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Solving student achievement problems with a data use intervention for teachers

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HIGHLIGHTS

- An intervention to support teachers and school leaders in data use is introduced.
- The effects of this data use intervention on student achievement were studied.
- 5 out of 9 data teams studied solved their educational problem.
- These teams improved student achievement.
- Professionalizing educators in data use can lead to improved student achievement.

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ABSTRACT

The significance of data use for school improvement is recognized internationally. Several interventions have been developed to support schools in the use of data. However, there is a lack of research into the effects of these interventions, especially regarding student achievement. We developed a data use intervention to support teachers and school leaders in using data for school improvement. We studied the extent to which participating teams of teachers and school leaders have solved the student achievement problem they worked on. Five out of nine teams have been able to increase student achievement. We discuss these results and their implications.

1. Introduction

Internationally, policy makers, researchers and practitioners increasingly recognize the significance of data use for school improvement (Datnow, Park, & Kennedy-Lewis, 2013; Mandinach & Gummer, 2013; Schildkamp & Kuiper, 2010). Teachers can use data, such as assessment data, student background data, and classroom observation data, to determine the learning needs of their students. They can adapt their instruction accordingly, and this can lead to school improvement in terms of increased student learning and achievement (Campbell & Levin, 2009; Carlson, Borman, & Robinson, 2011; Lai, McNaughton, Timperley, & Hsiao, 2009; McNaughton, Lai, & Hsiao, 2012; Van Geel, Keuning, Visscher, & Fox, 2016; Van Kuijk, Deunk, Bosker, & Ritzema, 2016).

However, obstacles to the use of data have been identified in many studies (Marsh, 2012). Examples include lack of collaboration in the use of data, a negative attitude towards data use (Jimerson, 2014), and lack of related knowledge and skills (Mandinach & Gummer, 2013; Marsh, 2012; Schildkamp & Kuiper, 2010; Schildkamp & Poortman, 2015). Even if high quality data are available and accessible to educators, this does not guarantee effective use of these data (Wayman, Jimerson, & Cho, 2012). Awareness of these obstacles has resulted in a variety of interventions to support data use (Marsh & Farrell, 2015). However, there has been little systematic research into the effects of professional development interventions to support data use in schools (Marsh, 2012; Marsh & Farrell, 2015). In Marsh's (2012) review study, the findings and levels of research evidence that are available on effects of interventions were mixed, with relatively less evidence at the level of student achievement. Therefore, this study aims at exploring the effects of a data use intervention on student achievement.

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To support teachers and school leaders in using data for school improvement, we developed an extensive and intensive professional development program. We take a broad view of data, defined as 'information that is systematically collected and organized to represent some aspect of schools' (Lai & Schildkamp, 2013, p. 10). This may refer to assessment data, structured classroom observation data, and student and parent survey results, for example. Data use refers to making decisions based on these data (Lai & Schildkamp, 2013; Mandinach & Honey, 2008). In the data use intervention we developed, teachers and school leaders work together in teams to learn how to use data to solve educational problems related to student achievement in their own school context. They use a systematic procedure and are guided by a data coach. The ultimate goal of teacher professional development programs, such as this data use intervention, is school improvement in terms of increased student achievement (Desimone, 2009; Griffin, 1983; Guskey, 1998). However, to improve student achievement, teachers first need to have developed and applied the knowledge and skills related to data use during the intervention. Previous research has shown that this intervention can lead to positive effects in terms of teachers' knowledge and skills for data use and the application of their data use knowledge and skills (e.g., the use of data to improve instruction in the classroom) (Ebbeler, Poortman, Schildkamp, & Pieters, 2016). However, the question is whether 'the ultimate goal of professional development', namely, promoting student achievement (Guskey, 2000; Kirkpatrick, 1996), can also be realized as a result of this data use intervention.

2. From professional development to solving student achievement problems

2.1. Professional development

The professional development intervention should be of high quality in its theory of action and design, before it can lead to positive effects (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). Professional development is often more effective when it takes place in teams (e.g., Borko, 2004; Crow & Pounder, 2000; Darling-Hammond, 2010; Datnow, 2011; Reiser & Dempsey, 2002; Stoll, Bolam, McMahon, Wallace, & Thomas, 2006; Vescio, Ross, & Adams, 2008). The use of data in teams is a promising way to improve school quality in terms of increased student achievement. Collaboration helps teachers to learn how to use data from each other, and promotes a fertile exchange of ideas and strategies (Wohlstetter, Datnow, & Park, 2008). Teachers' collaboration in data teams where they focus on collective inquiry (based on data) to improve student learning can lead to increased teacher and student learning (Wayman, Midgley, & Stringfield, 2006).

Furthermore, having a shared goal, a collective focus on student learning, reflective dialogue, leadership, and structured and guided activities related to practice, are also important conditions for effective professional development. Moreover, teacher professional development is more effective when it takes place over a longer period of time (Borko, 2004; Desimone, 2009; Garet, Porter, Desimone, Birman, & Yoon, 2001; Jimerson & Wayman, 2012; Stoll et al., 2006; Vescio et al., 2008; Van Veen, Zwart, & Meirink, 2012; Wayman et al., 2012; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009). In the data use intervention, the teams are a type of professional learning community (PLC) specifically focused on professional development in data use.

According to our data use framework (based on Coburn & Turner, 2011; Ikemoto & Marsh, 2007; Lai & Schildkamp, 2013; Mandinach, Honey, Light, & Brunner, 2008; Marsh, 2012; Schildkamp & Kuiper, 2010; Schildkamp & Poortman, 2015; Schildkamp, Rekers-Mombarg, & Harms, 2012), data use starts with a problem definition (regarding student achievement) and a specific and measurable goal. Data are collected first to verify the problem, and then to investigate possible causes of the problem (i.e., investigate a hypothesis). The team needs to make sure that these data are sufficiently reliable and valid (and collect additional data if necessary), and analyze and interpret these data to transform them into information. This information can only become actionable knowledge if the teachers and school leaders combine this information with their understanding and expertise to draw conclusions about the causes of the problem. Based on these conclusions, teachers and school leaders can either reject their hypothesis and formulate a new hypothesis about the cause of the problem, or accept the hypothesis and take action to solve their problem. If the latter, they also need to evaluate whether their actions have led to the desired outcomes and goal (collect new data).

This process of data use does not take place in isolation, but is influenced by school organizational characteristics, user characteristics, and data characteristics. It is a complex and non-linear process, involving several feedback loops. In conclusion: Data use involves an interpretative process, in which data must be accessed, collected, and analysed to be turned into information, and combined with understanding and expertise to become meaningful and useful as a basis for actions (Coburn & Turner, 2011; Mandinach et al., 2008; Marsh, 2012; Schildkamp & Poortman, 2015). Such actions are focused on solving the student achievement problem that was defined at the start.

2.2. The data use intervention

In the data use intervention we developed, data teams within a school consist of 4–6 teachers and 1–2 school leaders (e.g., team leaders), and a quality care manager, if available at the school. The team members analyze and use data collaboratively, to solve a specific educational problem at their school. Examples of such problems are low final exam grades for English or a high percentage of grade repeaters at a specific school level. The teams meet approximately every 3 weeks, for a duration of two years. A team meeting typically lasts 90 min. The teams are supported by an external coach from the university. The coach monitors the process of the team and provides the team with just-in-time support in going through the data team cycle. She, for example, supports the team in formulating a clear and concrete problem definition. Also, she prevents teams from jumping to conclusions, and supports them in conducting data analysis. Conditions such as collaboration, a shared goal and a collective focus on student learning are addressed in this intervention. To support data use in the teams, we developed a structured eight step intervention, from 'problem definition' to 'evaluation' (see Fig. 1), including an extensive set of guidelines and a data analysis course.

Data use in this intervention involves the following 8 main steps and activities, aligned with our data use framework described above (Section 2.1):

1. Problem definition: The first meeting(s) focus(es) on formulating a concrete and measurable problem statement that is backed up by the related data. Rather than 'disappointing results for mathematics', for example, a concrete and measurable problem statement would be: 'We are not satisfied with the final examination grades in mathematics from the last three years for our students in the fourth grade, because these grades are lower than 6.0 on average; we would like this to be at least 6.5 in three years' time. Schools are free to define the (student achievement) problem they want to solve.

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