

CAPACITY BUILDING BY DATA TEAM MEMBERS TO SUSTAIN SCHOOLS' DATA USE

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Doctoral Dissertation

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1. Introduction

Data-based decision making in education has been emphasized globally in recent years (Datnow & Hubbard, 2015). Data-based decision making refers to the collection and organization of data that are subsequently used to help improve the quality of the education provided by individual teachers, schools or districts (Lai & Schildkamp, 2013). These data can be both quantitative and qualitative, and need to be collected systematically, for example through assessments, surveys or classroom observations (Lai & Schildkamp, 2013; Wayman, Jimerson & Cho, 2012). Data can represent any aspect of students, teachers, parents, and/or schools, and can be classified as input data (e.g., student characteristics), outcome data (e.g., student achievements), process data (e.g., teachers' classroom management) or context data (e.g., school culture).

Data-based decision making, or data use for short, is important because decisions informed by data are more likely to be effective than decisions based on intuition and experience (Schildkamp & Poortman, 2015). Furthermore, data can support teacher learning by stimulating reflective processes and providing insight into the teachers' strengths and weaknesses. As a result, teachers may change their behavior, such as by trying out different instructional strategies, which can improve their performance as teachers (Schildkamp & Kuiper, 2010). This can lead to improved student achievement (e.g., Carlson, Borman, & Robinson, 2011; Faber & Visscher, 2014; Lai, Wilson, McNaughton, & Hsiao, 2014; Poortman & Schildkamp, submitted; Van Geel, Keuning, Visscher, & Fox, 2016).

Even though data use is associated with various benefits, previous studies have shown that most teachers do not use data to its best effect or do not use data at all (e.g., Nabors-Oláh, Lawrence, & Riggan, 2010; Means, Chen, DeBarger & Padilla, 2011). An important reason for this is that educators have difficulties analyzing and interpreting data (Jimerson & Wayman, 2015; Verhaege, Vanhoof, Valcke, & Van Petegem, 2010). To support schools in their use of data, several professional development programs have been developed that target (a combination of) student achievement, teacher learning, and organizational change by stimulating data use at a school-wide level (e.g., Coburn & Turner, 2011; Ikemoto & Honig, 2010; Karr et al., 2006; Marsh, McCombs, & Martorell, 2009; Schildkamp & Poortman, 2015; Slavin, Cheung, Holmes, Madden, & Chamberlain, 2011).

One such program is the data team procedure (Schildkamp, Poortman, & Handelzalts, 2015). A data team consists of six to eight educators at the same school: 1-2 school leaders, 4-6 teachers and, if possible, the quality manager, who has access to the data. Collaboratively, they learn how to use data to analyze and address an educational problem in their school (e.g., high grade retention rates). Previous research has illustrated

that working with this procedure increased data team members' knowledge and skills related to data use (Ebbeler, Poortman, Schildkamp, & Pieters, 2016). However, it is not yet known whether working with this procedure can result in lasting school-wide changes regarding data use, both in policy (which includes the organization of work) and also in work practices themselves (e.g., Coburn & Turner, 2011; Honig 2008; Sherer & Spillane, 2011). An example of a school-wide change is when school leaders develop over time the school's vision and policy for data use for instruction, and teachers increasingly use data (e.g., student achievement data) to improve their instruction of their students. Whether such lasting school-wide changes are made is an issue referred to as sustainability (Fullan, 2007).

Whether a program can result in lasting school-wide changes is an understudied area of research, as previous work was mainly focused on programs' direct effects (Van Veen, Zwart, Meirink, & Verloop 2010). Moreover, we need to understand why programs (do not) result in such changes (Fullan, 2006a). Previous work has suggested that capacity building is helpful in that regard, with capacity building referring to the way in which educators gain knowledge and skills about data use, (e.g., Harris, 2002; Harris, 2011; Marsh & Farrell, 2015; Stoll, 2010). For example, Harris (2011, p. 626) stated that: 'Without deliberate, purposeful, and targeted capacity building, any attempt at implementation, is likely to flounder leaving behind it the rhetoric rather than the reality of change'.

Given the expected importance of capacity building, this thesis aims to explore the relation between how data team members build capacity within their team and their school and how data use is sustained. Determining how data team members built capacity within their team involved studying the processes of knowledge creation and sharing. Determining how data team members built their colleagues' capacity involved studying the process of knowledge brokerage.

Previous research on professional development programs to support schools' data use has provided little information on the process of capacity building (Marsh, 2012; Coburn & Turner, 2011). In particular, scholars have called for more analytic and theoretically-driven research (Marsh, 2012; Coburn & Turner, 2011; Little, 2012; Moss, 2012; Spillane, 2012). Moreover, insight into the relation between capacity building and the sustainability school-wide changes is crucial in order to come to a deeper understanding of the dynamic between an intervention, and the resulting on-the-ground responses and actions, such as how data are being used (Marsh, 2012; Coburn & Turner, 2011). From a practical point of view, information on capacity building and sustainability is critical for refining the intervention, optimizing its effectiveness, and making an informed decision on whether it is worth the investment of efforts and resources (Coburn & Turner, 2011).

Such understanding has a wider scope than just the data use context, as previous research has illustrated that one of the biggest challenges of professional learning

communities (such as data teams) is to make sustainable school-wide changes in policy and practice (e.g., Harris & Jones, 2010; Van Veen et al., 2010). Thus, insights into the relation between capacity building and the sustainability of school-wide changes could also be beneficial for other such types of bottom-up and small-scale professional development programs. Taking the aforementioned together, this thesis aims to explore how the process of capacity building is related to the way in which data use is sustained.

1.1. Theoretical framework

1.1.1. Capacity building

Capacity can be referred to as ‘the power to engage in and sustain learning of people at all levels of the educational system [...]’ (Stoll, 2010, p. 470). Capacity building is a multifaceted concept, and includes, for example, creating and maintaining the necessary conditions and structures within the school, and facilitating educators’ learning and skill-oriented experiences and opportunities (Fullan, 2006b; Stoll, 2009). In this thesis, the focus is on the learning process through which capacity can be build. Applied to the data use context, it refers to team members engaged in a professional development program who develop both their own and their colleagues’ ability to use data. Both will be explained below.

1.1.2. Capacity building within the team

Capacity building within the teams refers to creating and sharing knowledge among team members. Here, knowledge can refer to three types of content:

- The educational problem: this includes knowledge about what turned out to be (or not to be) the cause of the educational problem the team members are working on, and knowledge about the design and implementation of the actions for improvement. An example is that students who repeated a grade were found to do so because they lacked study skills. Such knowledge is hypothesized to provide an important contribution to solving the problem.
- Data use as applied to the educational problem: this includes basic and practical knowledge about data use. Examples are knowing the extent of the problem and knowing how to calculate certain grade retention rates.
- Data use in general: this includes abstract knowledge about data use. Examples are knowing when a hypothesis is testable, knowing when data are valid and reliable, and knowing how a hypothesis can be statistically tested. Such knowledge is hypothesized to facilitate a deeper understanding of data use as such, and has the potential to help team members identify needed data and draw inferences from data in appropriate ways (Coburn & Turner, 2011).

In this thesis, knowledge creation refers to the process through which team members gain knowledge about both data use and the educational problem. Moreover, knowledge sharing refers to the exchange of knowledge, both within and outside the team’s professional development context, to ensure that all team members are mutually engaged, as this reinforces learning (Wenger, 1998).

The process of capacity building is embedded within the data use theory of action. When using data, team members need to carry out several activities, as shown in Figure 1.1. First, the purpose for which data will be used needs to be determined. Second, data need to be collected and analyzed, thereby transforming them into information. After that, the information should be integrated with the team members’ own understanding and expertise. Here, capacity is built through creating and sharing knowledge. Subsequently, team members use this capacity to decide upon certain actions to improve the quality of education, which signals the importance of capacity building. Thus, capacity building needs to be targeted in order to support and improve team members’ actions based on data use (Little, 2012), and insight into the former is therefore required.

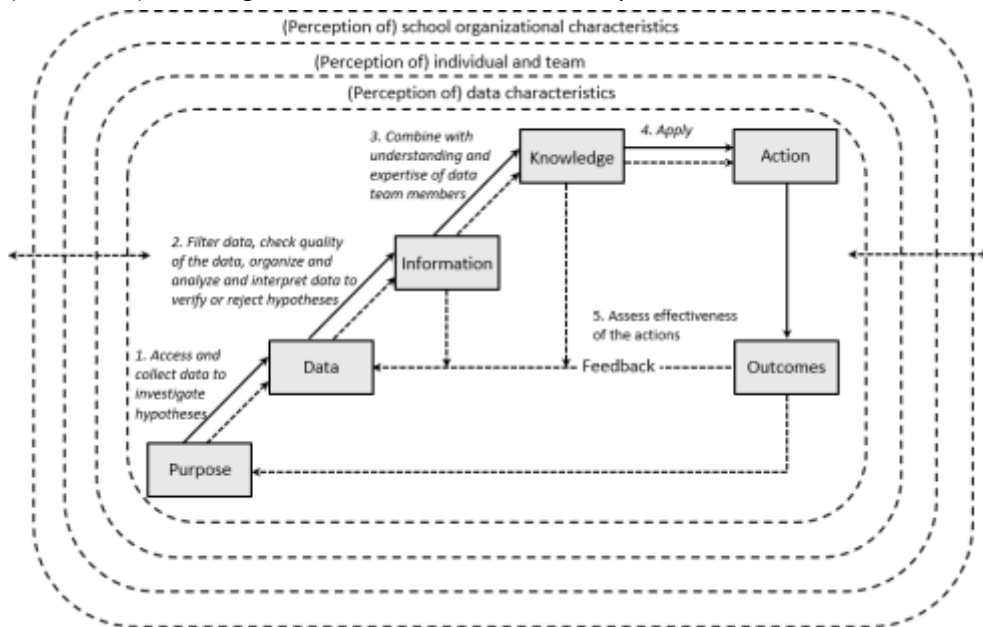


Figure 1.1. Data Use Theory of Action and Factors Influencing Data Use (Schildkamp & Poortman, 2015, p. 5; Based on Coburn & Turner, 2011; Lai & Schildkamp, 2013; Mandinach, Honey, Light, & Brunner, 2008; Marsh, 2012, p. 4; Schildkamp & Kuiper, 2010; Schildkamp & Lai, 2013).

1.1.3. Capacity building within the school

Team members should create and share knowledge to build capacity within their own team. They should also broker that knowledge beyond the team and build capacity within the entire school (Coburn, Touré, & Yamashita, 2009; Feldman & Tung, 2001). Brokerage is a term used to identify knowledge sharing by key individuals responsible for collective capacity building. The types of content are similar to those required for capacity building within the team: knowledge about the educational problem, about data use as applied to the educational problem, and about data use in general.

When team members successfully broker their knowledge, they build the capacity that is required to increase the school-wide level of data use (Honig, 2006; Hopkins, 2001). For example, knowledge brokerage is likely to facilitate their colleagues' participation in discussions of school-wide issues and increase school staff's communication about data use and the issues those data indicate to be important (Huffman & Kalnin, 2003; Lachat & Smith, 2005). Furthermore, it may well increase the collective willingness to solve identified educational problems, as well as illustrating the value of data use. Thus, capacity building within the school needs to be targeted in order to support and improve educators' actions based on data use. Therefore, insight into this process is required.

1.1.4. Sustainable data use

When team members build capacity for data use within their team and within their school, this might be related to the way in which data use is sustained in their school. Data use is deemed to be sustainable when working with the professional development program results in lasting school-wide changes in policy (which also includes the organization of work), and in work practices themselves (e.g., Coburn & Turner, 2011; Honig, 2008; Sherer & Spillane, 2011). This means that educators display behaviors associated with data use (e.g., teachers determine what topics are being mastered by their students and adjust their instruction accordingly) that develop over time in terms of their rigor or frequency.

The extent to which data use is sustainable is reflected in the development of schools' organizational routines. These routines are recurring actions that structure everyday practice in schools by supporting and focusing interactions among school staff (March & Simon, 1958; Nelson & Winter, 1982). These routines are composed of the ostensive and the performative aspects, which roughly refers to formal structures and everyday practice, respectively (Feldman & Pentland, 2003; Spillane, 2012).

Taking the aforementioned together, the main premise of this thesis is that the way in which data team members build capacity within their team and their school is related to the sustainability of data use; see also Figure 1.2.

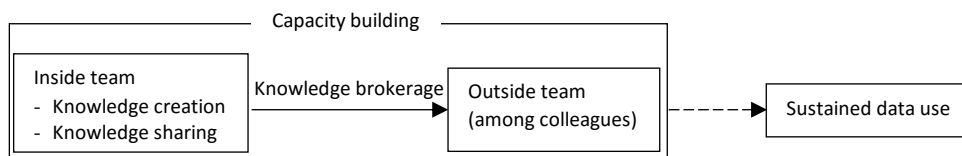


Figure 1.2. The Hypothesized Relation between Capacity Building and the Sustainability of Data Use

1.1.5. The professional development context: the data team procedure

Whether the process of capacity building is related to schools' sustained data use is studied in the context of the data team procedure. A data team consists of six to eight educators at the same school: 1-2 school leaders, 4-6 teachers and, if possible, the quality manager, who has access to the data (Schildkamp et al., 2015). They meet approximately twice a month for two years to learn how to use data to address an educational problem at their school. After that, they should be able to use data independently. Besides educating team members in data use, the goal of the data team procedure is school improvement by solving the educational problem and increasing the team members' colleagues' level of data use (Schildkamp et al., 2015).

Data team members work following a structured cyclic procedure, which includes an extensive set of guidelines and activities. A data coach from the university guides the team members through this procedure. This procedure is composed of the following steps; see also Figure 1.3:

1. Problem definition: the data team members identify and define the educational problem on which they want to focus their efforts and the goals they want to achieve. For example, when they decide to study high grade retention rates, they first need to collect data on the actual, current level of grade retention (e.g., how many students do repeat a grade?).
2. Formulating hypotheses: team members formulate a hypothesis as to the cause of the educational problem (e.g., factors that might cause grade retention).
3. Data collection: team members collect data to test their hypothesis. These data can be both quantitative and qualitative (e.g., student achievement data combined with whether or not they repeated a grade, or interview data for students who repeated a grade).
4. Quality check: team members determine the validity and reliability of their data (e.g., how much missing data is there?).
5. Data analysis: team members analyze their data, which can involve simple data analyses (e.g., descriptive analysis, summarizing interview data) or more sophisticated analyses (e.g., correlational and regression analysis).

6. Interpretation and conclusions: team members interpret the outcomes of their analysis and draw conclusions. Should the hypothesis turn out to be rejected, a new hypothesis needs to be investigated (back to step 2). Should the hypothesis turn out to be accepted, they proceed to step 7.
7. Implementing actions for improvement: team members develop and implement actions for improvement. They also think of ways to monitor the implementation of the actions, set deadlines, and determine which data are needed to determine the effectiveness of the implemented actions.
8. Evaluation: team members evaluate whether the educational problem has been addressed and whether the implemented actions for improvement are effective. To do so, additional data are collected. If necessary, the actions for improvement are modified (back to step 7). When the problem is solved, a new problem can be defined (back to step 1).



Figure 1.3. The Data Team Procedure
Adapted from Schildkamp and Ehren (2013, p. 56)

1.2. Main research question

This thesis aims to explore how the way in which capacity for data use is built is related to the sustainability of data use. It is assumed that data use is sustained in those schools in which data team members create knowledge and share knowledge with each other, and in which they subsequently broker this knowledge to their colleagues who do not participate in the data team. To illuminate whether that is the case, the main research question for this thesis is:

How does the way in which data team members build capacity, both within their team and within the entire school, relate to the sustainability of data use?

To answer the main research question, four studies were conducted. These will be outlined below; see also Figure 1.4.

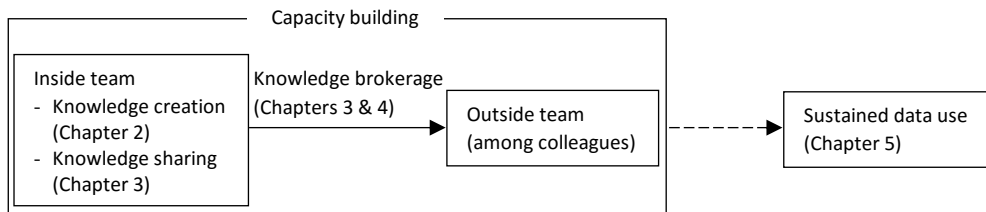


Figure 1.4. Outline of the Thesis

1.3. Outline of the thesis

Chapter 2 studies capacity building within the data team. It uses Nonaka and Takeuchi's (1995) Socialization, Externalization, Combination and Internalization model of knowledge creation to determine how data team members create knowledge. This four-stage model provides insight into the process through which groups or individuals use and test their insights and intuitions. The corresponding research question is:

- How do knowledge of the educational problem, of data use as applied to the educational problem and of data use in general result from the data team members' knowledge creation process, and how does this relate to the knowledge creation process in terms of modes (socialization through internalization) and transitions between those modes?

A qualitative micro-process case study was conducted for two data teams. The modes, transitions between those modes, and content of the knowledge creation process

were analyzed for all data team meetings over a two-year period. In addition, all team members were interviewed twice to triangulate the findings.

Chapter 3 studies capacity building both within the team and in the school. It does so by determining the way in which data team members change their knowledge sharing and brokering over time through the lens of social network analysis. The corresponding research questions are:

- In what ways do the data teams' knowledge sharing structures regarding data use and the educational problem change over time in terms of their density, reciprocity and centralization?
- How does data teams' brokering of knowledge about data use and the educational problem to their colleagues change over time, and which aspects (outward, inward, and forward) seem to occur most often?

Social network data were collected twice during the first year at eight schools that were in the process of implementing the data team procedure. These data were used to compute the density; reciprocity; centralization; and inward, outward, and forward brokerage measures. Qualitative data (log files of team meetings and teams' progress reports) were collected and analyzed to triangulate the quantitative findings for four particular cases.

Chapter 4 studies capacity building within the school by determining how data team members broker their knowledge. To do so, three research questions are posed:

- What type of knowledge content (educational problem, data use as applied to the educational problem, data use in general) is brokered by the data team members?
- At what level is knowledge brokered by the data team members (awareness, how-to, or principles)?
- What boundary crossing activities are used by the data team members (dissemination of boundary objects, personal communication with/without boundary object, providing practical experience)?

A longitudinal qualitative case study was conducted for four data teams. From these four teams, boundary objects (e.g., emails, presentation slides) were collected and all team members were interviewed twice. Furthermore, their log files, minutes of the meetings, and progress reports were collected and used to obtain a complete picture of knowledge brokerage and to provide background information.

Chapter 5 studies the extent to which data use is sustained. To do so, how schools' organizational routines for data use developed over time was investigated. A distinction was made between the ostensive and performative aspect of these routines, which roughly refers to formal structures and everyday practice, respectively. The corresponding research question is:

- To what extent is data use sustained in schools using the data team procedure, where sustainability of data use is defined in relation to the extent and manner of development over time of the ostensive and performative aspects of schools' organizational routines regarding: 1) engaging in the data team procedure, 2) acting upon their data team's improvement plan, and using data for 3) school development and 4) instruction?

A longitudinal mixed-methods study was conducted in six schools that implemented the data team procedure. Data were collected through questionnaires, policy documents, and semi-structured interviews.

Chapter 6 draws the answers to the aforementioned research questions together and explores how the process of capacity building is related to the way in which schools' data use is sustained. This chapter will also reflect on the outcomes and the research methodology. Finally, implications for the educational practice and future research are provided.