

**Social networks in (slow) motion.**  
**A complexity perspective on network change in the context of educational reform.**

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**Summary of research proposal**

Social networks change over time. In schools, social networks among teachers reflect a web of relationships through which teachers exchange valuable resources, such as instructional materials, information, knowledge, and social support. Availability of these resources, or a lack thereof, can support or hinder both teachers' instructional practice and student achievement, especially in times of educational reform (for instance, the implementation of a new reading curriculum). However, empirical knowledge on social network change during educational reform and its association with educational outcomes is limited. Drawing on complexity theory, and using a mixed method longitudinal design, this study aims to understand how teachers' social networks change during educational reform and how this network change enhances school improvement in terms of teachers' instructional practice and student achievement. Understanding the dynamics of social networks in the context of educational reform promises valuable insights for educational theory and practice as these networks may be leveraged to better create, use, and diffuse resources in support of school improvement.

**Extended research proposal**

Subject and aim

Studies that utilize social network analysis are rising in popularity and visibility throughout the social sciences. The appeal is not surprising as the idea that 'relationships matter' cuts across many scholarly disciplines and fields, such as business, organizations, communications, and economics (see Brass, Galaskiewicz, Greve, & Tsai, 2004; Monge & Contractor, 2003). The most distinguishing feature of social network studies is the two-fold focus on both the individual actors and the social relationships connecting them (Wasserman & Galaskiewicz, 1994). According to early social network scholars, many important social phenomena can be explained primarily, if not completely, by social structure (Berkowitz, 1982; Burt 1982; Wellman. 1983).

However, social network research is often critiqued as being static (Borgatti & Foster, 2003). While studies are beginning to explore social network dynamics in controlled laboratory settings, our knowledge of social network change in 'real-world' dynamic and complex social environments is limited. Recently, scholars have posed that during educational reform (for instance, government mandated improvement initiatives around reading and writing), social networks among educators change in order to meet internal and external demands that are posed by the reform (Daly & Finnigan, 2010). Yet, empirical insights in the dynamics of social networks in schools are lacking. Therefore, this study aims to explore how social networks among educators change over time, and how this affects school improvement (instructional practice and student achievement) in the context of educational reform.

As I will argue in the following paragraphs, complexity theory can provide a useful lens to understand and analyze how social relationships among educators evolve over time to support (or constrain) school improvement during reform. Success in this area holds promise for increased understanding of the success (or failure) of educational reforms, and efforts to improve student learning.

### *Social network change in the context of educational reform*

Typically, educational reform efforts are enacted using a variety of formal structures, processes, and accountability levers to improve school outcomes. Despite recognizing that school improvement is a complex process (Mintrop & Sunderman, 2009), educational reforms often involve linear standardized trajectories that are designed to be implemented in a systematic fashion across complex and varied learning contexts (Burch & Spillane, 2004; Honig, 2009; Honig & Hatch, 2004; O'Day, 2002).

Yet, a growing body of recent research suggests that, in practice, reform implementation encompasses a much more complex endeavor involving individual interpretation, social influence, teachers' collective sense-making, and co-construction (Datnow & Castellano, 2003; Datnow, Lasky, Stringfield & Teddlie, 2006; Honig, 2008; Hubbard, Mehan & Stein, 2006; Supovitz & Weinbaum, 2008). According to Mohrman et al. (2003, p. 321), change processes emerge from and are maintained through interpersonal relationships, and therefore "...lasting change does not result from plans, blueprints, and events. Rather change occurs through the interaction of participants."

Educational researchers, practitioners, and policy-makers are increasingly acknowledging the potential of teacher networks to foster systemic improvement in instructional quality and student achievement (Coburn & Russell, 2008; Daly & Finnigan, 2010, in press; Daly, Moolenaar, Bolivar, & Burke, 2010; Moolenaar, 2010; Moolenaar, Daly, & Slegers, 2010; Moolenaar, Daly, & Slegers, in press; Moolenaar & Slegers, in press; Penuel, Riel, Krause, & Frank, 2009; Penuel et al., 2010; Spillane, Halverson, & Diamond, 2001; Spillane, 2006). While these studies underline the importance of social networks for leadership, teaching, and learning, they compare networks of several schools at a single point in time, thereby providing no leads as to how teachers' social networks may change over time as they collectively interpret, co-construct, and enact educational reform.

### *A complexity perspective on network change*

In order to understand how social networks evolve over time, we build on complexity theory (Dochy, 2008; Dooley, 1997; Lemke & Sabelli, 2008; Seel, 1999). Complexity theory has been most closely associated with the natural sciences (Innes & Booher, 1999; Mitchell, 2009) and only within the last few decades has moved into the realm of the social sciences (Allen, 2001; Burnes, 2005), and in particular, educational research (Goldspink, 2007; Morrison, 2002; O'Day, 2002). Essentially a complex system is composed of various interconnected entities that, as a whole, displays properties that cannot sufficiently be understood by examining the properties of the individual entities (e.g., the swarm behavior of birds).

As individuals in social networks are interdependent rather than independent, they are constantly acting and reacting to what others are doing, and as such, changes at a higher-order level (e.g., school level) will have consequences for a lower-order level (e.g., individual level) and vice versa (Burt, 2000; Degenne & Forsé, 1999; Granovetter, 1985; Gulati, 1998; Jones, Hesterly, & Borgatti 1997; Uzzi, 1996, 1997). Hence, complexity theory is a useful lens to understand and analyze how social relationships among educators evolve over time.

Building on a complex systems approach, network change and school improvement may be occurring (and thus should be observed) at different time scales. For instance, minute to minute interaction between teachers might lead to increased knowledge of a new curriculum over days and weeks, resulting in new instructional practices over months (e.g., Van Geert & Steenbeek, 2005). Therefore, the co-evolution of social network change and school improvement can be illuminated by examining the interplay of social network structure (network homophily, centrality, etc.) and relevant individual and school level attributes (attitudes, knowledge, leadership, instructional practice, student achievement etc.) as joint dependent variables in a longitudinal time frame where network structure and attributes mutually influence one another over a longer period of time (Frank et al., 2008). Following teachers' instructional practice and

student achievement over time as educators enact educational reform will increase our insights in how social networks succeed or fail to create, use, and diffuse resources in support of educational improvement.

#### Innovative aspects

The proposed research project is innovative for three reasons: 1) the conceptual lens of complexity theory offers increased understanding of social network change in real-world dynamic environments (i.e., schools in the context of educational reform) and its relationship with school outcomes (i.e., improvement in instructional practice and student achievement); 2) innovative and advanced social network techniques will be used to study the co-evolution of social networks and school improvement; and 3) social network change will be studied at different time scales using a mixed method approach. This multi-method multi-technique approach will result in empirical studies on dynamic social networks that are, to my knowledge, unique to the field.

#### Current state of knowledge and advancement

The interdisciplinary field of social network theory will benefit greatly from a rigorous empirical longitudinal mixed method study in a real-world complex setting such as schools in educational reform. Given the growth and interest in the field and lack of such empirical longitudinal studies, success in this area is very likely to make a significant impact on research in education, psychology, and organizational science as well as a wide international multidisciplinary audience. In addition, this project will contribute to educational policy and practice by illustrating how to capitalize on the theoretical, methodological and practical advances represented by social network theory and analysis.

#### **Public summary of research proposal [in Dutch]**

##### *Sociale netwerken in (slow) motion*

Leraren delen informatie en kennis over onderwijsvernieuwingen in hun sociale netwerk op school. Maar hoe beïnvloeden hun sociale relaties de dagelijkse onderwijspraktijk? De onderzoekers bekijken hoe veranderingen in sociale netwerken bijdragen aan het succes (of falen) van onderwijsvernieuwingen.