, we examined the ways teachers in two Swedish schools exercised agency for change using the inclusive pedagogical approach as an interpretative lens to interrogate the nature of their practices. We examined the social networks of 54 teachers and other staff in the two schools to address three research questions:

What is the nature of change that teachers try to achieve or orient themselves toward?

How is teacher agency for change associated with inclusive pedagogy?

What kinds of interactions characterize teachers who exercise agency for change?

A previous study suggests that building relationships with students and other players were seen as a powerful way of exercising teacher agency for inclusive pedagogy (Pantić 2017), which requires a collaborative approach to problem-solving. This study examines teachers' purposeful interactions using personal network approach (also called egocentric network design, see methods section) to uncover intentionality in teachers' networking behavior in terms of their commitments and practices (Baker-Doyle 2012). For teachers, personal relationships and personal networks are a critical source of information, social support and resources, sense-making, normative pressures and influence (Coburn and Russell 2008; Frank et al. 2004; Moolenaar and Slegers 2010).

We were particularly interested in the size, diversity and strength of teachers' networks because teacher agency for inclusive pedagogy implies a propensity to seek support and work purposefully with various other actors (Lane and Sweeny 2019). Large network size is associated with greater access to social support, resources and information (e.g., Sun et al. 2013). The diversity of ties (in terms of roles of people whom teachers approach) affect the kinds of resources and opportunities that they can access, as well as the probability of exposure to new or different beliefs and behaviors (Spillane et al. 2018). The strength of ties is important for teacher agency and inclusive pedagogy because strong, collaborative ties are associated with trusting relationships, higher resource flows, and better learning outcomes (e.g., Frank et al. 2011).

Finally, we explored whether and how teachers from two different schools (see below) differed with regards to their change purposes (RQ1), agency for inclusive pedagogy (RQ2) and personal networks (RQ3) because previous studies have largely recognized the importance of institutional contexts and often conceptualized agency as an interplay between personal and contextual factors (Heijden et al. 2015; Lane and Sweeny 2019; Pantić 2017). Most of the opportunities or barriers teachers perceive for exercising their agency have been attributed to mezzo level factors, such as social opportunities to learn from each other, school cultures and levels of trust they perceived in their colleagues and superiors (Author 2017a; Riveros et al. 2012).

### Swedish policy context

The Swedish school system promotes inclusion and educational rights for all students (Skollagen 2010, p. 800). However, national evidence from international studies such as PISA and TIMSS suggested a decline in learning outcomes that related, among other things, to students' lower socio-economic background. In 2015, the Swedish Government formed the Swedish School Commission (*Skolkommissionen*) tasked to consider what changes are needed "to improve learning outcomes, the quality of teaching and equity in Swedish schools" (SOU 2017, p. 35). The Commission identified "a weakened and fragmented school system with low degree of cooperation, collaboration and collective efforts to improve (p. 34)". An OECD review of Sweden's school system concluded that "many Swedish teachers work alone and are not benefiting from potential feedback and peer-learning opportunities that their

colleagues can provide to improve and innovate their teaching practices” (OECD 2015, p. 126). The Commission identified that changes were needed both at a governmental level creating a more coherent and purposeful system of governance, but also at the school level. It stressed the need to involve both school leaders and teachers in developmental work and increase their professional autonomy and influence. In response, the Swedish government advanced a range of policies to stimulate and support professional learning and teacher leadership that reflected in school level policies that promote staff collaboration.

## Methods

### Schools and participants

The participants in this study were 54 teachers from two Swedish schools, *Disa* and *Vega* (pseudonyms) located within the city of Stockholm. The two schools differ in many respects.

*Vega School* is an international school that serves approximately 470 primary and lower secondary students aged 7–15. A total of 49 staff members include the leadership team of the headmaster, two coordinators for the primary and secondary programs, and a manager for the after school program, 32 teachers (some holding other roles too), 10 class assistants, an administrator, a librarian, and a nurse. The school’s vision includes fostering a challenging, open-minded, and inclusive environment for its students, and encourages respectful relationships between all stakeholders, to create a collaborative, diverse community. Some classes follow the Swedish National Curriculum in combination with the international curriculum. Most students come from an affluent area close to the school, while students who are part of an international group live in various areas in and around Stockholm. *Vega* policies emphasise teachers’ and students’ involvement in collaborative processes that embed sustained dialogue and reflection.

*Disa School* is an independent school that offers vocational training enrolling approximately 300 upper secondary pupils aged 16–19. The school is run by a leadership team/board consisting of the headmaster, vice headmaster and four team leaders. The school also has an educational leadership team responsible for educational issues. A total of 59 staff members include 27 teachers, 12 vocational assistants, and other specialist staff such as teaching assistants, mentors responsible for social contacts with pupils and different school-related issues concerning student well-being, a nurse, a counselor, a vocational guide, internship coordinator, as well as data technician, two administrators, and a janitor. Students apply from different geographical areas with a mix of socio-economic backgrounds, and the entry into vocational education is generally less requiring than the academic one. *Disa*’s vision is to give students education and knowledge for future work, provide a secure and joyful environment for students and staff, and be seen as creative and innovative by students and parents, combining high standards with joy in study and continuous quality improvement.

**Table 1** Participation overall and for each time of log collection in Disa and Vega

	Disa	Vega
Total Staff	59 staff	49 staff
Participation	42% (25)	59% (29)
Log participation		
Time 1	96% (24)	93% (27)
Time 2	44% (11)	59% (17)
Time 3	92% (23)	76% (22)
Total logs	58	66

## Data collection

In each school, staff members were asked to fill out an on-line log (see below) three times at roughly 2-month intervals between September and March of the 2018–2019 school year. Overall 42% of Disa’s staff and 59% of Vega’s staff completed at least one log.<sup>1</sup> This difference in response rate may be partly attributed to cultural or organizational differences between the two schools, but there are no a priori reasons to believe that the missing data are systematically different from observed data, which could result in bias in the estimate of school differences. Table 1 shows response rates for each time of data collection.

## Instrument

We used an online log for Teacher Reflection on their Agency for Change (TRAC) to gauge teachers’ own perceptions of the purposes, nature and contexts of their interactions with others as essential aspects of their agency (Author 2015; 2017a). The log was developed collaboratively with practitioners and validated in previous projects (see, e.g., Author 2017b) to enable teachers to describe their purposeful interactions in their own terms, and provide contextual information. It includes WHAT, WHO and WHY sections to reflect the aspects of agency as follows:

WHAT Section asks teachers to describe a particular purpose they sought to achieve, formulated as a ‘difference they try to make in their school’. The aim here was to capture the specific purposes and content of interactions in light of teachers’ perceptions of their role as ‘agents of change’ and ‘role implementers’ as well as alignment of these purposes to the principles of inclusive pedagogy (see coding procedures below).

WHO Section invites teachers to identify people they approached in the situation they described in the previous section, give reasons why they approached them and the nature of the interaction (e.g. advice or collaboration). This allowed us to collect

<sup>1</sup> Disa staff filled a Swedish version of the log (translated by the local researcher), while Vega staff used the log in English.

**Table 2** Participants' characteristics by school

	Disa	Vega
Total	25	29
Role		
Teacher	14	22
Leadership	0	4
Specials/support	11	3
Grade level		
Primary	0	20
Secondary	25	2
Both	0	2
Teaching experience		
1–5 years	5	13
5–15 years	7	12
More than 15 years	13	4
Gender		
Female	21	22
Male	4	7

social network data, such as type of ties in relation to the purposes and content that flow through them.

WHY Section (also called REFLECTION) provided space for reflection on the outcomes and contexts of specific purposeful interactions described in the previous two sections. It elicited teachers' reflections on the factors that enabled or constrained a particular action, such as school cultures and what they could do differently in the future (see "Appendix").

The log enabled us to collect data on teacher agency, inclusive pedagogy and social networks. We coded textual data across the whole log using previously developed codes for teacher agency and inclusive pedagogy, while the WHO section captured data on structural network properties such as size, diversity and strength. The TRAC instrument enabled us to simultaneously examine the purposes and content of teachers' interactions as well as their perception of structures and cultures that shape their interactions with others to achieve those purposes (e.g., in the WHY section). We applied inclusive pedagogy framework and social network analysis to interpret teachers' beliefs and interactions as more or less inclusive ways in which they sought support or advice, or worked with others (see coding scheme in Table 3). Participants also provided basic data on their role, experience, and gender. Table 2 shows participants' key characteristics by school.

### Data coding and analysis

We employed a novel approach to the analysis of relationships between teachers' agency, inclusive pedagogy, and their social interactions that combined two complementary analytical methods—epistemic network analysis (ENA) and social network



**Table 3** Codes

Code	Definition	Example
Purpose_Agency	Expresses view of teachers as agents of change	When I try to help a child with her parents getting separate. The communication with the students worked because it gave me a clearer picture of their need and created a relationship between me and the students
Purpose_Role_Implementation	Expresses view of teachers as role implementers	I aimed at helping the school grow by doing my work diligently and help in the realization of the curricular program objectives, mission, and vision of the school
Student_Capacity	Conveys beliefs or abilities consistent with competency in inclusive teaching pedagogy	A couple days prior to a spelling test, I was approached by a tearful student. In order to alleviate stress from her, I changed the spelling test format. She helped me understand that the time limit made her nervous and scared
Student_Barriers	Conveys beliefs or abilities inconsistent with competency in inclusive pedagogy	The past term I have been encouraging staff to bring their students with special needs to my office where I have collected items, games and puzzles for them to feel relaxed and to have some quiet time from the classroom
School_Capacity	Conveys belief in inclusive school culture or ability to build one	I worked with colleagues to change our schedule to have more quality time with students
School_Barriers	Expresses focus on school barriers to inclusive practice	The meeting with colleagues was quite late into the term and should have been done earlier. It is difficult to work together
Interaction_Leader	Interaction is with a school leader	My head teacher gave me feedback and took my question to the administrator in charge of schedules to see if this change was possible
Interaction_Teacher	Interaction is with a teacher	I was teaching a new subject that we haven't taught before and went to a teacher colleague to get advice about the subject and material for the projects
Interaction_Specials	Interaction is with specialist or member of support staff	She was in the mentor room and is allowed to have personal information. She could clarify that this behaviour was normal. With that knowledge I can try a new way of approaching this student
Interaction_Communication	Interaction to exchange information and coordinate activities	As my manager, I thought necessary to inform her about this incident

Table 3 (continued)

Code	Definition	Example
Interaction_Advice	Interaction to seek or give advice, including consulting experts	She is the most knowledgeable person in the school that I can go to for seeking advice on a student who is stressed, overwhelmed and more. We talk a lot about our common students and share articles with each other
Interaction_Collaboration	Interaction is focused on working together	We planned collaboratively in regard to the new classroom space, logistics for students, instructional material, and so on

analysis (SNA) (see Gašević et al. 2019; Shaffer et al. 2016). Data analysis was conducted in three phases to address the research questions (RQs) as follows.

### **Coding scheme and procedures (RQ1: The nature of change teachers interact toward)**

To address RQ1, we analyzed the content of the logs ( $n=124$ ) and generated four broad themes (Miles and Huberman 1994) that describe the nature of ‘change’ situations reported by teachers. Our coding scheme also included categories aligned with the three components of our analysis: *teacher agency*, *inclusive pedagogy*, and *social networks*. We used inductive coding to generate the themes that describe the content of situations reported in each log (see Table 4), and deductive coding scheme from prior research on teacher agency (see Author 2017), inclusive pedagogy (Florian and Black-Hawkins 2011) and teachers’ networks (e.g., Frank et al. 2011), to interpret those situations (see Table 3).

The main coding category for teacher agency was *sense of purpose*. This category focused on operationalizing agency as a function of teachers’ perceptions and understandings of their professional roles. We applied the ‘agent of change’ code to statements that described goals in which the teacher proactively took responsibility for students (e.g., learning and well-being) or broader school issues (e.g., trying to spread a new practice). Examples include teachers that ‘created a new learning space’, ‘reached out to colleagues about concerns with a student’, and ‘helped a child who was having difficulty concentrating in class’. Meanwhile, we applied the ‘role implementer’ code to statements that describe efforts to implement current policies and procedures, such as teachers that ‘delivered the new curriculum’. Application of the ‘agent’ and ‘role implementer’ codes was not mutually exclusive as both could occur within the same log.

Coding for inclusive pedagogy in this study included two main categories: *competence* and *school culture*. The *competence* codes captured inclusive pedagogy at the student level, while the *school culture* codes did so at the school level. At both levels, we applied the codes ‘capacity-building’ (where a practice was aligned to inclusive pedagogy) or ‘focus on barriers’ (where a practice was not seen to meet the standard of inclusive pedagogy). At the student level, we applied the ‘capacity-building’ codes for statements that expressed teachers’ abilities to support student learning and holistic development. For example, the statement “Getting as much information as possible about the child helped me to know the child and his preferences better, moving a step forward toward understanding his needs” was coded as ‘student capacity’ because the teacher focused on taking responsibility for addressing the student’s individual need. In contrast, we applied the competence code ‘focus on barriers’ when teachers expressed beliefs that do not align with inclusive pedagogy. For example, a teacher described why they approached another teacher for help with a student: “This friend of mine has extensive experience working with disabled children and I thought that she might be able to give me some advice”. We coded this statement as ‘student barriers’ because the reason for seeking support was based on the assumption that disabled students are a different type of learner. We took both statements from the same teacher log to illustrate how our coding scheme

**Table 4** Log frequency by themes

Themes	Definition	Frequency by School	
		Disa	Vega Total
Student learning and well-being	Activities that are a response to a student's academic and emotional needs. Focus is typically on a single student	22	20 42
Lesson planning and professional learning	Activities that involve planning instruction or learning new instructional approaches	13	20 33
Program improvement and logistics	Activities aimed at changing an organizational—often school-wide—practice. School routines are also included	17	13 30
Working conditions and learning environment	Activities intended to foster a favorable classroom or school environment for teaching and learning	8	11 19
	Total	60	64 124

captures the complexity of what might appear to be contradictory ways that teachers think about student learning.

The other coding category for inclusive pedagogy, *school culture* followed a similar approach for distinguishing between ‘focus on barriers’ and ‘capacity-building,’ but was applied to statements that expressed perceived barriers and opportunities for building relationships with others at the school community level. One teacher, for example, described approaching a specialist who, “works at another school in my home country”. We applied a ‘school capacity’ code to this statement because the teacher values cooperation with outside professionals. In contrast, we applied a ‘school barriers’ code to the statement “I wanted to discuss how our work is organized because it generates stress and frustration” because the teacher is concerned with an environment that precludes collaboration.

Finally, we applied a code for each interaction reported in every teacher log using three categories of interaction codes—communication, advice, and collaboration. Within each type of interaction, we applied a ‘low-strength’ or ‘high-strength’ version of the code. For example, we applied the ‘communication’ code to interactions that involved teachers communicating with others in order to exchange information. If the interaction only involved diffusing information, or interacting with someone for the sole purpose of conveying or receiving information, we applied a ‘low-strength’ communication code. A ‘high-strength’ communication interaction involved coordinating activities or interacting with someone to exchange information for organizational purposes. For example, we coded the statement “As my manager, I thought necessary to inform her about this incident” as a low-strength communication, because the participant indicates that the only purpose of this interaction is to provide their manager with information. In contrast, we coded the statement “By sharing things with me that we need to accomplish things in class and in school” as a high-strength communication, because the participant indicates that they received information for a specific organizational reason, “to accomplish things in class and in school”. Next, we applied the ‘advice’ code to interactions characterized by teachers engaged in giving or receiving advice, which could include resources. ‘Low-strength’ advice interactions involved exchanging resources and ‘high-strength’ advice interactions involved consulting experts. Finally, we applied the ‘collaboration’ code to interactions in which teachers worked with others to complete a task. ‘Low-strength’ collaboration involved thinking together and ‘high-strength’ collaboration involved working together.

All the codes were applied throughout the log regardless of the log section. The Swedish speaking researcher translated 20 (~16%) of logs into English. Two researchers independently coded the same log data and discussed how each code should be applied, before each researcher applied the coding scheme to the data in Swedish and English, respectively. Within the same log, for example, we applied ‘sense of purpose’ codes to text in the WHAT section, as well as the ‘how’ and ‘why’ of the WHO section. Likewise, although we mostly applied ‘interaction’ codes to text in the WHO section, we also applied these codes across the log wherever evidence that involved the nature of interactions occurred. Similarly, we identified the broad ‘content’ themes for the whole log by comparing and contrasting the content of the situations reported in each log.

## Epistemic network analysis (RQ2: Association between teacher agency and inclusive pedagogy)

To address RQ2, we used epistemic network analysis (ENA) to identify the structures of connections that teachers made between dimensions of agency and inclusive pedagogy when interacting with others. Grounded in the learning science theory of epistemic frames<sup>2</sup> (Shaffer 2006, 2016), ENA techniques transform qualitative codes applied to textual data into nodes in an epistemic network of connections between concepts or people who share similar ways of framing and solving complex problems (Shaffer et al. 2016). In epistemic networks, the weights of the connections among nodes (i.e., the co-occurrence of codes) are a central point of interest. We applied ENA to establish connections between agency for change and inclusive pedagogy in teachers' interactions. Using an ENA online software (see Shaffer et al. 2016 tutorial), we measured the connections among the sense of purpose, inclusive pedagogy and interaction codes (Table 3) by quantifying their co-occurrences and examining the strength of association between those codes, within and across teacher logs. For example, if a teacher log included a code for 'agent of change' and a code for 'school capacity', the ENA software would record a co-occurrence between these codes and construct matrices that are represented as vectors in a high-dimensional space. The matrices are analysed with singular value decomposition (SVD)<sup>3</sup> to project the points into a lower-dimensional space of orthogonal dimensions that maximized variance accounted for in the data, as in principal component analysis or factor analysis. This SVD approach enabled for visual projection of codes in a fixed analysis space suitable for visual and statistical examination of the structure of connections between the codes. The plots show two dimensions—SVD1 and SVD 2, that explain most variance in the data. It also enabled us to inspect the position of 'centroids'—arithmetic average values of edge weights in epistemic networks—to visually compare both individual teachers and groups of teachers, and statistically test for differences between groups along SVD dimensions. We used Teacher and Log IDs as ENA units for which the structure of connections is modelled to generate teachers' epistemic frames. Using logs as 'conversations' in the ENA models (see Shaffer et al. 2016) allowed us to investigate the associations between teachers' agency, inclusive pedagogy and interactions at a more granular level to capture the complexity of teachers' beliefs and behavior in specific situations. In practical terms, the same teachers could act as an agent or a role implementer in different situations. Namely, there were 19 teachers (about 35% of participants) that reported acting as an agent of change in one of their logs and as a role implementer in another log. Finally, we used 'Sense of Purpose' and 'School' meta-variables to generate two

<sup>2</sup> Epistemic frame theory interprets expertise in complex domains as a networked phenomenon, rather than as the isolated knowledge and skills of individuals. ENA methods have been applied to 'model patterns of association in any system characterized by a complex network of dynamic relationships among a relatively small fixed set of elements' (Shaffer et al. 2016, p. 10).

<sup>3</sup> SVD is similar to principal component analysis (PCA) and is often used to reduce the dimensionality of data sets. SVD transforms a large set of variables into a smaller one while preserving as much information as possible. The main difference between SVD and PCA is that SVD uses non-standardized data.

ENA models to examine the differences (in terms of alignment of their interactions with others to inclusive pedagogy) between teachers' acting as agents of change and as role implementers (model 1) in different school contexts (model 2). Meta-variables facilitated group comparisons by enabling us to run t-tests in order to detect whether there were statistically significant differences between the epistemic frames of two groups in each model—i.e., between situations in which teachers assumed roles of agents and role implementers on the one hand, and between Disa and Vega on the other hand.

### **Social network analysis (RQ3: kinds of interactions that characterize teacher agency for change)**

To address RQ3, we combined social and epistemic network analysis (SEN) to assess the relationship between teacher agency and their network properties. We conducted social network analysis to examine the personal (or egocentric) network of each teacher log. Ego-network analysis focuses on focal actors' (ego) ties with the other actors they are directly connected to (alters). A fundamental element in ego-network analysis is that each person has a personal network (or 'egonet')—partially of their own creation and nearly unique to them—that is assumed to have important consequences for their beliefs and behavior. For our analysis, we identified three egocentric network metrics as relevant for teacher agency: *size*, *diversity* and *strength* (see "[Introduction](#)").

*Size* The size of an ego network refers to the number of alters an individual interacted with. We used the total number of actors mentioned in each log to calculate egonet size. If, for example, a teacher reported interaction with seven people in their teacher log, then they have a network size of 7. If he or she only mentioned one actor, then the network size is 1.

*Diversity* This refers to the diversity of the ties in an ego network based on the roles of alters with whom the ego interacts (teacher colleagues, formally designated leaders, and special service providers, as well as categories of key community-based actors, i.e., external partners and families). We used this information to generate a diversity scale of 1–5, assigning scores based on the number of different types of actors with whom teachers interacted. For example, if a teacher nominated 3 teacher colleagues, 1 school leader, and 1 parent, this would yield a diversity score of 3. In contrast, if a teacher mentioned 7 teacher colleagues and no other types of alters, he or she would be given a diversity score of 1.

*Strength* We used the Interaction codes for tie strength (i.e., communication, advice, collaboration) from each teacher log to generate tie strength scores—with communication being on the weaker end of the spectrum, followed by advice-seeking and then by collaboration, which was the strongest kind of interaction. We constructed a scale of 1–6 using the low- and high-intensity codes in each category (see coding procedures above for examples).

We used t-tests to identify any significant differences between the tie attributes associated with interactions that involved agency and those that involved role implementation. We also generated egonet visualizations and connected egonet diagrams that illustrated patterns of interactions in each school.

Finally, we cross-examined patterns in our data that might illuminate any relationships between the results for each of the three RQs. For example, we used a Chi-squared test of independence to analyze the differences between the qualitative themes in terms of teacher agency and role implementation. For each question, we compared the data from the two schools to identify any differences between the teachers coming from the two settings in terms of content, nature and structure of their interactions.

## Findings

### Change is embedded in teachers' day-to-day activities

With regard to the RQ1, teachers interpreted the meaning of change in various ways. While some logs focused on school-wide initiatives such as implementing a curricular program, others described activities embedded in the daily classroom practice of teachers, for example, supporting individual student learning. Overall, we identified four themes: (1) student learning and well-being, (2) lesson planning and professional learning, (3) program improvement and logistics, and (4) working conditions and learning environment. Table 4 describes each theme and shows the proportion of logs by theme across schools. Below we present examples for each theme.

#### Student learning and well-being

Student learning and well-being was a major theme when teachers promoted change. When asked how they 'made a difference' in their schools, many teachers responded in terms of making a difference in the life of an individual student. Teachers helped students with a wide range of non-academic issues, including eating disorders, or coping with the psychological stress of traumatic events such as bereavement or divorce. Teachers were sensitive to students when they were struggling academically, but even when discussing academic interventions, teachers frequently addressed the socio-emotional dimensions of learning:

I have a student who, already from the start of the school year, was experiencing great difficulties with his schoolwork...I wanted the student to feel like the schoolwork at [Disa] was manageable and that they can handle it and enjoy school. [Log 11, Teacher, Disa]

Overall, teachers interpreted change as an ongoing process of attending to the academic and emotional needs of students. Moreover, they often did not disentangle the academic and emotional dimensions of learning, but view them as an integrated phenomenon.

#### Lesson planning and professional learning

Lesson planning and professional learning was another important theme that emerged from the teachers' accounts of making change. Broadly speaking, these



cases involved changing instructional practices and pedagogical approaches—either their own or those of their colleagues. As a Disa teacher stated:

I wanted to change the way I teach. Earlier I have used a lot of PowerPoints... Making the PowerPoints took a lot of my time, but the students didn't actually learn. I slowed down my pace [by reducing] the amount of information in my lessons. I changed from doing PowerPoints to writing at the blackboard. The students got to hear me saying things, see me writing things and writing down themselves doing notes [Log 54, Teacher, Disa].

As this example illustrates, improving students' active learning was the main reason teachers were motivated to change their practice. Policy changes, such as a new curriculum, instructional policy, or using technology in the classroom, also provoked teachers to change their practice. In other cases, teachers focused on changing the teaching practice of others. Typically, teachers attempted to influence their colleagues by providing formal professional development (e.g., workshops), sharing instructional resources, modeling lessons, and/or offering informal advice.

### **Program improvement and logistics**

Program improvement and logistics was another important target of teachers when they attempted to effect change. These teachers tried to initiate new programs or get the school involved in outside programs, often involving attempts to implement niche projects:

As one of the new 'Design' teachers in charge of the schools 3D printers, I wanted to promote awareness of the possibilities of 3D printing, and just get students excited about the year. I offered all classes (not just the ones I teach) the opportunity...I think I raised some awareness, but I was hoping for more [Log 102, Teacher, Vega].

Another way that teachers made a difference was focused on improving or changing organizational processes. Several teachers identified opportunities to make logistical changes, for example, changing the format of the report cards to make it 'more suitable' for the school's curriculum. In other cases, teachers were reacting to a school-wide change, for example to the way assessments were graded.

### **Working conditions**

Teachers discussed actions aimed at changing the environment around them. Broadly, teachers aimed to improve collegiality and collaboration within their schools. There were several cases that involved improving the well-being of their co-workers.

Me and my colleague who work with special education sometimes feel that we are quite lonely in our profession. We wish that we would have colleagues to share thoughts and ideas with. A year ago, I tried to get in touch with and form a network with special education colleagues working in the area around our

**Table 5** Content of interactions for agency and role implementation

Context of interactions	Agency	Role implementation	Total count
Student well-being	47% (34)	14% (8)	42
Lesson planning	18% (13)	40% (20)	33
Program improvement	25% (18)	23% (12)	30
Working conditions	11% (8)	16% (11)	19

Chi-squared test

$X^2 = 15.849$ ,  $df = 3$ ,  $p = 0.001217$

school. Unfortunately, everyone that joined left one by one due to high workload [Log 89, Specialist, Disa].

This his quote illustrates that some teachers saw emotional support and a sense of community as central to their relationships with their colleagues. Other examples included making the school environment more inviting for parents, or organizing a workshop to reduce stress. Teachers also focused on ensuring a productive learning environment for all students.

Examination of the frequency of occurrence of agency and role implementation codes within the four themes revealed that agentic interactions occurred most often in situations that involved student learning and well-being. In contrast, the most common type of context in which role implementation took place was lesson planning. A chi-squared test of independence revealed a significant relationship between agency and the content of interactions ( $p = 0.001$ ). Table 5 shows the frequency of teacher logs for agency and role implementation by the content of interactions.

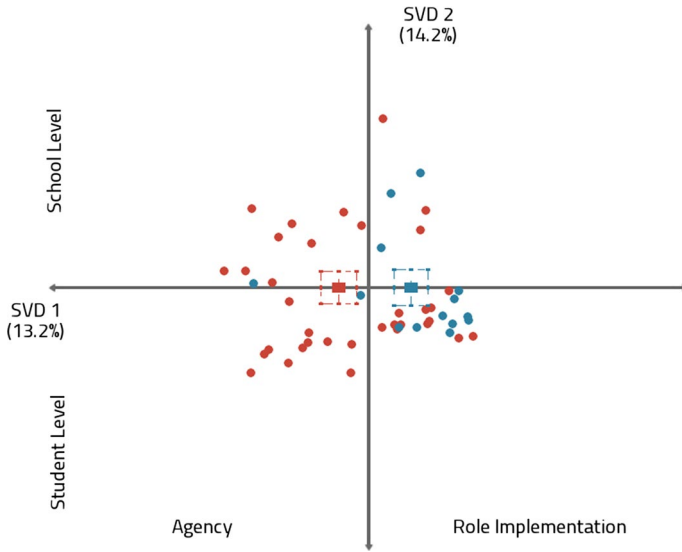
Teachers frequently acted as agents of change when responding to students' emotional needs:

My aim was to help a child that seemed to be unhappy at school...There were several occasions when I had observed that this child seemed to feel unwell and I had heard that from other people, too...I realised that a long-term plan was needed, and that collaboration between members of staff, the child, and the child's family members would be essential. [Log 120, Teacher, Disa]

Role implementation generally involved interaction in which teachers aimed to change practice in line with their school's curriculum. In Disa, for example, where the curriculum included vocational training, several teachers wanted to change their practice by incorporating more hands-on activities into their lesson plans:

I wanted to incorporate more practical activities into my teaching...I wanted students to try something new, to help each other, [and] in a way, to better understand their future professional work. I organized practical stations in the lesson room...I did not contact anybody at the time, but I had spoken with a colleague about using more stations in class. [Log 54, Teacher, Disa]

When teachers reported instances of change toward improving practices beyond their own classroom, their efforts were often stymied, for example because their 'pet



**Fig. 1** Comparison of agency (red) and role implementation (blue) mean plots

projects' were additive to, rather than complimentary of, day-to-day instruction and school policies.

### Teacher agency is situational

With regard to the RQ2, the ENA results showed significant differences between the epistemic frames of teachers when acting as agents and those associated with acting as role implementers. Figure 1 displays this divergence as an ENA means plot. The means plot maps the centroid for each log. The red dots represent logs with agentic situations, while the blue dots show logs with instances of role implementation. The mean of each group appears in the center of a box delineating the group's confidence interval.

The ENA space in which the centroids (for 'agency' and 'role implementation') are visualized is defined by the first and second dimensions that account for the greatest variation in data. In this case, the first dimension (SVD1), reflecting a distinction between 'agency' and 'role implementation' appears to account for 13% of the variance, while the second dimension (SVD2) reflecting the focus of activity at student or school level accounts for 14% of the variance in teachers' situational behavior. A two-sample t test revealed that acting as agents of change and role implementation differ significantly along SVD1 ( $p=0.05$ ).

The results indicate that low values of SVD1 are about student capacity, while high values are about interactions with leaders and student and school barriers. Low values of SVD2 are about student capacity and interactions with specialists, while high values are about school capacity. This means that codes on the

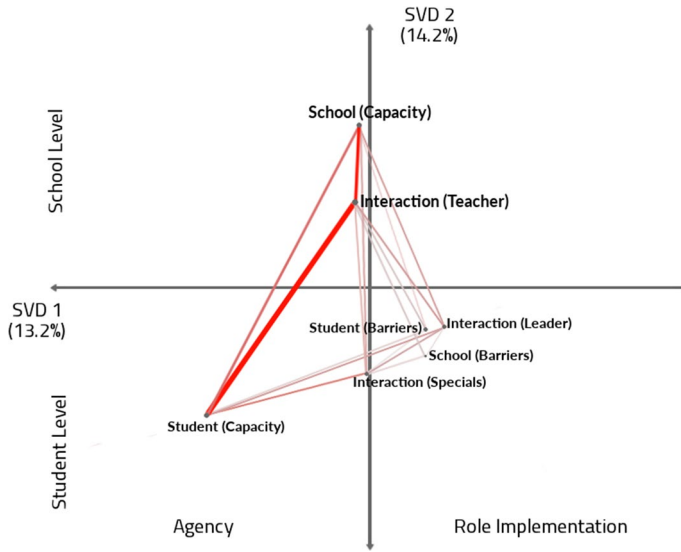


Fig. 2 Epistemic frame for agency

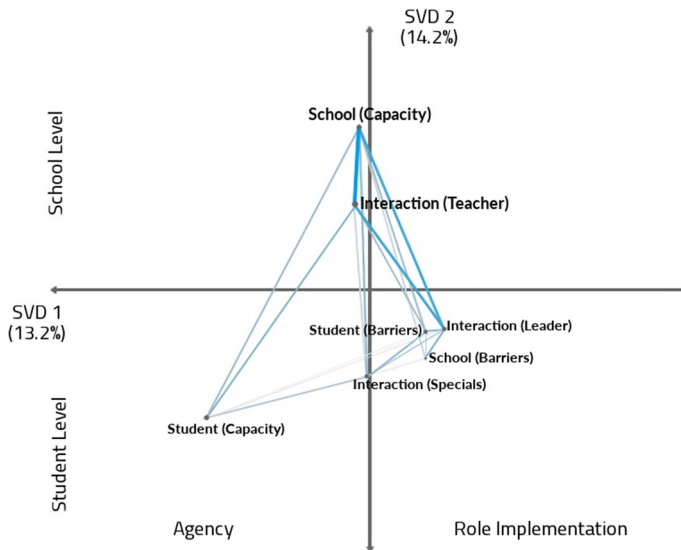


Fig. 3 Epistemic frame for role implementation

left-hand side of the graph (e.g., ‘student capacity’) are more likely to coincide with agency (see Fig. 2) while those are the right-hand side (e.g., ‘interaction leader’) are more likely to correspond with role implementation (see Fig. 3).

With regard to the association between teacher agency and inclusive pedagogy, the ENA plots show a few key differences between agentic and role-implementing epistemic frames. The epistemic frame for agency (Fig. 2) indicates a strong connection between inclusive pedagogy codes and interactions with teachers, evidenced by the thicker plot line between ‘student capacity’, ‘school capacity’ and ‘interaction teacher’. These results indicate that agentic behavior tends to include working with other teachers in ways that promote student capacity building and positive school cultures. These findings support the posited relationship between inclusive pedagogy and teacher agency, especially in situations that focus on students’ learning and well-being:

When the school year began I was asked to provide support to a child with ADHD as part of my role as class assistant. My aim was to first observe the individual child, and also pay attention to how the group dynamics worked, how the child worked individually and as part of a group, and what type of support would the child need from me.... Jan (pseudonym) gave me some information regarding the background of the child both in school and at home. This information was very important because it helped me view the child as a whole and enabled me to understand and be aware of social and emotional factors that were influencing the child’s behaviour and well-being [Log 108, Teaching Assistant, Vega].

Supporting the emotional well-being of students and being sensitive to their home environment are characteristic of teachers who display agency for inclusive pedagogy (Author 2017). This teacher’s account demonstrates her ability to assess student learning holistically and work with colleagues to build integrative pupil support systems. When exercising agency, teachers frequently reported working with other teachers, as well as support staff and specialists, to enable inclusive approaches to student learning and well-being.

However, acting inclusively was not exclusive to instances of agentic behavior. The role-implementing epistemic frame (Fig. 3) is characterized by a strong connection between interactions with leaders and teachers and capacity building at the organizational level, indicating that role implementation was associated with inclusive practice in different kinds of situations. Notably, role implementation was more often coded as inclusive pedagogy at the school level:

My aim was to be a collaborator and help facilitate teamwork as much as possible by covering lessons and assisting in the classroom whenever needed. I communicated with the headteacher who was cooperative and supportive. [The headteacher] gave guidance during the process of planning. [Changes are] I help the classes during teacher absences...reorganizing the assistant teachers, help with the ASC team, and collaboration within the teams [Log 77, Teaching Assistant, Vega].

Building strong, trusting relationships is an important part of creating an inclusive school culture. The assistant teacher in this case wanted to implement their duties more effectively. The assistant’s positive view of school leaders is

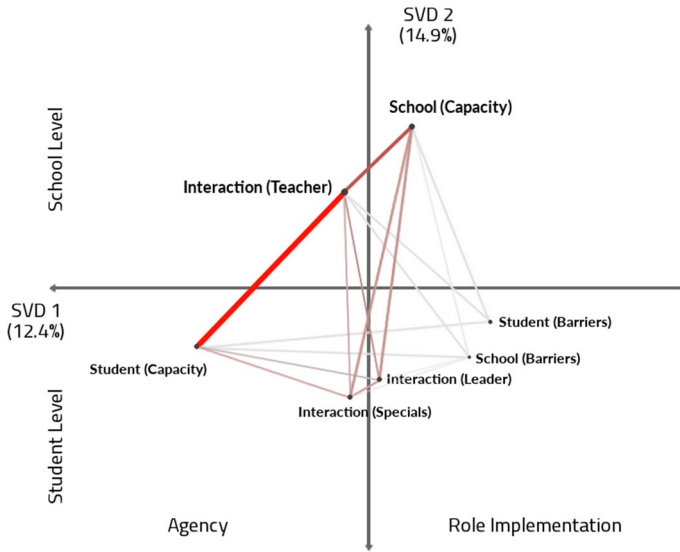


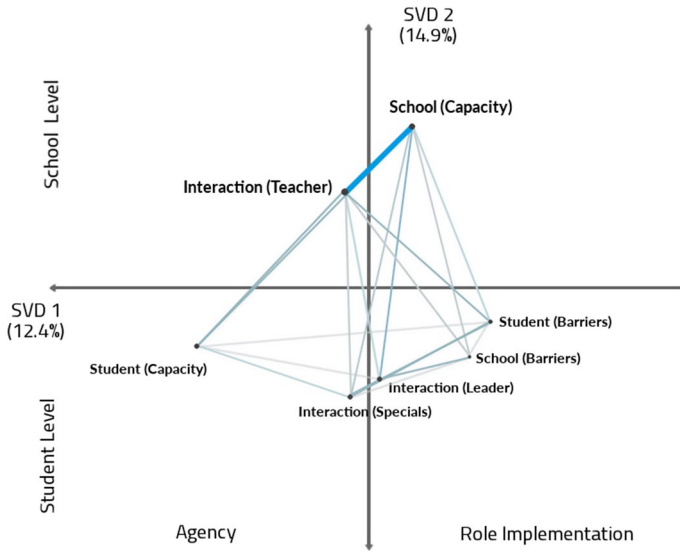
Fig. 4 Epistemic frame for Disa

indicative of a supportive working environment. More importantly the underlying motivation for change is facilitating teamwork and improving collaboration. Teachers and school staff that value cooperating with others and foster collaboration are features of inclusive school cultures (Black-Hawkins and Florian 2012).

On the other hand, teacher logs that revealed practices that hindered any inclusive pedagogical approach appear to be linked to the epistemic frames of role implementation (see Fig. 4). Although the ENA plots place the ‘student barrier’ and ‘school barrier’ codes on the right-hand side of the plot—and thus closer to role implementation—this link is not particularly strong. A closer examination of logs content revealed that ‘focus on barriers’ kinds of initiatives focused on providing something extra for a particular group of students:

My aim was to support children with learning needs. I created a club for a group with the same diagnosis. I worked with the teacher that has the relevant children in her classroom. I communicated with my manager because I knew they would be supportive. [Log 87, Teaching Assistant, Vega]

In these cases, practice cannot be said to meet the standard of inclusive pedagogy (viewing differences between learners as an ordinary aspect of human development). When teachers provide something different (*a club for a group with the same diagnosis*) for some children, they are creating the conditions for a repetition of exclusion (Allan 2006) in an environment where difference is a problem. An inclusive pedagogical approach does not rely on such distinctions. Inclusive pedagogy seeks to remove the limits imposed by judgements about who learners are who can do what. It seeks to provide opportunities for all children to learn within a classroom community that does not prejudge learners (Florian and Spratt 2013).



**Fig. 5** Epistemic frame for Vega

We also found differences in the epistemic frames for teacher logs between Disa and Vega (Figs. 4 and 5).

Specifically, the ENA plots show a strong connection between student capacity and teacher interactions in Disa on the one hand, and a strong connection between school capacity and teacher interactions in Vega. Participants from the two schools assigned this difference to Disa teachers interactions pertaining to individual student counseling concerning workplace challenges, while at Vega teachers had weekly meetings relating to lesson planning.

### Teacher agency is relational

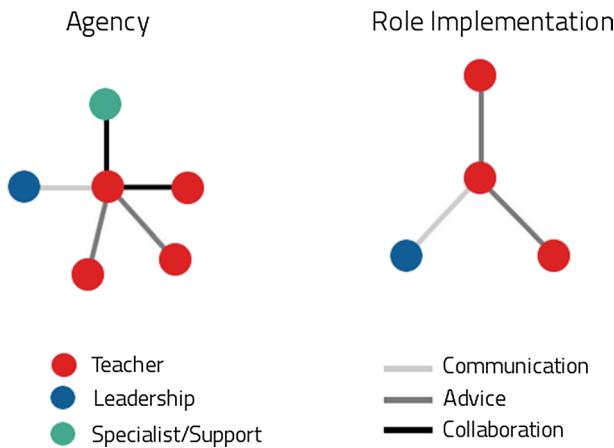
With regard to the RQ3, we found important differences between teachers' interactions when acting as agents of change in comparison to teachers' interactions when acting as role implementers. Table 6 shows significant differences in tie attribute scores for agents and role implementers on all three network measures.

On average, when acting as agents, teachers tended to interact with more people (and therefore had a larger network) in comparison to situations in which they acted as role implementers. We also found that the diversity scores for agentic situations were significantly higher than those characterized by role implementation and that agency was associated with stronger interactions across a more diverse set of actors in comparison to role implementation. To highlight these differences, we drew two ego-net motifs—one for agency and for role implementation—that model a 'typical' interaction for each type of situation (Fig. 6). The network motifs are based on average data and are for illustrative purposes.

**Table 6** Results of two-tailed *t* tests comparing agency and role implementation ego-nets

	Agency		Role implementation		<i>t</i> test	<i>p</i>
	<i>(n</i> = 73)		<i>(n</i> = 51)			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Size	2.658	1.734	1.941	1.529	2.4288*	0.0167
Diversity	1.738	0.866	1.411	0.669	2.3761*	0.0191
Strength	3.877	1.542	3.187	1.505	2.4627*	0.0154

\*\**p* < 0.01, two-tailed; \**p* < 0.05, two tailed

**Fig. 6** Comparison of model ego-net for agency and role implementation

Of the 47 teacher logs that focused on implementation, 30% ( $n=15$ ) had an ego-net structure with advice ties, but no collaboration ties (some also had communication ties). Notably, interactions associated with role implementation of low/medium-strength were almost never situated in the context of student learning and well-being—only one example was recorded. Rather, these interactions were found most often in teacher logs that took place in the context of lesson planning ( $n=7$ ), followed by both program improvement ( $n=5$ ) and working conditions ( $n=5$ ).

Next, there were notable differences between the two schools in both the structure and composition of their networks. The results of two-tailed *t*-tests showed comparing the tie attributes of teachers across schools also showed significant differences between both schools in the average that number of collegial ties reported by Disa teachers was, on average, significantly higher than those for Vega teachers. In practical terms, Disa teachers approached roughly one more people on average in comparison with Vega teachers. This is evidenced in Table 7 by a difference in the size scores for Disa ( $M=2.862$ ) and Vega teachers ( $M=1.924$ ).

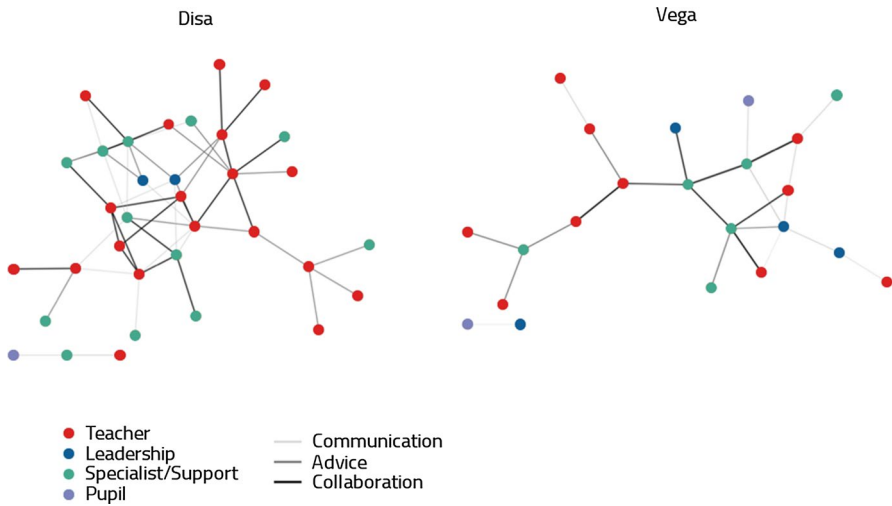
One factor that may help explain the higher level of collegial ties in Disa is differences in staff experience levels. More than half of the teachers at Disa have



**Table 7** Results of two-tailed *t* tests comparing tie attributes of Disa and Vega egonets

	Disa		Vega		<i>t</i> test	<i>p</i>
	(n = 58)		(n = 66)			
	<i>M</i>	SD	<i>M</i>	SD		
Size	2.862	1.711	1.924	1.542	3.1882**	0.0018
Diversity	1.707	0.773	1.515	0.827	1.334	0.1847
Strength	3.689	1.363	3.501	1.716	0.6764	0.5001

\*\**p* < 0.01, two-tailed; \**p* < 0.05, two tailed



**Fig. 7** Diagrams of Disa and Vega networks for student learning and well-being theme

more than 15 years of teaching experience, while in Vega less than five of the teachers that participated in our study had 15 or more years of teaching experience. This means Disa teachers have more experience working with colleagues in general and may also have extensive experience working with each other.

To further examine these differences, we compared Disa and Vega network visualizations when change was focused on student learning and well-being. Figure 7 shows the connected egonets of the two schools.

The social network diagrams support and expand on several of our findings. The Disa network (left) appears denser than the Vega network corroborating our statistical *t*-test showing a higher level of collegial ties amongst Disa teachers. Both networks show that teachers and specialists/support staff—represented by the red and green circles, respectively—work together frequently when tackling change aimed at students. Further, many of these interactions are collaborative as evidenced by the high proportion of black lines connecting teachers and specialists/support staff, while interactions with school leaders are infrequent and focused on either communication or advice. At the same time, in Vega, teachers tended to approach fewer

colleagues in general and fewer teacher colleagues specifically in comparison to Disa teachers. This is evidenced by the chain structure of Vega's network, which is indicative of a sparse, de-centralized network. Meanwhile the composition of the chain structure shows few overlapping interactions amongst teachers—in other words Vega teachers did not report interacting with many of the same colleagues. By comparison, Disa's network structure is much more transitive, indicating more mutual interactions amongst Vega staff. In addition, Vega teachers were less likely to engage in advice and collaboration in comparison to Disa teachers as evidenced by the lighter lines between actors in the Vega diagram. Overall, mirroring broader trends in the data, teachers in Vega interacted with fewer actors when they seek to support a student compared to those in Disa. Taken together with previous findings, the network diagrams suggest that more teachers were involved in more intense collaboration around student support in Disa in comparison with those in Vega. While evaluating causal factors for these differences was beyond the scope of this analysis, anecdotal evidence indicates that this could be related to the school policy for teacher assignment. Due to an older student population, Disa used a rotation schedule for classes, meaning teachers often shared the same cohort of students. Several teachers indicated that their motivation for reaching out to colleagues was because they worked with the same class or group of students.

## Discussion and conclusions

Overall, teacher reported various kinds of change they tried to achieve or orient themselves toward (RQ1). Most often teachers interpreted change as an ongoing process of attending to the academic and emotional needs of students. These findings suggest teachers tend to exercise agency to provide holistic support to students in which their learning and well-being are an integrated phenomenon. These findings are consistent with those of previous research suggesting that teacher agency for change is often focused on students (e.g., Heijden et al. 2015). They also indicate that teacher agency may not always be about instigating change, but rather, a responsive behavior embedded in daily practice. In this sense, change was less about initiating a new program or implementing systemic reform, than it was about supporting the emotional and psychological needs of the people around them. Our findings highlight the importance teachers place on paying attention to changes in student well-being. Children and teenagers are constantly changing, and many teachers understand change as seeing them through it, consistent with other studies that found teachers highlight the importance of caring, supporting, and 'being there' for students, as central to their work (Boag-Munroe 2004).

With regards to the association between teacher agency for change and inclusive pedagogy (RQ2), our results indicate that teacher agency for change is positively associated with the collaborative ways of working principle of inclusive pedagogy. Notably teachers displayed agentic behavior to promote student capacity building and inclusive school cultures, by working collaboratively with colleagues within and beyond the school (e.g., reaching out to school colleagues, families or other professionals). These findings corroborate those of previous studies that suggested agency

for inclusive pedagogy involved supporting students to navigate school structures, rather than focusing on the various barriers that might be seen to obstruct their learning (Author 2017). However, inclusive pedagogy codes were also manifest in the implementation of existing policies, usually at school level, with some examples of practice that could not be said to meet the standard of inclusive pedagogy despite descriptions of the practice as inclusive. This is a complex but common phenomenon that occurs in situations where policies of inclusion support practices that result in a repetition of exclusion (Allan 2006). This is precisely the problem that the assumptions of an inclusive pedagogical stance is designed to address. In this study, evidence of an inclusive pedagogical approach was evident in some situations, but it coexisted with other practices that were contrary to it. This is consistent with other studies of inclusive pedagogy (Florian and Black-Hawkins 2011; Florian et al. 2017) and foregrounds the importance of teacher agency as mechanism of change.

Teacher agency for change is also associated with more interactions, more diverse and more collaborative interactions, especially when teachers focused on students' learning and well-being (RQ3). This finding suggests that teachers' agency is characterized by their working with various others in a way that implies more intense collaboration (e.g., over period of time) in contrast to role implementation situations in which teachers tended to have more one-off interactions, such as going to their manager for advice while focusing on lesson-planning and programme improvement. These findings resonate with research that found teachers used diverse relationships to mobilise support and secure resources when faced with challenges that extended beyond instructional matters, such as issues with behavior and planning lessons to meet diverse student needs (Lane and Sweeny 2019). Our findings complement previous studies of teacher social networks, which indicate that collegial interactions are an important factor in educational change (e.g., Daly et al. 2010). First, coordinating with leaders and other teachers was prominent when implementing new, as well as existent, programs and policies. Second, teachers frequently collaborated with each other, as well as specialists and support staff, when making changes related to student learning and well-being. Researchers and policymakers have targeted socioemotional well-being as an important factor in student learning. Yet, research on teacher social networks has focused predominantly on the enactment of practices that effect academic learning, such as math pedagogy and literacy. We build on this work by also showing the prominence of students' social and emotional well-being. To this end, examining the evolution of teachers' practices that are consistent with inclusive pedagogy have been a useful conceptual vehicle for exploring the relationship between networks and social emotional learning.

Finally, how teachers exercised their relational agency differed between the two school settings. The teachers from two schools helped us interpret the possible reasons for a strong connection between student capacity and teacher interactions in Disa on the one hand, and a strong connection between school capacity and teacher interactions in Vega. Vega teachers were having collaborative planning meetings every week (part of implementing the international curriculum), where they were expected to collaborate with fellow teachers about lesson planning, and also to create action plans for supporting students in need. This illustrates how institutional context create structures for collaboration. Further, Disa and Vega serve different

student populations with different needs, which may help explain some of the differences in the interaction patterns. For example, specialist support in Disa is provided at the school level both to students directly and to teachers and other staff, which may explain why Disa teachers had more interactions around student support than those in Vega. The majority of Vega teachers work with primary students, while Disa enrolls secondary students for vocational training. Primary and secondary students may require different responses. It was common, for example, for Disa teachers to work with vocational instructors to address issues with student learning and lesson planning.

## Methodological implications

Epistemic and Social Network Analysis have previously been combined to study collaborative learning using data produced in massive open online courses (Gašević et al. 2019). Our study is the first to apply this learning analytic approach in studies set in real school contexts. Studies of teacher agency have predominantly been designed as qualitative case studies to capture the complexity and context embeddedness of agency in particular locations. Combining epistemic and social network analysis allowed us to capture a great deal of such embeddedness by analysing situational data reported by teachers, while also enabling us to quantify such contextual data to identify patterns in teachers' relational behaviour across school contexts. In the future, this approach could be used to study teacher agency for change at a larger scale, e.g., to distil the essence of such agency across different policy or cultural contexts or study its impact on particular change outcomes.

This study combined teacher agency and inclusive pedagogy frameworks to examine teachers' beliefs and practices underlying (change) agency and their purposeful interactions aligned to the principles associated with inclusive pedagogy. In combining these frameworks, our study explored the possibilities of linking theoretical concepts that are distinctive but not indistinct. For example, it could be claimed that inclusive pedagogy assumes teachers are acting agentially by the choices that they make while teaching. In focusing on agency itself rather than what the agentic actions were in the service of, this study suggests additional methodological considerations for future research if the approach is to be applied to study particular change outcomes. Notably, in integrating ideas from theories of change agency, inclusive pedagogy and SNA, we developed a novel coding frame that could be subject to further refinement in future studies. In terms of agency for change, the focus of this study, our findings suggest that the methodological approach developed for this study captures microlevel practices that are otherwise difficult to quantify and study systematically. While the methodological approach is promising, its use is currently limited and further larger scale investigations are warranted.

With regard to inclusive pedagogy, our study revealed some of the methodological challenges associated with combining SNA and ENA and offered important insights for the design of future studies. For example, where we coded a teaching practice that involved seeking expertise as a 'student barrier', on the assumption that some students are a different type of learner, we coded another advice seeking action

of the same teacher as ‘capacity building’ because the teacher was seen to be valuing cooperation with professionals outside of the school. While further refinement of these codes is needed, this study has broken new ground for future research by allowing us to examine the nature, as well as presence of collaborative working.

### **Practical implications**

Our findings also have implications for teachers’ professional learning and school development. The idea that learning and change are better thought of as a social practice, rather than something within the mind of an individual has become commonly accepted (Lave and Wenger 1991; Riveros et al. 2012; Roth and Lee 2007; Wenger 1998) suggesting that embedded learning that involves other colleagues might be more beneficial than ad hoc courses or workshops. Structures and cultures that enable teacher collaboration, are seen to be a fruitful setting for developing knowledge and social capital that can stimulate teacher learning and innovation (Wubbels 2007; Riveros et al. 2012). Importantly, such structures and cultures are malleable through teachers’ own practices and collaboration with others, which were seen both as a function of agency and its structural conditions (Author 2017a). Some of the participants in our study reported such efforts in their logs—creating the kind of relational structures that improve conditions for their individual and collective practices. In this context, our study provided insights (and feedback to teachers in two schools) about the content and nature of their micro-level interactions that can be useful for understanding how their practices are shaped by and help shape the very relational patterns that enable or constrain their agency for change.

### **Appendix**

Web-based log for Teacher Reflection on their Agency for Change (TRAC).

## Log for Teacher Reflection on their Agency for Change (TRAC)



### WHAT

Think of a time (over the past term) when you tried to make a difference in your school: What was your aim? What did you do?



### WHO

If anyone, whom did you approach to help you make the difference? Please name people within or outside school in the order in which you approached them.

#### Person 1

Role:

Code:

Type of Interaction:

Why did you go to this person?

How did this person help you make the difference?



### REFLECTION

What difference did you make? What worked? What did not work? Reflecting back on this experience, what would you do differently and why?

Submit form

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