

# Essential features of effective networks in education

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## Abstract

**Purpose** – The purpose of this paper is to advance clarity and precision around effective action in networks, understood as collaboration that: first, deepens the learning and engagement of students and adults; second, enhances the professional capital of teachers and leaders; and third, becomes a positive force of whole system improvement. It distills eight essential features of effective networks by fleshing out key lessons from existing research and from emerging education network developments in the English-speaking world and Latin America. It then discusses three shifts required for a new partnership between networks and central leadership to turn networks into forces of educational system renewal.

**Design/methodology/approach** – Two sources of evidence were identified and reviewed: first, literature reviews and studies aimed at identifying characteristics of effective networks in education; and second, network case studies and R&D initiatives that used networks as their improvement strategy and had demonstrated positive impact on student outcomes or on one or more professional capital variables often associated with improved student outcomes. To distill the eight essential features of effective networks and three required shifts in the relationship between networks and central leadership, the authors engaged in an iterative process of thematic analysis (Boyatzis, 1998) deliberately searching for key characteristics and processes describing effective collaboration. The list was revised for completeness and parsimony.

**Findings** – The eight essential features of effective networks identified are: first, focussing on ambitious student learning outcomes linked to effective pedagogy; second, developing strong relationships of trust and internal accountability; third, continuously improving practice and systems through cycles of collaborative inquiry; fourth, using deliberate leadership and skilled facilitation within flat power structures; fifth, frequently interacting and learning inwards; sixth, connecting outwards to learn from others; seventh, forming new partnership among students, teachers, families, and communities; and eighth, securing adequate resources to sustain the work. The three required shifts in the relationship between networks and central leadership are: first, from supply driven to demand driven; second, from compliance oriented to learning oriented; and third, from bureaucracy to movement.

**Research limitations/implications** – The key limitation derives from the scarce available evidence to date causally – or even co-relationally – connecting network activities with improved student learning. This paper summarizes what is known to date about effective collaboration in networks and advance a theory of action that causally links network activities with improved student outcomes and enhanced professional capital. This theory of action, summarized in eight essential features, simultaneously offers key hypotheses for social network theory in education and actionable guidelines to develop effective networks.

**Practical implications** – The eight essential features of effective networks and the three required shifts in the relationship between networks and central leadership presented here were intentionally framed as action oriented. They offer a clear and actionable set of guidelines to develop effective networks.

**Social implications** – The power of networks as vehicles to dramatically improve schools and entire educational systems is yet to be realized. This paper offers guidelines to enhance the effectiveness of networks, and thus contributes to the realization of the yet unfulfilled promise of networks.



**Originality/value** – This work adds originality and value in three ways: first, it draws from both existing studies on effective networks and successful and promising education networks; second, its findings apply to multiple configurations of networks, across multiple contexts – existing publications place their focus on specific network configurations or a specific network case or initiative; third, it looks at effective collaboration in networks from the dual perspective of local problem solving and whole system improvement.

**Keywords** Social capital, Collaboration, Networks, Professional capital, Collaboratives, Whole system reform

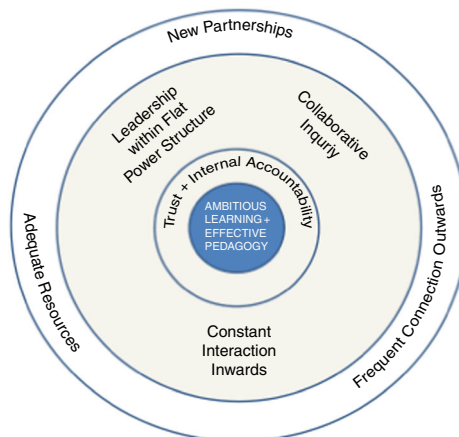
**Paper type** Conceptual paper

Over the past two decades, networks have increasingly gained the attention of the education sector for their promise as vehicles for innovation and improvement in educational systems (Daly, 2010; Elmore, 2007; Huberman 1995; Lieberman and Grolnick, 1996). However, the proliferation of networks as a change strategy has traveled at a much faster rate than their effectiveness. Indeed, existing networks in education seem to be more often inconsequential than effective (Chapman and Mujis, 2014; De Lima, 2010). When it comes to improving student outcomes across entire educational systems, it is not the existence or the creation of networks *per se* that matters but how they function and what they actually do. Simply put, networks are a set of people or organizations and the direct and indirect connections that exist among them, whereas collaboration is the act of working together with a common purpose. Since the function and inner workings of networks are core determinants of their effectiveness, our focus is on effective collaboration in networks.

The purpose of this paper is to advance clarity and precision around effective action in networks, understood as collaboration that:

- (1) deepens the learning and engagement of students;
- (2) enhances the professional capital of teachers and leaders to continuously deepen student learning and engagement; and
- (3) becomes a force of improvement in the whole system.

In particular, we distill eight essential features of effective networks (Figure 1) by fleshing out fundamental lessons from existing research on effective networks, from



**Figure 1.**  
Essential features of effective networks

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successful and promising education network developments in the English-speaking world and Latin America, and from recent discoveries of the new science of *Social Physics* (Pentland, 2014). The principles and strategies that we present apply to groups of educators, networks of schools, networks of districts, or cross-sectional networks of actors with diverse formal roles in an educational system working together.

### Networks on the move

The authors of this paper have been involved in large-scale reform efforts with different yet complementary origins: one supporting successful reform efforts initiated by leadership at the top of the educational system in Ontario, the other engaged in large-scale pedagogical change initiated at the grassroots level in Mexico. Two clear conclusions from this work are: top-down change by itself does not work; nor does bottom-up alone. These system reform efforts, successful and sustained for over 12 years in Ontario, promising yet abruptly interrupted in Mexico after three years, have blended top-down and bottom-up forces. “Leadership from the Middle” (Hargreaves and Ainscow, 2015; Hargreaves and Braun, 2012) has emerged as an important feature of system improvement. The location of the “middle” depends on the structure of a system. In jurisdictions with districts or other local authorities, these constitute the middle. Where there are no local agencies, as in New Zealand, the middle is clusters of schools. The logic of Leadership from the Middle is that leaders in the middle work together on a common agenda building lateral capacity as they link to key priorities. They learn from each other and in so doing become better partners upwards to the state, and downwards to their local schools and communities. Regardless of the locus of origin of a whole system reform agenda – the top, bottom, or the middle of an educational system – the key question is what approaches are most effective at developing professional capital (Hargreaves and Fullan, 2012) and system coherence (Fullan and Quinn, 2015; Hargreaves and Shirley, 2009; Johnson *et al.*, 2015). Our ongoing collaboration with system leaders in Ontario and internationally offers the basis to our interest in effective collaboration in networks.

This paper adds value to existing knowledge on education networks in three ways. First, it is action oriented and action informed, and thus is well suited to inform deliberate strategies by policy makers and network participants. While consistent with the existing literature on effective networks (Bell *et al.*, 2006; Earl and Katz, 2005; Leithwood and Azah, forthcoming), the conclusions presented here also draw from successful or promising education networks on the ground. Second, the ideas presented here encompass and apply to multiple configurations of networks, across multiple contexts. In contrast, existing publications on effective networks focus on a specific network configuration (e.g. networks of schools, district networks) or a specific network case or initiative. And third, we look at effective collaboration in networks from the dual perspective of local problem solving and whole system improvement. That is, we draw attention not only to the dynamics of effective collaboration within networks, but also to the new partnerships required between networks and central leadership in order to turn networks into effective forces of change across entire educational systems.

### The promise of networks

The potential of networks lies in two domains. First is the large reservoir of resources, expertise, and knowledge that remain dormant, untapped, or underused in classrooms, schools, educational systems, and society at large (Ainscow, 2014). Second, good ideas that do exist are not tested and further developed as they remain in isolated pockets,

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while groundbreaking inventions and innovations come from people who work together to solve complex problems (Isaacson, 2015; Nielsen, 2012).

The new science of *Social Physics* (Pentland, 2014) is making fundamental discoveries on the causal connections between patterns of social interaction and changes in human behavior, productivity, and creativity. Through a method known as reality mining, which consists of collecting and analyzing rich data on human behavior captured through personal digital devices, social physics has dramatically enhanced the speed and reliability with which social network dynamics can be described, analyzed, and causally linked to relevant outcomes. We will discuss and draw on some of the key discoveries from social physics later in this paper. For now, we will just point out that, relative to social physics, research on social networks in education is in its baby steps. That being said, some partial evidence is now available on the impact of networks on student outcomes and professional capital. We discuss this below.

We know a great deal about what makes for effective collaborative school cultures (Lieberman and Mace, 2010; Little, 1982; Stoll *et al.*, 2006). We know a lot less about inter-school, inter-district, and multi-layered collaboratives. This is so for two reasons. First, such strategies on any scale are relatively recent so there's only a small database to learn from. Second, there are many more permutations and combinations when it comes to collaboration between schools or districts compared to collaboration within schools. Clusters in a word are more complex.

Some evidence exists that shows a positive relationship between school-to-school collaboration and student outcomes in England, where this strategy has been intentionally promoted system-wide for about a decade. Chapman and Mujis (2014), for example, examine the effects of federations – two or more schools that establish a collaborative partnership under a common governance structure – on student achievement. Their quantitative study used multilevel modeling to compare the performance of 264 federated schools from 50 districts to a matched sample of non-federated schools that were performing similarly at baseline. Of the six types of school networks identified in the study, one showed consistent gains in student achievement: federations where a high-performing school partnered with one or more low-performing schools. After approximately two years of joining a federation, federated schools were performing significantly better than their non-federated counterparts.

Much of the other social network research in education produced so far is either descriptive of network structures and network dynamics (Daly and Finnigan, 2011; Earl *et al.*, 2006; Hite *et al.*, 2005) or looks at the relationship between network data and variables expected to be linked to student achievement, such as teacher efficacy, satisfaction, school climate, et cetera (Bell *et al.*, 2006; Leithwood and Azah, forthcoming; Mascall *et al.*, 2008).

The field is in a very early stage of building evidence that causally connects network dynamics with improved student outcomes, increased professional capital, and enhanced educational systems. At the same time, the excitement about the potential of networks seems to be spreading faster than our knowledge about what makes them effective (De Lima, 2010). The mere adoption and widespread dissemination of networks as a strategy for change is likely to produce superficial and even harmful practices if not accompanied with clarity and precision about the patterns of interaction that distinguish effective from inconsequential or even harmful networks. This paper is intended to provide a framework for effectiveness to guide an emerging field. With the eight essential features presented here, we hope to advance precision and set a direction for the present and future work of networks in education.

### Crafting the essential features of effective networks

The evidence base we built and reviewed consisted of existing literature reviews and studies aimed at characterizing effective networks, as well as case studies and evaluation reports of improvement or research and development initiatives known to have used networks as a key component of their improvement strategy. We deliberately looked for network initiatives with positive impact on relevant student outcomes or on one or more professional capital variables often associated with improved student outcomes.

We identified six literature reviews/studies specifically aimed at identifying characteristics of effective networks. Of these, one focussed on effective collaboration among educators from different schools (Lieberman and Grolnick, 1996), four looked at networks of schools (Bell *et al.*, 2006; Earl and Katz, 2005; Hadfield and Jopling, 2006; Hargreaves *et al.*, 2015), and one examined characteristics of effective networks of district leaders (Leithwood and Azah, forthcoming). The reference lists of these publications were also reviewed to identify other reviews and studies focussed on effective networks. No other such publication was identified.

Network case studies and research and development initiatives were identified through snowball sampling initiated by asking system leaders in our own professional networks to nominate any improvement initiatives they knew about which used networks as part of its main improvement strategy and also had demonstrated positive impact on student outcomes or on some dimension of professional capital. These initial points of contact were also asked to share key documents and to provide names and contact information of key leaders of the identified initiatives. Twelve such initiatives were identified, which are listed together with their key associated literature on Table I. Taken together, the six reviews/studies and 12 network initiatives constitute our empirical base to distill key features of effective networks.

To distill the essential features of effective networks, we engaged in an iterative process of thematic analysis (Boyatzis, 1998) focussed on deliberately searching for key characteristics and processes that described effective networks, constantly moving back and forth between emerging themes and the evidence base listed above. Once a preliminary list of essential features was completed, it was checked as a whole for completeness and parsimony. Completeness was pursued by identifying key features

|   | Key literature                    | Network type <sup>a</sup> |     |    |
|---|-----------------------------------|---------------------------|-----|----|
|   |                                   | i-s                       | i-d | ml |
| Manchester Challenge, UK                          | Ainscow (2014)                    | X                         |     | X  |
| Raising Achievement, Transforming Learning, UK    | Hargreaves <i>et al.</i> (2007)   | X                         |     |    |
| Networked Learning Communities, UK                | Earl and Katz (2005)              | X                         |     |    |
| National Support Schools, UK                      | Hill and Matthews (2008, 2010)    | X                         |     |    |
| Learning and Change Networks, New Zealand         | McKibben (2014)                   | X                         |     | X  |
| Manaiakalani, New Zealand                         | Annan (2015)                      |                           |     | X  |
| Ontario Reform Strategy, Canada                   | Fullan and Rincón-Gallardo (2016) | X                         | X   | X  |
| Alberta Initiative for School Improvement, Canada | Hargreaves <i>et al.</i> (2009)   | X                         |     |    |
| Networked Improvement Communities, USA            | Bryk <i>et al.</i> (2015)         |                           |     | X  |
| CAEd-Supported Networks, USA                      | CAEd (2015)                       |                           | X   | X  |
| Learning Community Project, Mexico                | Rincón-Gallardo (2016)            | X                         |     | X  |
| Escuela Nueva, Colombia                           | Colbert and Arboleda (2016)       | X                         |     | X  |

**Notes:** <sup>a</sup>i-s, inter-school network; i-d, intra-district network; ml, multi-layered; X, identifies the network type for each network listed

**Table I.**  
Network case studies  
and R&D initiatives

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of effective networks consistently found in the thematic analysis but not encompassed in any of the essential features listed. Parsimony was pursued by identifying and addressing any unnecessary repetitions or overlaps. Table II presents the studies and cases reviewed against the eight features of effective networks presented here. Three additional themes emerged that pointed to a key enabling condition for effective collaboration in networks, that is, a new type of interaction that is developing between improvement networks in education and central offices. These will be discussed separately at the end of the paper.

Effective collaboration in networks requires and triggers significant shifts in the mindsets and practices of educators and school and system leaders. We discuss eight key features of effective collaboration and offer some guidelines for their design and support. As shown in Table II, these features can be identified consistently and repeatedly across a diverse range of reports and case studies of networks of educators, schools, and education systems. They are also consistent with the network developments we have observed and supported on the ground.

### **The essentials of effective networks**

The list below contains the eight essential features of effective networks referred to in Figure 1 that we derived from the existing literature, network initiatives, and our own experience cultivating, and learning alongside networks, clusters, and collaboratives. All eight features are crucial and feed on each other. This section briefly discusses each essential feature. The essentials of effective networks are as follows:

- (1) focussing on ambitious student learning outcomes linked to effective pedagogy;
- (2) developing strong relationships of trust and internal accountability;
- (3) continuously improving practice and systems through cycles of collaborative inquiry;
- (4) using deliberate leadership and skilled facilitation within flat power structures;
- (5) frequently interacting and learning inwards;
- (6) connecting outwards to learn from others;
- (7) forming new partnership among students, teachers, families, and communities; and
- (8) securing adequate resources to sustain the work.

#### *Focussing on ambitious student learning outcomes linked to effective pedagogy*

Effective collaboration requires a common vision that captures the hearts, minds, and hands of network actors. Effective networks connect this vision with a common goal that is at the same time inspiring and measurable. A focus on substantially improving teaching and learning to develop deeper student learning and engagement (quality) and to reduce variability in performance (equity) provides the best vehicle to collaborate effectively in schools as well as between and across education systems. It simultaneously feeds the intrinsic motivation of teachers to make a positive difference in the lives of their students and satisfies the public mandate of educational systems to provide high-quality education to the younger generations.

Ambitious student learning goals in effective networks are accompanied by a shared commitment to measurable outcomes. There are two ways in which effective

|   | 1. Focus: ambitious student learning linked to effective pedagogy | 2. High trust and internal accountability | 3. Practice improvement through collaborative inquiry | 4. Deliberate leadership, facilitation, flat structure | 5. Frequent interaction inwards | 6. Connecting outwards | 7. New partnerships | 8. Securing resources |
|---|---|---|---|--|---------------------------------|------------------------|---------------------|-----------------------|
| <i>Literature reviews, syntheses and studies</i>  |   |   |   |  |                                 |                        |                     |                       |
| Leithwood and Azah (forthcoming)  | X   | X   |   | X  | X                               | X                      |                     | X                     |
| Earl and Katz (2005)  | X   | X   | X   | X  | X                               | X                      |                     | X                     |
| Bell <i>et al.</i> (2006)   | X   | X   |   | X  | X                               | X                      | X                   | X                     |
| Hargreaves <i>et al.</i> (2015)   | X   | X   |   | X  | X                               | X                      |                     | X                     |
| Hadfield and Jopling (2006)   | X   | X   | X   | X  | X                               | X                      |                     | X                     |
| Lieberman and Grolnick (1996)   | X   | X   |   | X  | X                               |                        |                     | X                     |
| <i>Case studies and R&amp;D initiatives</i>   |   |   |   |  |                                 |                        |                     |                       |
| Manchester Challenge, UK Raising Achievement, Transforming Learning, UK National Support Schools, UK Networked Learning Communities, UK Manaiakalani, Australia | X   | X   | X   | X  | X                               | X                      | X                   | X                     |

(continued)

**Table II.**  
Effective networks studies and cases vs eight essential features of effective collaboration

|   | 1. Focus: ambitious student learning linked to effective pedagogy | 2. High trust and internal accountability | 3. Practice improvement through collaborative inquiry | 4. Deliberate leadership, flat facilitation, flat structure | 5. Frequent interaction inwards | 6. Connecting outwards | 7. New partnerships | 8. Securing resources |
|---|---|---|---|---|---------------------------------|------------------------|---------------------|-----------------------|
| Learning and Change Networks, New Zealand         | X   | X   | X   | X   | X                               | X                      | X                   | X                     |
| Ontario Reform Strategy, Canada                   | X   | X   | X   | X   | X                               | X                      |                     | X                     |
| Alberta Initiative for School Improvement, Canada | X   | X   | X   | X   | X                               | X                      |                     | X                     |
| Networked Improvement Communities, USA            | X   | X   | X   | X   | X                               | X                      |                     | X                     |
| CAEd-Supported Networks, USA                      | X   | X   | X   | X   | X                               | X                      |                     | X                     |
| Learning Community Project, Mexico                | X   | X   | X   | X   | X                               | X                      | X                   | X                     |
| Escuela Nueva, Colombia                           | X   | X   | X   | X   | X                               |                        | X                   | X                     |

**Notes:** X, indicates the features identified in each network study or case listed



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networks may accomplish this. One is to deliberately set measurable targets linked to ambitious learning goals, as in the case of Ontario (Fullan and Rincón-Gallardo, 2016) and the UK (Earl *et al.*, 2003). The other is to develop a clear and precise definition of effective pedagogy – what it looks like in practice – and establish mechanisms for network actors to continuously observe, try out, and refine their practice, as in the Learning Community Project in Mexico (Rincón-Gallardo, 2016) and Escuela Nueva in Colombia (Colbert and Arboleda, 2016). In these cases, measurable targets have not been front and center, but measurable improvements have been achieved.

It is often the case that collaboration in networks produce no or superficial changes to instructional practice and to the systems that are maintaining the status quo. What students learn is a direct function of the tasks they are asked to perform (Doyle, 1983). Improving and deepening student learning requires changing the nature of the tasks students are asked to do, shifting the nature of the relationship between teachers and students when they approach knowledge (City *et al.*, 2009), and identifying and modifying the systems that maintain the status quo (Bryk *et al.*, 2015). Paying deliberate attention to changing instructional practice is the most direct way to turn collaboration into a highly effective vehicle to improve student outcomes.

The ongoing use of evidence on student and school performance can enhance effective collaboration. First, it helps the group know their progress and identify whether what they are doing is having an impact. Second, evidence on student and school performance can help push the group beyond its comfort zone by highlighting key areas of improvement that they might otherwise prefer not to look at, such as persistent low achievement among students from historically marginalized groups, or stagnated or declined performance after a number of years of implementing an improvement strategy for which school leaders and teachers have high hopes. Once effective collaboration gets going and positive impact becomes visible, data can fuel the collective efficacy in the group. When a group is aware of their power to get better at what they do, ownership and engagement get reinforced and establish the ground for subsequent improvements and sustainability.

Carefully selecting data that simultaneously offers credible measures of student learning and gives the best predictions on the desired outcomes is crucial to effective collaboration in networks. The best working systems have strong, thorough, and user-friendly data bases that track each and every student, and offer timely, relevant, and transparent data to inform daily actions. They also know and guide their actions by how much progress they are making on key indicators.

#### *Developing strong relationships of trust and internal accountability*

The essence of network-related whole system improvement is developing strong relationships around a shared compelling agenda. These thrive in environments of high trust, which set the ground for an internal dynamics of push and pull that move the work of the group forward. Trust is crucial to engage in challenging conversations when there are breaches to shared agreements or when poor/inadequate performance needs to be called out. More importantly, trust is fundamental for group members to open up to acknowledge what they do not know and to learn in public, a fundamental precondition for learning and growth. Bringing the guard down to acknowledge what we do not know and being open to learn in public represents a radical departure from the stance of certainty and ambiguity teachers and system leaders have historically represented. It is especially difficult for educators and administrators, most of whom have learned that not knowing is something to be penalized, or even something to be

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ashamed of. High trust is fundamental for the openness to learning required to make the practice and outcomes of network participants transparent. While in high-stakes contexts the natural response of data comparing results creates defensiveness, environments of high trust turn transparency of data into a sense of moral urgency to get better and learn from others.

Internal accountability occurs when people in a group hold themselves responsible for their results and how they go about making improvements (Elmore *et al.*, 2004). Fundamental as high trust is for effective collaboration, it does not necessarily get too far by itself and, indeed, can disable rather than enable change when it simply and only encourages the group to stay within everyone's comfort zone keeping the status quo unchallenged. In effective networks, strong relationships of trust go hand with hand with internal accountability.

Developing trust and internal accountability takes time, and this should be specially kept in mind by impatient system leaders who expect too much too fast from networks. A slow start building relationships is sometimes the best way to accelerate improvement in the longer run. We have talked to and filmed several leaders who said that they worked hard to develop relationships in the first six months in order to establish the basis for going further.

*Continuously improving practice and systems through cycles of collaborative inquiry*

Tapping into the fundamentally human inclination to learn by doing, effective collaboration almost invariably engages participants in ongoing cycles of collaborative inquiry. Although different models are used by different networks (e.g. Bryk *et al.*, 2015; Ontario Ministry of Education, 2014; Timperley *et al.*, 2014), cycles of collaborative inquiry essentially consist of:

- (1) Using credible evidence (student achievement data, student work, classroom observations, etc.) to identify a problem of practice at the right grain size – challenging enough to require a stretch of existing knowledge and capacity within the group and manageable enough to be tackled with the existing capacity of the group.
- (2) Designing, trying out, and testing changes in practice aimed to solve the identified problem.
- (3) Rapidly accumulating evidence of impact; embedding those changes that improved teacher effectiveness and student performance into the daily work of participants, and refining or discarding change ideas based on evidence of their effectiveness or lack thereof.
- (4) Identifying a next problem of practice.

Collaborative inquiry helps groups stay in a do rather than a talk mode. The most effective networks engage participants in a developmental kind of doing, that is, in tasks that change their ways of knowing and acting as these are performed. They learn incrementally as they try out doing things differently, learn from failures and get better over time.

The activity of effective networks fluctuates between continuous practice to consolidate new routines to increase depth and precision on the one hand, and identifies and pursues the next areas of improvement in the network, on the other hand. Relentlessly identifying the next area of growth is crucial to prevent falling back into a plateau of mediocre practice. The goal of effective collaboration unequivocally is to zero in on new outcomes never before achieved.

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The most effective networks do not only get better at improving their internal work, but also at identifying and strategizing to continuously change the systems and structures that maintain the status quo and constrain their improvement work. In this way, effective networks serve simultaneously as powerful vehicles to develop professional capital and as collective agents of change of educational systems.

#### *Using deliberate leadership and skilled facilitation within flat power structures*

Networks require deliberate leadership. In the same way that we have described effective school leaders as lead learners (Fullan, 2014) networks must be led by leaders who model and facilitate learning and leadership in others. Another important notion is that there are many leaders with the formal leader as *primus inter pares* – first among peers.

Skilled facilitation is a fundamental aspect of effective networks. Especially at the start-up phase of a network, two key inputs are required. First, guidance from an external facilitator is often essential. Developing effective collaboration requires constant cultivation with the help of others who have done it before. A skilled third party is often necessary to point to the elephant in the room and help network participants navigate difficult conversations successfully. Second, because networks are a new phenomenon we must learn rapidly from our experiences. Three things are required: being reflective and alert to our own learning; involving external evaluators and critical friends who will assess and give feedback on progress; and plugging into the growing knowledge base about the characteristic of effective networks.

Especially in the case of system networks (e.g. networks of schools or networks of districts), a mix of senior leaders and people across layers of the system can enhance their effectiveness. The presence of senior leaders signals the importance of collaboration for the system, whereas the participation of actors from different levels of the system helps ensure that collaboration becomes embedded in the culture of the system.

Important as this type of cross-sectional structure may be for some networks, the most effective networks have fluid leadership roles, with authority determined by practical knowledge and expertise that are relevant at a particular moment in time rather than by position in the institutional hierarchy. Social physics has found that the best predictor of group intelligence is the equality of conversational turn taking. That is, groups where many individuals contribute to the conversation are more collectively intelligent than those where a few people dominate the conversation (Pentland, 2014). When effective networks include members with a form of institutional authority over the rest, these formal roles become almost invisible when collaboration is set into motion: formal leaders or facilitators take a deliberate learning stance as they support, coordinate, and lead collaboration; overseers become active participants and model teamwork themselves; in the case of Networked Improvement Communities researchers put their talent at the service of solving practical problems defined by practitioners, making changes rapidly and incrementally based on learning from experience.

#### *Frequently interacting and learning inwards*

Effective collaboration is characterized by dense, frequent knowledge sharing among participants. In *Social Physics*, Pentland (2014) finds that the most effective groups in terms of outcomes have very frequent interactions among themselves,

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along with numerous interactions with highly diverse people outside the group (feature 6). Stated differently, the activities of effective networks are a combination of engagement – focussed, cooperative interaction within the particular network – and exploration – searching for new, potentially valuable ideas and practices by engaging in diverse social networks. Engagement consists of focussed interaction to consolidate and refine practice within the group. Frequent interaction consolidates group norms and forms of behavior, while developing high levels of trust and a strong sense of responsibility to the group – or what Elmore *et al.* (2004) call internal accountability.

A key discovery of social physics is that social interaction has the most powerful effect in influencing individual behavior. More specifically, the likelihood that we will adopt a new behavior – everything from our diet, to exercising, to our political views – is a direct function of the degree to which the peer group where we are embedded exhibits the new behavior. Constant exposure to a given behavior predicts the adoption of this behavior more strongly than predictors such as personal traits or the behaviors and beliefs of friends (Pentland, 2014). Interacting frequently with other colleagues whose work is improving student outcomes is thus one of the most powerful strategies for continuous improvement and innovation.

#### *Constantly connecting outwards to learn from others*

At the same time, the most effective groups keep connections to the outside through the frequent interaction of individual members with their larger networks. When the problem of practice at hand requires expertise that falls beyond the capacity of the group or when innovation is necessary, activating these outside connections can offer access to required expertise and new ideas.

Constant connection outwards is also important in that it helps break down what Pentland (2014) calls the “echo chamber” phenomenon, whereby a group with strong internal ties keeps circulating the same old ideas and practices. Effective innovation and outward brokering continue to be difficult to achieve in networks in the education sector, yet these are crucial for networks to serve as a force of continuous renewal in educational systems.

#### *Forming new partnerships among students, teachers, families, and communities*

Some networks we have observed have cultivated a radical transformation of the roles of students, teachers, and families. The new learning becomes a deep partnership among the main players. Students, individually and in groups, take more charge of their own learning and produce deeper learning under the proactive guidance of teachers. Teachers in groups orchestrate the learning experiences of students. And parents and families become partners in the learning futures of their children. These partnerships are especially crucial among diverse cultures where many students start in a position of relative disadvantage (Annan, 2015).

It is becoming increasingly evident that achieving excellence and equity in education requires significant changes to what happens to children outside as well as inside the schools (Ainscow, 2014; Whitehurst and Croft, 2010). The most highly effective networks combine school-focussed strategies with efforts to engage the wider community through actions such as health and nutrition initiatives, neighborhood services, et cetera. Involving multiple community partners such as universities, the media, local businesses, and sports clubs to simultaneously improve school systems

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and their surrounding communities, however, is not easy. Deliberate leadership to find and maintain a common purpose, stay the course, and create alignment and coherence is fundamental to turn new community partnership into impactful vehicles of school and community transformation.

### *Securing adequate resources to sustain the work*

Effective networks secure resources to run their everyday activities. Resources that matter are those that create the conditions for effective collaboration, such as time for network actors to collaborate. Networks must have access to some flexible funds – small amounts can make a big difference. Equally if not more important is securing resources to ensure sustainability. As Hargreaves *et al.* (2014) point out, successful organizations prepare for sustainability from the beginning of their improvement journeys, rather than at the end. They tackle key questions from early on, such as how to build solid foundations for the continuation of success over time, even after the founding network leaders are gone; whether to keep on improving in what the group already excels at or strike out a new direction; or how to keep short-term gains connected to long-term goals (pp. 137-157).

Resources to support frequent, effective collaboration will not always come easy, and simply waiting to receive external resources to initiate collaboration is not the right strategy. In the face of scarcity of external resources, proactive leadership organizes a collective struggle to find crucial resources to sustain the work of networks, and this can generate a sense of collective identity and commitment in the group (Lieberman and Grolnick, 1996). Effective networks capitalize on resources under their control (individual time, schedules, school or district facilities to meet, available data and data systems, etc.) to start the work of collective improvement. As they demonstrate impact and gain momentum, networks can attract the attention of central leadership, funders or other allies willing to invest in deepening and spreading effective collaboration.

When done right, the most important resource of effective collaboration – the personal and collective drive to make a positive difference in the lives of students – is continuously re-generated and expanded as the improvement work deepens and widens. Networks also develop leadership within themselves. This enables greater impact in the short run (more leaders with a shared focus), and paves the way for the next generation of leaders. The eight essential features of effective networks offer the route to this unlimited potential for renewal of the education sector.

### **A new partnership between local networks and central leadership**

The power of effective networks lies not only in their potential to improve teaching and learning in schools, but more importantly, in their power to become forces of positive change of entire systems. The full realization of this potential requires:

- (1) developing a mindset of system leadership among participants of collaborative groups – that is, taking responsibility for the improvement of other groups as well as your own, and serving as “boundary spanners” between groups;
- (2) creating cross-sectional venues of ongoing collegial inquiry, discussion, and decision making to strengthen enabling conditions for effective collaboration and to identify and remove constraints; and
- (3) becoming better partners laterally and vertically with system leaders.

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We use the concept “systemness” to characterize the movement we are describing in this paper. Systemness means that people are deliberately doing their own part as they contribute to and benefit from the agenda of the larger system. When a school moves from individualism to collaboration, individual teachers stop thinking only of “my” children in “my” classroom, and become committed to all the children in the school. When individual school principals in a network become almost as committed to the success of other schools in the group as to their own, they are exhibiting system thinking. When networks become better partners with other networks and with system leaders they are also contributing to the improvement of the whole system. All of these cases represent an increase in systemness, or the state where a majority of people come to see themselves as system players.

Pushing the argument further, effective networks can develop the power to turn educational systems into self-evolving, learning organizations. Enabling, supporting, and unleashing the power of effective networks requires a redefinition of the link between central offices and local networks (see, e.g. the Alberta Initiative for School Improvement, in Hargreaves *et al.*, 2009). The developments we are describing reflect three fundamental shifts in the evolution of school systems.

#### *From supply driven to demand driven*

In a collaboration-oriented system, central leadership continues to play a crucial role on things such as setting an inspiring vision for the system, defining overall priorities, monitoring progress, building capacity, delivering resources and enabling conditions for effective collaboration, and providing an adaptable framework and broad guidelines for collaboration. Networks, especially those where effective collaboration is already underway, should take reasonable control over the agendas that are to be the focus of their collaboration – e.g. their specific problems of practice, internal norms and processes, etc. A “gradual release of responsibility” approach whereby support and intervention from external facilitators diminishes as internal capacity increases is adequate for the purposes of enhancing effective collaboration in networks across entire systems. Local networks take on the responsibility of demonstrating positive impact of their work on professional capital and student learning, and receive in exchange greater freedom over their improvement agendas.

#### *From compliance oriented to learning oriented*

In a new system that enables and is reinforced through effective collaboration in networks, learning is placed at the center of the education endeavor, and evidence of improved learning takes precedence over any claims of non-compliance. In a learning-oriented system, lead learning, or creating the conditions for all to learn while learning alongside them about what works and what does not (see Fullan, 2014) is the new role of leaders across the educational system, regardless of their formal role within a hierarchy.

#### *From bureaucracy to movement*

Another fundamental shift that is required in the relationship between central offices and local networks in order to realize the full potential of networks is the move from one of command, control, and compliance to one of movement building aimed at radically transforming the institutional culture and structure of schooling and school systems into one that fosters deep learning and continuous improvement all the way from students to schools to the central office.

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## The next phase of system improvement

Networks represent a serious quality proposition for the future of education, and thus require deliberate cultivation and support. There are many more ways for networks to go wrong than to positively improve outcomes and education systems. Effective action in networks does not just happen by bringing people together and encouraging them to get along and collaborate. Setting into motion and sustaining an effective network is hard work. As captured in the essential features discussed here, it requires a relentless focus ambitious student outcomes linked to increasingly effective pedagogies, high levels of trust and internal accountability, a practice of continuous and transparent learning, deliberate leadership with a radical redefinition of authority, constant interaction within and outside the network, new partnerships between students and the adults in their lives, and the necessary resources to consolidate and sustain the work.

Leadership from the middle with its deliberate learning stance, its ongoing lateral connections, and its partnered links upward and downward may be the most powerful approach of all times in achieving greater system coherence and sustainable improvement and innovation. It requires a process with essential components that are tested against success, and strengthened through learning from successes and failures.

Networks should be initially assessed on the basis of what is likely to make for productive work. Premature judgment on impact should be avoided although commitment to measurable impact is part and parcel of the modus operandi of effective networks. The bottom line is that networks need a purposeful design with clear features and a compelling practical theory of action. They should produce evidence and learning from their efforts – for their own sake, and for the sake of the system.

As we enter a potentially transformative period of change for education, where innovation combined with focus and links to impact will be essential, we predict that effective networks will become increasingly critical to system success. The eight essential features of effective networks and the three fundamental shifts in the relationship between central leadership and networks presented here represent our best effort to offer clarity and direction for a next stage in the evolution of the education sector.

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