MARZANO RESEARCH

Evidence meets practice.

By
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Data Use Solutions:

Building Teacher Capacity and Efficacy

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Framework

The research is clear: teachers have the strongest effect on student achievement compared to other school factors (Sanders et al., 1998; Opper, 2019). Sadly, teachers are in short supply in many parts of the country, and shortages are likely to worsen (Nguyen et al., 2022; Sutcher et al., 2019). What can education leaders do to make sure teachers stay and teach effectively?

Among many recommended solutions, professional learning and mentoring has promise (Carver-Thomas et al., 2017). A study involving educators from 32 Organisation for Economic Cooperation and Development (OECD) countries found that teachers' social status varies among contexts and that teachers are less likely to quit when they perceive their work is supported and valued (Qin, 2021). Amid growing teacher shortages, providing dedicated time for teacher reflection and the use of data to improve instruction could boost educators' sense of professionalism, as well as their effectiveness. In a review of international research, the majority of studies found connections between teacher data use, satisfaction, and efficacy (Ansyari et al., 2020). When teachers feel efficacious (valued, satisfied, and confident that their teaching makes a difference), they may be more willing to stay, and they may be more effective.

However, despite the annual and interim testing typical in U.S. schools over the last two decades, many articles document the need to build teacher capacity to use data to improve instruction (Means et al., 2011; Schildkamp et al., 2020). In addition to increasing teacher efficacy, research has shown that effective teacher data use is associated with increases in student achievement (Lee et al., 2020; Klute et al., 2017); therefore, building data use capacity to increase efficacy may ultimately improve student achievement.

Objectives

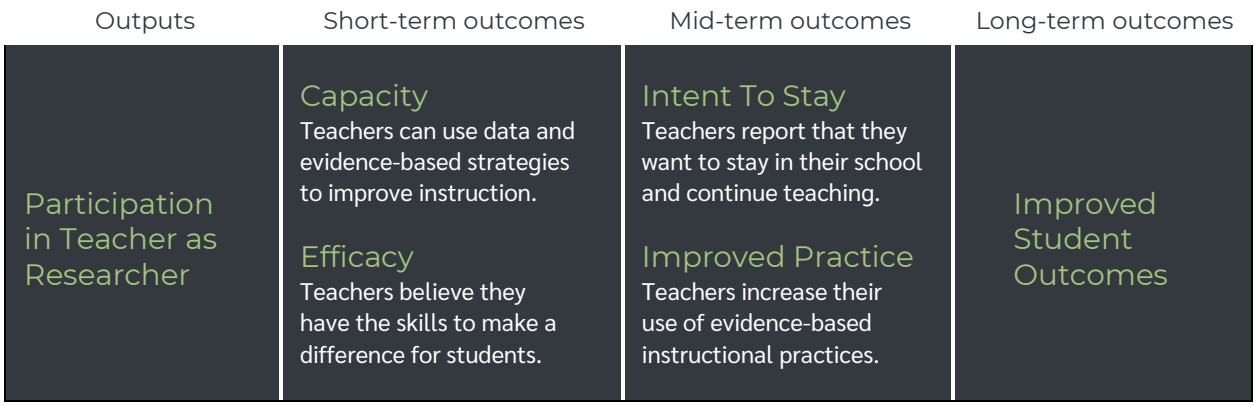
As part of a larger evaluation, this study examined the relationship between teachers' use of formative student data and sense of efficacy. In spring of 2022, 17 teachers in 10 schools in 4 districts participated in a pilot of *Teacher as Researcher,* a series of professional development workshops. Then, in the 2022–23 to 2023–24 school years, 174 teachers from 49 schools and 30 districts participated in the revised workshops. During the workshops, teachers learned about an instructional improvement inquiry cycle, conducted two quasi-experimental studies, and used analysis of formative student data to adjust instruction (see Marzano et al. [2020] and Cherasaro et al. [2015] for intervention description). Coaches supported teachers through six two-hour workshops, in which teachers:

1. selected an instructional strategy to test,
2. implemented it in their classrooms,
3. gathered data on implementation and students' learning, and
4. analyzed the data to determine effectiveness and next steps.

During the workshops, teachers produced reflection documents related to each of these four activities.

Ultimately, education leaders expect that ***if*** teachers select evidence-based strategies and have access to tools, coaching, and research design workshops, ***then*** teachers will improve their capacity to use formative student data and will increase their efficacy, ***which will lead to*** changes in teacher practice and intentions to stay in the teaching profession, ***which will ultimately help*** increase student achievement (Figure 1).

Figure 1. Intended Outputs and Outcomes of *Teacher as Researcher*



This study examined short-term outcomes (changes in teacher efficacy and capacity to use data and evidence-based strategies) during *Teacher as Researcher.* The study asked:

1. (RQ1) To what extent is participation in the South Carolina *Teacher as Researcher* Initiative related to changes in teacher capacity to use data and evidence-based strategies to improve instruction and teacher efficacy?
2. (RQ2) How did participating teachers reflect on their capacity to use data and evidence-based strategies to improve instruction and reflect on their efficacy?

Methods and Data Sources

We employed a sequential mixed methods design (Creswell & Clark, 2017). First, we examined teacher data use and efficacy through a quantitative Pre/Post Teacher Capacity and Efficacy Survey. Among the 174 participants, 103 (60%) completed the workshops and responded to the relevant survey items.

We based survey items about teacher data use and evidence-based strategies on the objectives of *Teacher as Researcher*. These items measured four themes related to teacher capacity to use data to improve their instruction. Teachers rated their responses on a 5-point scale from "I don't understand this" to "I understand this, and I use it often in my teaching." Items focused on **reflective practice** highlight the metacognitive act of self-evaluation and its relationship to change in behavior. "Thinking about my student's reactions to past instruction as I plan future instruction" is an example item for this theme. Other items centered on **knowledge about testing and evaluating instructional strategies**, such as the practice of "aligning assessments and lesson plans."

The third set of items evaluated **knowledge about selecting appropriate instructional strategies**, such as a teacher's understanding of "identifying strategies that work for my students." Other items measured **collaborative data practices**, or the sharing of ideas and structures with educational partners, such as "using what I learn in a professional learning community to improve my classroom teaching." We used the full score, totaling across these four themes, to evaluate change in teacher data use. The full scale included 15 items and demonstrated reliability estimates above $\alpha = .8$ at both time points.

We based efficacy survey items on Hoy & Woolfolk (1993), using a 10-point scale ranging from 1=*Not at all* to 10=*Very well*. An example question is: "To what extent can you craft good questions for your students?" Reliability estimates from pre ($\alpha = .896$) and post ($\alpha = .949$) suggest strong reliability. The analysis used a total score for this 8-item scale.

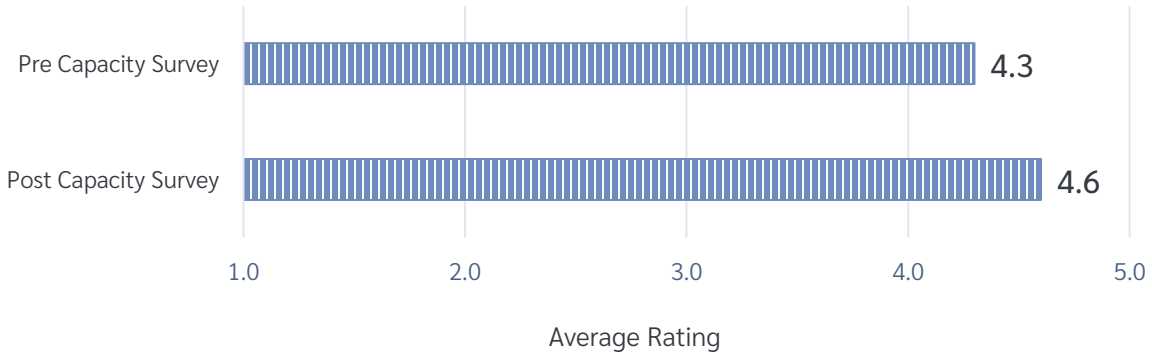
To answer RQ2, we used qualitative data. We examined teachers' open-ended responses to a satisfaction question from an Exit Survey administered at the end of each of the six workshops. The question asked what was most useful about the workshop.

For RQ2, we also examined teachers' workshop reflection documents overall. Then, we selected three teachers for deeper analysis, created summaries of their experiments and reflection documents, shared these with the three teachers, and re-analyzed based on their feedback to create more in-depth portraits of their experiences than was possible through analysis of documents alone.

Results

For RQ1, we found that participating teachers significantly increased their capacity to use formative student data to improve instruction from pre to post time periods (t (102) = 6.17, $p < .00$). Initially, teachers indicated some capacity for data use (4.3) on the 5-point scale. By the end of the professional learning, the mean response was 4.6 (Figure 2).

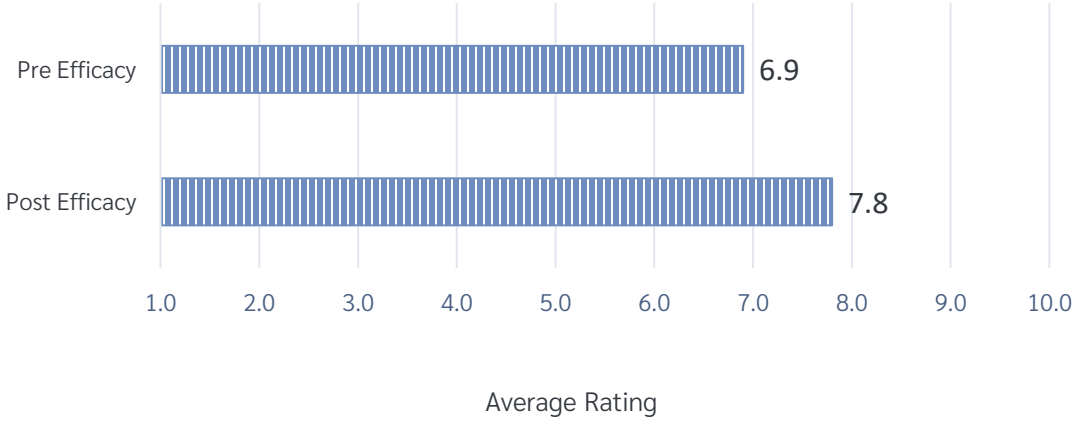
Figure 2. Change in Capacity to Use Data and Evidence-Based Strategies, 2022–23 through 2023–24



Note. Effect size of $d = .71$. 103 teachers had both pre and post scores and are included in this analysis.
Source: Author analysis of *Pre/Post Teacher Capacity and Efficacy Survey* data.

Similarly, we found significant pre and post differences for teacher efficacy (t (102) = 9.64, p < .00), indicating greater self-efficacy after completing the data use workshops. Pre survey efficacy levels were relatively low (6.9) but rose to 7.8 on the post survey (Figure 3). In comparison, the *Teachers' Sense of Efficacy Survey* created by Tschannen-Moran and Woolfolk Hoy has shown typical scores of 6.7 to 7.5 on a 10-point scale (Page et al., 2014).

Figure 3. Change in Teacher Efficacy, 2022–23 through 2023–24



Note. Effect size of g = 0.88. 103 teachers had both pre and post scores and are included in this analysis.
Source: Author analysis of *Pre/Post Capacity and Efficacy Survey* data.

For RQ2, based on analysis of the open-ended survey items, we found that after the first four sessions, teachers frequently said they increased their capacity to use data to improve instruction:

> *Today I was able to dive deeper into what an instructional strategy is and how the things I have been doing already are actually strategies that I can refine and do with more purpose and intent.*

> *Tonight's session helped me think more critically about my pre and post assessments and how to streamline them to focus solely on the learning objective.*

After teachers completed two quasi-experimental studies in their classrooms in sessions 5 and 6 as part of their Instructional Improvement Cycles, their comments showed that they felt more efficacious in their instruction.

Importantly, they most frequently commented that they appreciated reflecting on their work with their colleagues:

> *This [session] really made me think a little more about my practice. One is never too experienced to not refine his/her craft.*

> *It was really helpful to listen to other teachers' experience with the study. It gave me some idea into how to better assess outcomes.*

> *I was able to interpret my results and reflect on what led to them, and was able to begin thinking about future applications of an instructional strategy.*

> *It was helpful having an opportunity to discuss the implemented strategy and figure out ways of improving it for the next cycle.*

For RQ2, among our three in-depth portraits, all three noted they would continue strategy use and identified ways to improve strategies in the future. A typical quotation included:

> *I plan to continue to use [the strategy] next year in my classes when teaching these topics. However, I plan on spending more time on how to find the quartiles followed by more error analysis examples.*

Findings from our three portraits also suggest that planning, conducting, and reflecting on experiments may improve professionalism. The teachers showed ownership and enthusiasm about their work, which might lead to greater teacher retention rates.

> *It was really exciting to have the chance to collect our data on our strategy and see how it was working in our classroom. … It gave us a real sense of ownership as to what we were doing, which I really did appreciate.*

Significance

The quantitative results suggest that *Teacher as Researcher* supports increases in teacher data use and efficacy. These findings are significant and indicate that two short-term outcomes for T*eacher as Researcher* are being met: (1) teachers report increases in capacity to reflect on data and use evidence-based strategies to improve instruction, and (2) teachers believe they have the skills to make a difference for students.

Qualitative data shed light on changes in teachers' capacity to use data and changes in teacher efficacy. In the first four sessions, teachers reported gaining capacity to use data to improve instruction, and in sessions 5 and 6, they reported increased efficacy. This increase in efficacy in the qualitative data was related to reflection with peers.

As a result of these findings, *Teacher as Researcher* developers and participants likely want to continue the professional development. In the future, we believe it will be important to investigate the role of teacher collaboration within the professional development and the relationship between efficacy and collaboration.

In the broader context of what is known about teacher data use, these findings suggest that data use and teacher efficacy are positively connected. Other future researchers may benefit from considering how data use interacts with efficacy, especially since both efficacy (Cantrell et al., 2013; Kim et al., 2018; Tschannen-Moran et al., 2004) and teacher data use (Klute et al., 2017; Lee et al., 2020; Means et al., 2011; Schildkamp et al., 2020) are connected to positive results for students. In the future, comparisons of data use in general and classroom-based research could reveal more about the best ways for teachers to make effective decisions about instruction.

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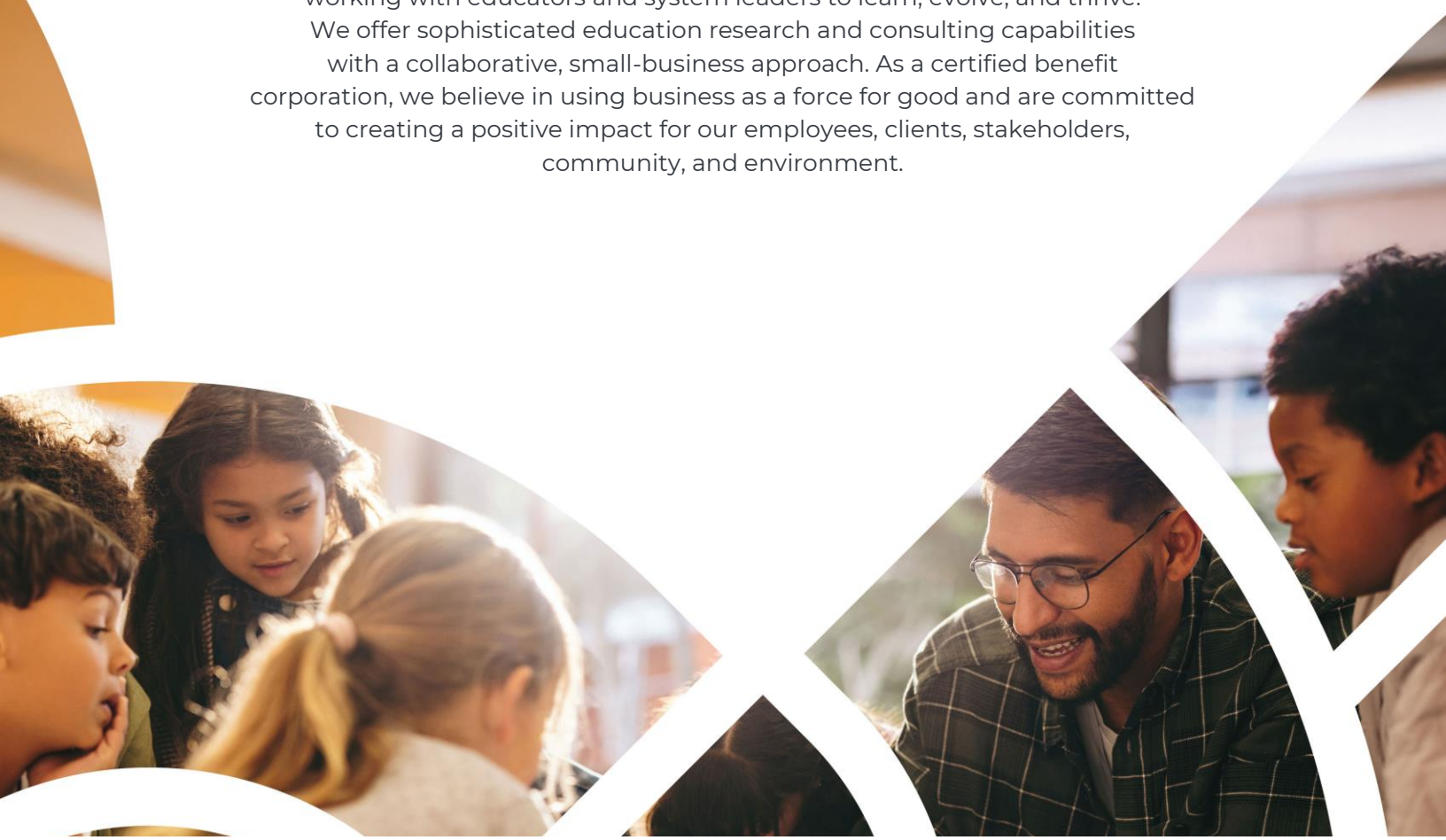

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