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# The impact of data use professional development on student achievement

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## HIGHLIGHTS

- Data use professional development (PD) in interventions can improve achievement.
- Effects are associated with collaborative use of evidence to fine-tune instruction.
- Data use PD may be optimal in conjunction with content-area PD.

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## ABSTRACT

This paper describes the data use professional development (PD) component of a whole-school intervention that has been replicated in 53 schools over eight years. Quasi-experimental designs were used to test for intervention impact. The intervention improved achievement in reading comprehension, writing and high school qualifications. Effect sizes were generally higher than international comparisons. The data use PD involved collaboratively analyzing data to determine the achievement problems; identifying and testing the causes of the problems using theory evaluation principles; and co-creating solutions. The relative contribution of the data use PD to the intervention and the importance of content knowledge are discussed.

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## 1. Introduction and literature review

There is an increasing international emphasis on using data as part of teacher and school leader decision-making to improve teaching and student achievement. However, data use is not typically part of teacher training college curricula (Mandinach & Gummer, 2013), and there is general agreement that teachers need support to develop the knowledge and skills required to use data for decision-making (Earl & Timperley, 2008; Schildkamp & Kuiper, 2010). This has led to a growth in teacher and school leader in-service professional development (PD) in data use, often as part of a larger PD program (Campbell & Levin, 2009; Schildkamp & Poortman, 2015; Slavin, Cheung, Holmes, Madden, & Chamberlain, 2011; Timperley & Parr, 2009).

The consensus hypothesis, that data use in schools is a condition

that enables greater teacher effectiveness and improves student outcomes, has received little systematic testing. For example, a recent literature review into factors influencing the use of data found that of the 14 high quality studies on PD that improves teaching and learning using data, only two reported on the effects of data use PD over time (Schildkamp et al., 2014). Studies on the impact of data use PD can be hard to locate because some data use PD programmes are just one component of larger, multi-component interventions involving other types of PD (e.g., Lai, Wilson, McNaughton, & Hsiao, 2014; Timperley & Parr, 2009). According to some authors in the field [e.g., Schildkamp & Poortman, personal communication, November 26, 2015], data use PD is not considered a separate component of an intervention if the data use PD component is central to the intervention design. However as we will discuss later, this view is not universally shared, particularly if approaching the PD with a design-based research [Anderson & Shattuck, 2012] or improvement science lens [Bryk, Gomez, Grunow, & LeMahieu, 2015].

The aim of this paper is to examine the impact of data use PD on

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achievement within the context of a larger intervention. We discuss how data use PD has been positioned within the intervention and its contribution to the overall intervention impact. As part of positioning the data use PD within the larger intervention, we explain in detail the data use PD processes and their theoretical premises, as these are likely to influence the impact of the PD. A working definition of data use in schools is information that is collected and organized to represent some aspect of schools (Lai & Schildkamp, 2013). This definition allows for the multiple kinds of data that teachers and school leaders need for decision-making, and is deliberately broad to include any relevant information about students, parents, schools, and teachers derived from both qualitative (e.g., structured teacher reflections on classroom teaching) and quantitative (e.g., standardized tests) methods of analysis (Lai & Schildkamp, 2013). It also allows for usage at a number of levels in schools including in Professional Learning Communities (PLCs) across schools, within schools, and within departments or grade level groupings.

Data use reflects a number of functions, such as an accountability-focused function aimed at making schools accountable for student educational outcomes, or an evidence-based teacher inquiry function (Lai & Schildkamp, 2015). Here, data use PD is defined as PD where the emphasis is on supporting teachers and/or school leaders understand and manage their own data (using the broad definition of data above), identify strengths and weaknesses and root causes for the weaknesses, and then determine an appropriate solution to address those weaknesses and capitalize on the strengths. It is therefore more theoretically aligned to data use for evidence-based teacher inquiry than accountability.

### 1.1. Evidence of impact

There is well established evidence that the formative use of assessment data to improve teaching can improve achievement (see Black and Wiliam's (1998) seminal review of 250 studies on formative assessment, for example). However, the impact of using data, when defined more broadly for multiple levels of usage (e.g., across schools, within schools) is less established and mixed, with few data use PD programmes having evaluated their impact on achievement (Schildkamp et al. 2014).

Case studies of districts that have significantly improved achievement in the USA and Canada implicate the use of data to inform district and school decisions in conjunction with other features such as coherence (e.g., Campbell & Levin, 2009; Council for the Great City Schools, 2002). However, such case studies typically provide after-the-fact explanations of good results (Slavin et al., 2011), and it is unclear whether schools and districts that did not make gains were using the same data use strategies (Herman et al., 2008). Nonetheless, such case studies draw support from reviews such as Timperley, Wilson, Barrar and Fung's (2007) best evidence synthesis of PD that made a difference to student learning and Hawley and Valli's (1999) review of PD, both of which implicated the analysis of data in improving achievement.

The few experimental and quasi-experimental studies on data use PD provide mixed results. Earlier studies on data use PD programmes focused on using student assessment data suggested very small to no effects (e.g., Carlson, Borman, & Robinson, 2011; see also a review of programmes in Slavin et al., 2011). Carlson et al.'s (2011) randomized control trial across districts found significant but very small effects of the use of benchmark assessments on state mathematics assessments ( $ES = +0.06$ ), but no significant effects on reading assessments ( $ES = +0.03$ ). Slavin et al. (2011) found that generally the PD resulted in small effects in the first two years of the PD at both grade levels and subjects, with stronger outcomes by

year four of the PD. (This is consistent with Borman's (2005) evaluation of schooling improvement reforms more generally, where the greater shifts in achievement [ $ES = +0.50$ ] happened after six years). There were, however, variations by grade level and subject.

Recent quasi-experimental studies with specific student populations suggest contributions of larger and more positive effects (Lai, McNaughton, Amituanai-Toloo, Turner, & Hsiao, 2009, Lai et al., 2014; Timperley & Parr, 2009). These studies found that data use PD combined with other intervention features was able to reduce long-standing achievement gaps between indigenous and ethnic minority students, albeit these studies included PD beyond data use, and were smaller scale studies than those that found smaller impact on achievement (e.g., Carlson et al., 2011).

Taken as a whole, the evidence suggests variable but potentially positive effects. However, there are a number of issues when interpreting these studies to determine if data use PD can make an impact on achievement. Firstly, what constitutes data use PD in terms of the data use processes that were part of the PD is not always clear. There is agreement across authors in the general process for data analysis (e.g., Boudett & Steele, 2007; Earl & Katz, 2006; Marsh, 2012). The general process involves establishing a purpose for data analysis (although in some cases, this is not stated explicitly); collecting, analyzing, and interpreting the data; and finally acting on the analysis and interpretation (Lai & Schildkamp, 2013). However, the processes of data use advocated by different authors vary in complexity, and also more subtly in emphasis. For example, the Centre for Data-Driven Reform in Education has a model of data use on its website which is targeted at school and district leaders (Centre for Data-Driven Reform in Education, 2011).

The general data analysis process is similar to others, but with one important difference: As an outcome of the data analysis, leaders are encouraged to select interventions which have a narrow definition of effectiveness to address the school's problems that they have identified through data. On the website, the criteria for selecting an optimal intervention is that the intervention has evidence from (ideally) randomized control trials with 40+ schools replicated over time, and that there have been evaluation studies carried out by third party researchers and published in high quality peer-reviewed articles. By contrast, the Dutch data team model (Schildkamp & Poortman, 2015), while also encouraging school leaders to use data to address school problems identified from the data, does not prescribe the solution; rather the data team facilitators work with schools to find their own solutions (Lai & Schildkamp, 2015). This difference in emphasis may be due to the goals of each data use PD, a difference in national policy difference and/or theoretical and methodological differences between the two data use PD approaches.

The different emphasis on how to address the problem revealed by the data has potentially a large influence on whether the data use PD can impact on student achievement. One could argue that drawing on a solution with an established research base to solve the identified problem has a greater chance of solving the identified problem than having individual school leaders come up with new ways of addressing the problems themselves. Conversely, one could argue that school leaders understand the school context better and are better able to create context appropriate solutions. These differences suggest that understanding the theoretical and conceptual bases of data use PD is vital if we are to understand how data use PD impacts on student achievement.

A related issue is that a number of data use PD programs occur in conjunction with other types of PD (e.g., Campbell & Levin, 2009; Lai et al., 2014), and what is missing from these studies is a test of the different PD components with outcomes. Without such testing, it is hard to disentangle the impact of data use PD from other types of PD occurring simultaneously, and hard to determine

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