



## Editorial

# Professional development in data use: An international perspective on conditions, models, and effects



## 1. Introduction

Data use for educational decision making has become prevalent in many parts of the world. Data are broadly defined, as ‘information that is collected and organized to represent some aspect of schools’ (Lai & Schildkamp, 2013, p. 10), including both qualitative and quantitative data such as assessment data, structured classroom observation data, and student and teacher interview data. Data use can be described as an iterative and cyclic process and typically includes the following steps: establishing a goal for the use of data, data collection, sense making based on data analysis and interpretation to convert data into usable information, taking action to improve teaching and learning, and evaluation (Boudett & Steele, 2007; Earl & Katz, 2006; Lai & Schildkamp, 2013; Mandinach, Honey, Light, & Brunner, 2008; Marsh, 2012; Schildkamp & Poortman, 2015).

Although the importance of data use is widely acknowledged, building human capacity around data use does not yet receive enough attention (Mandinach & Gummer, 2013). This has led to an increase in teacher in-service professional development to support data use (Marsh & Farrell, 2014). Such professional development initiatives generally focus on developing teachers’ and school leaders’ data use knowledge, skills, and attitudes. However, the ultimate goal is to improve teaching, leadership, student learning, and student achievement (Reeves & Honig, 2015; Schildkamp & Kuiper, 2010). Achieving this goal requires teachers and school leaders to convert data to useful information, and then to appropriate action, which is a great challenge (Jimerson & Wayman, 2015; Marsh, Sloan McCombs, & Martorell, 2010; Orland, 2015).

Recent literature argues that there is little systematic research available into the effects of professional development to support data use in schools: “the field still lacks definitive evidence” (Mandinach & Gummer, 2015, p. 1; see also Marsh, 2012; Marsh & Farrell, 2014). There are only a few studies which actually measure the impact of data-use professional development on teaching practice and student learning. For example, a recent systematic literature review (Schildkamp et al., 2014) into factors influencing the use of data found only two publications that included a focus on studying the effects of data use professional development programmes over time (out of a total of 16 peer reviewed articles on the importance of data-use professional development on improving teaching and learning). Although there are some promising interventions linking data use professional development with

improved student achievement (see literature review in Lai & McNaughton, 2016 for details), the findings and levels of research evidence that are available about effects of professional development are mixed, with especially less evidence at the level of student achievement (Marsh, 2012).

In an attempt to address this gap, at the AERA 2015, we presented the Division H Vice Presidential international invited session *Professional development interventions in data use and their effects: An international perspective*. In this session, we provided new evidence of the impact of in-service professional development in data use on student achievement (Lai, 2015; Poortman, Ebbeler, & Schildkamp, 2015), and the impact of teacher preparation on teachers’ use of data for instructional practice (Van den Hurk, Houtveen, & Van de Grift, 2015). This special issue is based on this invited session and addresses the gap in the literature examining the impact of data-use professional development on teaching practice and student learning in a variety of international settings. It also includes related issues, such as the importance of teacher collaboration (Van Gasse, Vanlommel, Vanhoof, & Van Petegem, 2016), data literacy (Mandinach & Gummer, 2016), the combination of conditions that may lead to particular instructional responses to data (Farrell & Marsh, 2016), and the involvement of students in the use of data (Jimerson, Cho, & Wayman, 2016).

## 2. The articles in this special issue

This special issue contributes new knowledge and insight about teachers learning how to use data for all concerned with teachers, teaching, or teacher education. Four main areas are presented and discussed in the papers in this special issue: 1) the concept of data literacy required to use data effectively in relation to teacher preparation and professional development (Mandinach & Gummer, 2016); 2) conditions for the effective implementation of data use (Farrell & Marsh, 2016; Hoogland et al., 2016; Jimerson et al., 2016; Van Gasse et al., 2016); 3) the effects of different approaches to professional development and more informal ways of learning how to use data, both in pre-service and in-service education (Lai & McNaughton, 2016; Poortman & Schildkamp, 2016; Van den Hurk, Houtveen, & Van de Grift, 2016); and 4) the implications of the findings of the studies discussed for both pre-service and in-service education and for further research (Mandinach & Jimerson, 2016).

Different educational practices, in different countries (i.e., Belgium, New Zealand, the Netherlands, and the USA), using

different types of professional development, and different methods for researching the characteristics and effects of data use are presented. This will lead to more insight into professional development in the use of data, both in pre-service and in-service settings.

Mandinach and Gummer (2016) describe the evolution of a conceptual framework regarding 'data literacy for teachers' (DLFT). They examined different types of publications, from different countries, and consulted US (-based) experts to define the main components of DLFT and the specific dispositions, knowledge, and skills related to these components, with reference to Shulman's (1987) forms of knowledge essential to good teaching. The use of data has to be integrated with the instruction of teachers in the classroom in order to impact student learning and achievement. They also argue that introducing data use to teachers after they are already in practice is too late. Their article concludes with a call to schools of education and teacher preparation programs to integrate data literacy into curricula and practical experiences.

The next articles in this issue present prerequisites and conditions influencing data-based decision making. Hoogland et al. (2016) conducted a systematic international literature review to identify prerequisites for successful data use. Moreover, focus groups with Dutch experts and practitioners verified and illustrated the findings from the review. Several prerequisites of successful data use in the classroom were identified, such as teacher collaboration around the use of data, data literacy, and leadership. Several conditions need to be fulfilled for teachers to be able to use data to improve the quality of instruction in the classroom. The authors of this paper noted that most of the studies found were qualitative studies, focused on the influence of one or more factors, but never a combination of factors. Therefore, the authors recommend conducting more large scale quantitative studies, to investigate the size of the impact of the factors that influence data use, as well as how these factors influence each other.

The next paper based on a study in Belgium by Van Gasse et al. (2016) focuses specifically on a prerequisite of data use identified in Hoogland et al., namely teacher collaboration in data use and teachers' professional learning resulting from these activities. The goals of this qualitative study were to provide insight into teachers' learning activities regarding collaborative use of pupil learning outcome data and into teachers' resulting professional learning. Examples of teacher learning activities are storytelling and helping; examples of professional learning are new or confirmed ideas and turning these into practice. This study shows that in general there is little collaboration between teachers around the use of data in Flemish schools, and teachers mainly use storytelling and helping activities. Moreover, as the interview results showed, teachers' professional learning as a result of teacher collaboration is limited. Data are rarely used for making instructional changes in the classroom.

Farrell and Marsh (2016) also focus on the use of data for making instructional changes, in the US context. They used qualitative comparative analysis to examine cases of teachers' data use in middle schools from a year-long study. The analysis shows the important influence that certain types of data, the involvement of a coach or peer group, and the school culture can have on teachers' instructional responses to data. They take the knowledge about these conditions a step further, because they did not focus on the impact of single conditions. Their methodological approach helped to identify how combinations of different conditions affect the outcomes of data use activities. Multiple pathways of conditions can lead to particular outcomes regarding changes in instruction. Farrell and Marsh therefore argue for more complex methods for understanding the conditions that enable or constrain data use for instructional planning.

Another important aspect of using data for instructional

improvement is the involvement of students in the use of data. This recent trend of student involved data use (SIDU) is discussed in Jimerson et al. (2016) in the US context. In SIDU, teachers purposefully and directly involve students in tracking and analyzing the students' own learning data. Jimerson et al. explore the ways in which teachers across several districts learned how to involve their students with data. Results of their qualitative study show that teachers involve students in the use of data in different ways. Examples of the ways in which the teachers in their study implemented SIDU are: using tracking sheets with students, binding these sheets into individual data folders, and using data walls in the classroom. The teachers also brought up challenges related to SIDU, such as (lack of) time and student data literacy. Based on their findings, the authors provide several recommendations for further research, teacher preparation and support.

The next three papers present effects of teachers learning how to use data with different types of professional development. The papers provide promising evidence of data-use professional development on achievement in schools (Lai & McNaughton, 2016; Poortman & Schildkamp, 2016) and in a teachers' training college (Van den Hurk et al., 2016), with varying ways of studying impact depending on the nature of the intervention.

Poortman and Schildkamp (2016) present the effects of a data use intervention for teams of teachers and school leaders on solving student achievement problems of schools in the Netherlands. They developed a data use intervention in which conditions for effective professional development and a data use framework based on the literature are integrated. While previous research into this intervention focused on teacher satisfaction, learning, and use of knowledge and skills (Ebbeler, Poortman, Schildkamp, & Pieters, 2016), this mixed methods study explored the effects of the intervention on solving student achievement problems. Five of the nine teams studied were able to solve their student achievement problem that the schools set out to solve and achieve the goal they set at the start of the intervention. Measures that were implemented by the data teams in this study included the implementation of formative assessment, instructional improvement, and improving curriculum coherence. Where it was appropriate to calculate effect sizes, the effect sizes (pre-post) found ranged between 0.45 and 0.66. The authors discuss what this means for practice and for further research.

Lai and McNaughton (2016) describe the data use professional development component of a whole-school intervention that has been replicated in 53 schools in New Zealand over eight years, across different contexts, and with students with varying starting achievement levels. While the Poortman and Schildkamp (2016) study indicates the value of a stepwise data use intervention focused on a problem chosen by the school itself, the intervention described by Lai and McNaughton focusses on literacy. The data use professional development involved collaboratively analyzing data to determine the achievement problems; identifying and testing the causes of the problems; and co-creating solutions. Solutions typically involved the improvement of literacy instruction in the classroom. Quasi-experimental designs were used to test for intervention impact. The results of several longitudinal studies show that the intervention consistently improved achievement in reading comprehension, writing and high school qualifications. Effect sizes were generally the same as or higher than international comparisons. The greatest impact appeared to be on high school reading achievement (up to  $d = 0.62$  when compared with a projected baseline of achievement had the intervention not occurred; and up to  $d = 1.68$  pre-post).

Van den Hurk et al. (2016) also studied the effects of a data use intervention, but in a pre-service context. In agreement with the other papers in this special issue: For teachers to use data

effectively, more is needed than intensive professional development. Teachers should already be prepared for using data earlier in their career. Van den Hurk et al. investigated the effects of a Master course for teachers in the Netherlands. Prior to the start of this data use module all students had to make a recording of one of their lessons. The data were discussed in teams. Based on these observational data and teacher effectiveness literature students had to select at least one area of teaching behavior they wanted to improve. Next, students implemented these instructional improvements in their classroom, and were observed again. Differences between pre- and post-test measures in a simple one-group pre-test post-tests design proved to be significant with effect sizes ranging from  $d = 0.29$  to  $d = 0.76$ . This study demonstrates the importance and feasibility of already starting with data use in teacher preparation.

The special issue concludes with a synthesis by Mandinach and Jimerson, who further emphasize that effective data use can only be integrated in daily practice if teachers learn continuously throughout their career, beginning in teacher preparation programs. As the papers in this special issue show, the use of data needs to be connected to improving the quality of education (e.g., instruction, assessment, the curriculum), in order to lead to improved learning and achievement. This synthesis contextualizes how the special issue articles contribute to the knowledge base of how teachers use data by relating them to key common themes. These common themes are: the need for continuous learning around data; the need to integrate data skills with content knowledge and pedagogical content knowledge and link these data skills to other aspects of effective teaching; the sustainability of impact; models of effective professional learning and the impact of collaborative inquiry and data teaming; and the logic model on impact of data use. The synthesis concludes with the next steps to bring the field of data use in education further.

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