Research paper

Pre-service teachers' data use opportunities during student teaching

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HIGHLIGHTS

- Explored student teacher (ST) opportunities to use data for instructional purposes.
- Examined how ST data use correlates with prior/concurrent experiences.
- On average, STs garnered some experience with each of 27 data use practices.
- Each of 27 data use practices were "never" experienced by some STs.
- ST data use related to school level and participation in only select experiences.

ARTICLE INFO

ABSTRACT

Education systems internationally are implementing data use initiatives with the aim of improving student learning. As teachers are key actors in the implementation of such initiatives, this study explored pre-service teachers' ($N = 142$) opportunities to learn how to use data during pre-service education, specifically student teaching. The study also examined how student teacher data use varies by school level and relevant coursework and in-school learning experiences. Findings suggest that student teaching might plausibly serve as a source of experiential learning relative to data use, especially at the elementary level, and regardless of pre-service teachers' prior or concurrent teacher education experiences.

1. Introduction

Recent evidence internationally suggests that educator data use is a viable strategy by which to promote student achievement growth. For example, a two-year school-wide educator data use intervention implemented in the Netherlands was associated with overall student achievement gains that amounted to about a month of schooling; at the same time, larger gains in that study were observed for schools serving large shares of socioeconomically disadvantaged students (van Geel, Keuning, Visscher, & Fox, 2016). Another district-randomized study in the U.S. offered similarly strong evidence for positive effects of a data-driven reform intervention on student mathematics achievement (Carlson, Borman, & Robinson, 2011).

Classroom teachers are key actors in the implementation of data use initiatives and practices. By informing with data decisions related to instructional goals, methods, and time allocation, teachers theoretically better target their instruction to students, resulting in higher levels of achievement (Hamilton et al., 2009; Means, Padilla, DeBarger, & Bakia, 2009). Despite increasing international interest in data use (e.g., van Geel et al., 2016), however, research shows that the analysis, interpretation, and instructional use of data prove challenging for some teachers (Athanases, Wahleithner, & Bennett, 2012; DeLuca & Bellara, 2013). In light of such challenges, scholars and practitioners have naturally directed much attention to the development of in-service teachers' capacity to use data (e.g., Kerr, Marsh, Ikemoto, Darilek, & Barney, 2006).

Pre-service teacher education too has been charged with building teacher—or at least new teacher—capacity to use data (Mandinach & Gummer, 2013b; National Council for Accreditation of Teacher Education, 2010). Recent research on U.S. pre-service education, though, estimates limited opportunities for pre-service teachers to learn how to use data per se (Mandinach, Friedman,

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& Gummer, 2015; Mann & Simon, 2010; July). The teacher education community also lacks strongly-evidenced mechanisms by which to sufficiently equip pre-service teachers to use data upon entry to the field (Reeves & Honig, 2015; Greenberg & Walsh, 2012).

In addition to course-based learning opportunities, classroom-based experiences potentiate pre-service teacher learning concerning data use (Arrington & Lu, 2015; Elliott, 2010). Research suggests that during classroom-based experiences, cooperating (supervising) teachers exert considerable influence on pre-service teachers through the modeling of, and engagement of pre-service teachers in, particular instructional behaviors (Clarke, Triggs, & Nielsen, 2013; Rich & Hannafin, 2008); as well as contextualized professional dialogue (Graham, 2005). Notable among these classroom-based experiences is *student teaching*, a culminating pre-service experience that generally lasts at least an academic semester and must be successfully completed to earn a teaching credential. In comparison to other (earlier) classroom-based experiences, during student teaching experiences pre-service teachers are most robustly involved in the facets of actual teaching practice (Coleman, Coley, Phelps, & Wang, 2003; Darling-Hammond, 2006). Given the classroom responsibility and autonomy often granted to pre-service teachers during student teaching (Darling-Hammond, 2014), this period is an especially conceivable source of knowledge/skill development vis-à-vis data use. However, research concerning pre-service teachers' data-related experiences during pre-service education—both during coursework and classroom-based experiences—is insufficient to well inform teacher education practice.

Not surprisingly, the status of pre-service education for data use has resulted in calls for future research to address outstanding questions concerning the nature, distribution, and impact of pre-service teacher opportunities to learn about and practice data use (DeLuca & Bellara, 2013; Mandinach & Gummer, 2013b). Also absent from the literature are studies which compare the relative influences of different pre-service and in-school teacher-learning mechanisms on data use practices (Marsh, 2012). This investigation responds by seeking to understand pre-service teachers' opportunities to use data during student teaching as well as factors related to those opportunities (i.e., mechanisms for teacher learning and placement school level).

In particular, the present study centered on the following research questions:

1. To what extent and in what ways do student teachers use data pedagogically?
2. To what extent does student teacher data use vary as a function of pre-service coursework and in-school formal and informal learning opportunities?
3. To what extent does student teacher data use vary as a function of school level (i.e., elementary, middle, high) ?

Research-based knowledge concerning student teacher data use, and its correlates, is critical for teacher education practitioners. Such information can support decisions concerning, for example, how student teaching experiences should be designed and implemented so as to maximize opportunities for student teacher practice vis-à-vis data use (and the training of cooperating teachers toward this end). At the same time, investigation of the relative contributions of pre-service and in-school mechanisms by which to promote student teacher data use can inform decisions concerning the best teacher education mechanism(s) to implement (e.g., formal teacher inquiry coursework) to achieve the aims carved out by recent data use initiatives. There may be particular teacher education experiences offered before or during student teaching which promote pre-service teacher engagement in data use during

this period. Similarly, knowledge of school-level differences in student teacher data use can help teacher educators target efforts to promote student teachers' opportunities to engage in these practices.

2. Literature review

2.1. Data use

Data use—popularly 'data-driven decision-making'—has been theorized as a process in which an actor: 1) accesses or collects data, 2) filters, organizes, or analyzes data into information, 3) combines information with expertise and understanding to build knowledge, 4) knows how to respond and takes action or adjusts one's practice, and 5) assesses the effectiveness of these actions or outcomes that result (Hamilton et al., 2009; Marsh, 2012). The underlying theory is that by informing with data decisions related to instructional goals, methods, and time allocation, teachers can better target their instruction to students, ultimately resulting in higher levels of achievement (Means et al., 2009). Usable data are not limited to assessment data, whether classroom-based or external, but can include also other forms of data such as a student's status as an English language learner, attendance, or misbehavior (DeLuca & Bellara, 2013; Mandinach & Gummer, 2013a). At the same time, 'data' are conceptualized to include both quantitative and qualitative data, such as respectively the number of test questions answered correctly or the exact nature of a made speech error.

In terms of specific data use practices (behaviors), scholars have differentiated between action-oriented and analysis-oriented tasks (Cosner, 2011; Marsh, Pane, & Hamilton, 2006). Action-oriented tasks, the focus of this study, entail deriving actions based on data such as providing feedback to students, selecting students/content on which to focus or which instructional method(s) to use (Mandinach & Gummer, 2013a), and deriving student learning objectives (SLOs; Summers, Reeves, Schwartz, & Walker, 2015). Analysis-oriented tasks entail the analysis of data, for example computing descriptive statistics for a set of test scores or examining student work products qualitatively for patterns such as errors or misconceptions. While teachers may engage in analysis-oriented and action-oriented tasks in tandem, sometimes action-oriented tasks will be completed only because analysis processes have been performed by others or automated (e.g., in the case of computer data systems).

2.2. Data use and in-service teacher education

There are two key mechanisms by which to support teacher learning and practice around data use: in-service teacher education and pre-service education. Most efforts intended to equip teachers for data use, at least of late, fall within the in-service realm. For example, the literature contains evidence for the effects of in-service teacher data use interventions (or interventions containing data use components) on teacher practices such as setting goals, providing feedback, and analyzing data (Gearhart & Osmundson, 2009; Mertler, 2009), and more importantly, student achievement (Carlson et al., 2011; McDougall, Saunders, & Goldenberg, 2007).

Formal and informal in-school teacher education mechanisms by which to promote data use are various (Coburn & Turner, 2011). These include traditional in-service workshops, as well as other means for teacher learning such as data teams, data coaching, and professional learning communities (Marsh, 2012). While there is some evidence that particular forms of in-service workshops can be effective, both in general and in terms of data use (Ingvarson,