



© 2023 the authors. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License.

1. Shima. Taghavian^{ID}: Department of Curriculum Studies, University of Shahid Rajaei Teacher Training, Tehran, Iran
2. Farshid. Kheirkhah^{ID}: Department of Educational Psychology, University of Shahid Rajaei Teacher Training, Tehran, Iran. (Email: farshid.kheirkhah44@gmail.com)

Article type:
Original Research

Article history:
Received 11 February 2023
Revised 14 March 2023
Accepted 25 March 2023
Published online 01 April 2023

How to cite this article:

Taghavian, S., & Kheirkhah, F. (2023). Identifying Pedagogical Factors Influencing the Use of Diagnostic Assessment in Secondary Classrooms. *Assessment and Practice in Educational Sciences*, 1(2), 19-27. <https://doi.org/10.61838/japes.1.2.3>

A Qualitative Investigation of Sociocultural Factors Impacting Assessment Design in Multilingual Education

ABSTRACT

This study aimed to identify and explore the key cognitive, contextual, and emotional factors that influence how secondary school teachers interpret and use assessment data in formative assessment contexts. This qualitative study was conducted with 25 secondary school teachers from Tehran, selected through purposive sampling to ensure relevance to the research focus. Data were collected using semi-structured interviews, designed to elicit rich narratives about teachers' experiences with interpreting various forms of assessment data. Interviews were conducted until theoretical saturation was achieved, and each session was audio-recorded and transcribed verbatim. The data were analyzed inductively using thematic analysis, supported by NVivo software. The analysis followed a multi-step coding process, beginning with open coding, followed by the identification of subthemes and overarching categories. Three core themes emerged from the data: cognitive framing of assessment data, contextual influences on data use, and emotional and relational dynamics. Teachers' beliefs about the purpose of assessment, their level of data literacy, and prior teaching experience shaped their interpretive approaches. Institutional constraints such as time limitations, lack of infrastructure, and rigid curricula affected data use, while collaborative cultures and relevant professional development were enabling factors. Emotional responses—ranging from anxiety to motivation—also influenced interpretation, especially when connected to student-teacher relationships and ethical concerns. The study underscores that teachers' interpretation of formative assessment data is a multifaceted process shaped not only by technical skill but also by emotional readiness, professional beliefs, and contextual conditions. Improving formative data use requires a holistic approach involving targeted professional development, collaborative environments, and structural supports.

Keywords: Formative assessment, data interpretation, teacher beliefs, qualitative research, data use in education, secondary education, professional development.

Introduction

In recent decades, the global shift toward evidence-informed education has emphasized the role of formative assessment as a tool to enhance learning by providing teachers with actionable insights into student understanding. Central to this process is the teacher's ability to interpret assessment data effectively and to integrate that interpretation into instructional decision-making. However, despite increasing access to data, research indicates that many teachers struggle to translate assessment results into pedagogically sound actions, particularly in formative contexts that require ongoing, responsive adjustments (Datnow & Park, 2018; Schildkamp et al., 2020). Understanding how teachers make sense of the data they collect—and the

cognitive, emotional, and contextual factors that shape this interpretation—is essential for improving the efficacy of formative assessment practices.

Formative assessment, as conceptualized by Black and Wiliam (1998), is “assessment for learning” rather than “assessment of learning.” It involves eliciting evidence of student learning and using that evidence to adapt teaching and learning activities. The process is inherently interpretive, requiring teachers to go beyond surface-level metrics and engage in diagnostic reasoning to identify student misconceptions, progress, and readiness for future tasks. The successful application of formative assessment therefore depends not only on the availability of data but also on the teacher’s ability to make sense of and act upon that data in ways that are meaningful and contextually appropriate (Heritage, 2010; Wiliam, 2011).

Despite this emphasis, studies have shown that interpreting assessment data is far from a straightforward process. Teachers are often required to juggle multiple sources of evidence—ranging from test scores to observational notes—and to do so in real-time under conditions of uncertainty and resource constraints (Farrell & Marsh, 2016; Ingram et al., 2004). Moreover, the nature of the data itself may vary in terms of quality, format, and relevance to specific instructional goals, further complicating the interpretive task (Jimerson & Wayman, 2015). In formative contexts, where decisions must be sensitive to individual learners and instructional objectives, these challenges are magnified.

The complexity of data interpretation in educational settings is compounded by several teacher-related factors. Cognitive factors such as data literacy and pedagogical content knowledge play a pivotal role in shaping how assessment information is analyzed and understood (Mandinach & Gummer, 2016). Teachers with higher data literacy are more adept at identifying meaningful patterns and linking them to instructional decisions. However, such competencies are unevenly distributed across teaching populations, often due to variations in pre-service and in-service training (Datnow & Hubbard, 2015). Studies have shown that even experienced teachers may struggle with making inferences from data, especially when the data is ambiguous or poorly aligned with curriculum standards (Schildkamp & Kuiper, 2010).

In addition to cognitive factors, affective and motivational aspects also influence teachers’ data interpretation practices. Emotional responses such as anxiety, frustration, or overconfidence can color how teachers perceive the significance of student performance data (Brookhart, 2011; Gearhart & Osmundson, 2009). Moreover, teachers’ beliefs about assessment—whether they see it as a tool for learning or as an accountability measure—affect the degree to which they engage deeply with data (Brown, 2011). Research has indicated that when teachers perceive assessment data as irrelevant, overly punitive, or disconnected from their instructional context, they are less likely to utilize it meaningfully (Kerr et al., 2006; Marsh, 2012).

The context in which teachers work further shapes their interpretive practices. Organizational factors such as time availability, technological infrastructure, collegial support, and school leadership significantly influence how and whether teachers use assessment data (Datnow & Park, 2015; van Geel et al., 2016). Time constraints are among the most commonly cited barriers, with many teachers reporting that they lack dedicated time to reflect on data or collaborate with peers in analyzing results (Nelson et al., 2012). In schools with a strong culture of collaboration and data use, teachers are more likely to engage in joint interpretation and collective decision-making processes, which enhances both the accuracy and the instructional relevance of data interpretation (Schildkamp et al., 2014).

Furthermore, the nature of the curriculum and assessment systems in place may constrain or enable teachers’ data interpretation efforts. In rigid curriculum environments, teachers may feel forced to prioritize coverage over depth, leaving little room for data-driven differentiation or remedial instruction (Datnow et al., 2007). Standardized assessments that lack diagnostic depth may also provide little usable feedback, especially for students at the margins of performance (Bennett, 2011). Conversely, flexible curriculum frameworks and rich formative assessments empower teachers to act as instructional decision-makers, provided they are supported with the necessary training and resources.

Recent studies suggest that professional development can play a critical role in enhancing teachers' capacity to interpret and use assessment data. However, not all training programs are effective. Effective professional learning is often collaborative, ongoing, and closely tied to actual classroom practice (Mandinach & Gummer, 2016). Programs that focus narrowly on technical skills without engaging with pedagogical or contextual dimensions tend to have limited impact on practice (Datnow & Park, 2019). Moreover, mentorship and peer learning have been identified as particularly valuable in building teachers' confidence and reflective capacity around data interpretation (Jimerson et al., 2013).

Given this multifaceted landscape, there is a growing need for qualitative research that explores how teachers themselves experience and navigate the task of interpreting assessment data in formative settings. While quantitative studies have mapped broad patterns in data use, they often fail to capture the underlying cognitive, emotional, and contextual mechanisms that drive teachers' decisions. Qualitative approaches allow researchers to examine how individual teachers make sense of data in relation to their professional beliefs, classroom experiences, and institutional realities (Coburn & Turner, 2011). Such insights are essential for designing support systems that are not only effective but also responsive to the lived realities of teaching.

The present study seeks to address this gap by investigating the key factors that shape teachers' interpretations of assessment data in formative contexts. Focusing on secondary teachers in Tehran, the research employs a qualitative design grounded in semi-structured interviews to explore how teachers understand, process, and act upon student performance data in their daily instructional practice. By identifying both enabling and constraining factors—from internal beliefs to external structures—this study aims to contribute to the ongoing effort to improve formative assessment practices through a better understanding of teacher agency and interpretation.

Methods and Materials

Study Design and Participants

This study employed a qualitative research design to explore the key factors influencing teachers' interpretations of assessment data within formative assessment contexts. A constructivist paradigm underpinned the research, aligning with the objective of capturing the nuanced, subjective experiences of teachers in interpreting assessment information to guide instructional practices. Through in-depth qualitative inquiry, the study sought to generate rich, context-sensitive insights into the cognitive and contextual processes that shape how assessment data is understood and used by educators.

The research was conducted in Tehran, Iran, and involved a purposive sample of 25 secondary school teachers actively engaged in formative assessment practices. Participants were selected based on their demonstrated involvement in using assessment data to support student learning, ensuring relevance to the study objectives. Recruitment was facilitated through professional teaching networks and educational forums. Sampling continued until theoretical saturation was achieved, meaning no new themes emerged during the final interviews, thereby confirming the adequacy of the sample size for thematic depth.

The participants varied in terms of teaching experience, subject area, and school type (public and private), allowing for diverse perspectives on assessment interpretation. The inclusion criteria required that participants had at least three years of teaching experience and had received prior training in assessment for learning practices.

Data Collection

Data were gathered using semi-structured interviews, which enabled participants to articulate their perspectives freely while allowing the researcher to probe specific aspects related to formative assessment and data interpretation. Each interview lasted between 45 and 70 minutes and was conducted in person at a location convenient to the participant, such as their school or a

neutral academic space. An interview guide was developed to ensure consistency, covering themes such as sources of assessment data, interpretive practices, professional learning, and contextual influences. All interviews were audio-recorded with informed consent and transcribed verbatim for analysis.

Data analysis

The transcribed interviews were analyzed using thematic analysis facilitated by NVivo software, which provided a structured platform for coding, categorizing, and interpreting qualitative data. The analysis process followed an inductive approach, beginning with open coding to identify recurring concepts and ideas. These initial codes were then organized into broader subthemes and overarching themes through iterative comparison and constant refinement. Memo writing and reflective journaling were used throughout the process to support analytical rigor and track interpretive decisions. Triangulation was enhanced through peer debriefing with qualitative research experts to validate the coherence and credibility of the emerging thematic structure.

Findings and Results

Theme 1: Cognitive Framing of Assessment Data

Personal Beliefs About Assessment

Teachers' interpretations of assessment data were shaped by deeply held personal beliefs about the purpose and nature of assessment. Many participants viewed assessment primarily as a tool for guiding learning rather than for ranking students. A number of teachers expressed skepticism about standardized assessments, emphasizing a preference for formative methods. One participant noted, "I see assessment as an ongoing dialogue, not a final judgment." Another added, "Most of the time, tests just don't tell me what I really need to know about my students."

Data Interpretation Skills

The capacity to meaningfully interpret data varied across participants, influenced by their familiarity with analytical practices. Some teachers reported difficulty connecting raw scores with instructional strategies, while others described using patterns in student responses to identify learning gaps. A teacher explained, "When I notice most students miss the same question, I try to find out if the teaching was unclear or the concept itself is hard." Another stated, "I still feel unsure interpreting charts or percentages. It's not my strength."

Prior Teaching Experience

Years of classroom experience provided a cognitive filter through which data were processed. Experienced teachers reported drawing on historical data and past patterns to make sense of current performance. One veteran educator explained, "After a while, you can feel what's going wrong before even looking at the scores." Another added, "I compare this year's results with past ones to check if I'm improving or not."

Confidence in Data Use

Teachers varied in their confidence levels when dealing with data. Those who lacked formal training often expressed hesitation and preferred informal discussion with colleagues. One participant shared, "I'm afraid of misreading the data and giving wrong feedback. I ask my co-teacher to double-check." Others admitted they avoided engaging with detailed analysis, stating, "I know data is important, but I don't feel comfortable unless someone walks me through it."

Perceived Relevance of Data

The extent to which teachers considered assessment data relevant affected their level of engagement. If the data were perceived as misaligned with the curriculum or classroom realities, they were often disregarded. One teacher said, "The results

don't reflect what we're teaching—they're from a different world." Another noted, "I only use data when I feel it helps me, otherwise it's just paperwork."

Types of Assessment Data Valued

Teachers prioritized certain types of data, such as student work samples and observational notes, over standardized test scores. Authentic and context-rich information was seen as more informative. One participant emphasized, "I trust what I see during group work more than what a quiz tells me." Another said, "I love peer feedback—it tells me how students are thinking, not just what they know."

Theme 2: Contextual Influences on Data Use

Institutional Expectations

Institutional mandates and performance pressures influenced teachers' interaction with assessment data. Several participants described data-related tasks as bureaucratic, aimed more at satisfying administrative requirements than enhancing learning. One teacher noted, "Sometimes we just enter scores into the system to show we're compliant, not because we use them." Another shared, "The school wants graphs, not analysis."

Available Infrastructure

Many participants pointed to infrastructural limitations, such as lack of access to up-to-date software or centralized data platforms, as barriers to effective data use. One participant reported, "We still record everything manually. It's hard to make sense of data when it's scattered everywhere." Another added, "If I had access to visual tools, I could interpret results better."

Time Constraints

Teachers commonly cited lack of time as a key obstacle to thoughtful data analysis. The demands of lesson planning, classroom management, and administrative tasks left little room for reflective interpretation. One teacher said, "Even if I wanted to analyze scores deeply, when would I do it? Between grading, planning, and meetings?" Another remarked, "I rush through the data because there's no dedicated time."

Peer Collaboration

Collaboration with colleagues provided valuable support for interpreting assessment data. Teachers described informal sharing sessions, co-analysis, and mutual validation as helpful strategies. A teacher shared, "Talking to another teacher helps me see patterns I might miss." Others mentioned, "We often compare results after unit tests to adjust teaching across classes."

School Culture

The broader culture of the school influenced how teachers engaged with data. In schools that encouraged innovation and open dialogue, data use was more dynamic. In contrast, in rigid or hierarchical environments, teachers felt constrained. One participant observed, "Here, we're free to experiment with assessments and data use." Another lamented, "We're told what to do, and there's no room to question the format."

Professional Development Opportunities

Access to meaningful professional development played a pivotal role in shaping teachers' competencies and confidence. While some had benefitted from targeted training, others found sessions abstract and disconnected from practice. One teacher said, "We need workshops that focus on actual classroom data, not just theories." Another added, "Mentoring from experienced colleagues helped more than any seminar I've attended."

Curriculum Rigidities

A rigid curriculum framework limited the scope for flexible use of assessment data. Teachers explained how standardized pacing guides and fixed exam schedules often forced them to ignore or underutilize diagnostic insights. One participant shared,

“Sometimes I know students need more time, but the curriculum doesn’t allow it.” Another added, “We’re stuck in a system that rewards speed over understanding.”

Theme 3: Emotional and Relational Dynamics

Emotional Reactions to Data

Teachers’ emotional responses to assessment outcomes ranged from anxiety and frustration to satisfaction and relief. Data that revealed student progress were a source of motivation, while poor results often triggered self-doubt. One participant said, “I feel terrible when the scores are low. I question my methods.” Another reflected, “Seeing improvement gives me a real sense of achievement.”

Student–Teacher Relationship

The relational context significantly influenced how teachers interpreted data. Many expressed a desire to protect students’ emotional well-being by softening feedback or reframing results. One teacher explained, “I avoid harsh labels—I don’t want students to think they’ve failed.” Another added, “If I know a student is struggling at home, I read the data with that in mind.”

Motivation for Data Use

Teachers’ intrinsic and extrinsic motivations shaped their commitment to data-driven practices. Some viewed data interpretation as part of professional responsibility, while others were motivated by the desire to improve outcomes. One teacher stated, “I use data because I want to be a better teacher, not because I have to.” Another noted, “When I see students benefiting, it encourages me to continue.”

Trust in Data Sources

Teachers reported varying levels of trust in different data sources. Many expressed skepticism toward automated grading systems and preferred more organic forms of evidence, such as direct observation. A teacher said, “Machines don’t understand student context. I prefer to see how they work through a problem.” Another mentioned, “I use my gut as much as I use the numbers.”

Fear of Misjudgment

A significant number of participants voiced concern over the ethical implications of misinterpreting data and potentially misjudging students. This fear often led to cautious interpretations. One participant shared, “I don’t want to label a student wrongly based on one bad test.” Another stated, “There’s always the worry that I’m reading too much—or too little—into the results.”

Discussion and Conclusion

This study set out to explore the key factors influencing how secondary school teachers in Tehran interpret assessment data within formative assessment contexts. Through thematic analysis of qualitative interview data, three overarching themes emerged: cognitive framing of assessment data, contextual influences on data use, and emotional and relational dynamics. These themes highlight the multifaceted nature of data interpretation, revealing a complex interplay between internal teacher characteristics, institutional conditions, and interpersonal factors that shape the way data are understood and used to inform instruction.

The first major theme—**cognitive framing of assessment data**—demonstrated that teachers’ beliefs about the purpose of assessment significantly influence how they approach and interpret data. Many participants expressed a preference for formative over summative assessment, viewing data as a means to support student learning rather than evaluate performance. This aligns with earlier findings by Brown (2011), who noted that teachers’ conceptions of assessment affect their willingness to engage deeply with data. Moreover, teachers who believed in the instructional utility of assessment data tended to adopt

more diagnostic reasoning approaches, consistent with Wiliam's (2011) emphasis on assessment as a dynamic and responsive pedagogical tool. However, even among those with strong formative beliefs, the capacity to interpret complex data was uneven. Participants often struggled with numerical or statistical information, highlighting an ongoing challenge of **limited data literacy** in educational settings, as observed in previous work by Mandinach and Gummer (2016).

Additionally, **prior teaching experience** played a significant role in shaping teachers' interpretive strategies. More experienced educators described drawing on intuition or comparing current data with historical trends in their classrooms, suggesting that interpretive competence may evolve over time through reflective practice. This is consistent with Farrell and Marsh (2016), who argue that experienced teachers are more adept at using pattern recognition and contextual cues to make sense of ambiguous or incomplete data. Still, confidence levels varied, with several participants expressing hesitation or anxiety about potentially misinterpreting results. This resonates with findings by Brookhart (2011), who emphasized that confidence in data use is not necessarily a function of teaching experience alone, but also of prior training and perceived support systems.

The second major theme—**contextual influences on data use**—revealed that institutional conditions often constrain or enable teachers' engagement with assessment data. Time emerged as a critical barrier, with most participants reporting insufficient time during the school day to analyze or reflect on data meaningfully. This finding is echoed in studies by Nelson, Slavit, and Deuel (2012), who documented that without designated time and collaborative structures, data-related tasks become superficial or rushed. Furthermore, participants reported a lack of adequate infrastructure, such as access to data management systems or analytical tools, which inhibited their ability to visualize and interpret results. These findings parallel those of Jimerson and Wayman (2015), who emphasized the importance of digital and organizational support for effective data use.

School culture and professional development also emerged as key contextual determinants. In schools with a strong culture of collaboration and open communication, teachers described engaging more frequently in joint data interpretation, benefiting from peer input and collective reflection. This supports the work of Schildkamp et al. (2016), who found that data teams and collaborative structures significantly enhance the quality and consistency of data-informed decisions. However, in schools with rigid curricula or top-down mandates, teachers reported being constrained in their ability to act on data insights, often feeling that formative data was sidelined in favor of performance targets. This tension between institutional accountability and instructional autonomy has been well-documented in previous studies (Datnow & Park, 2018; Kerr et al., 2006).

The third theme—**emotional and relational dynamics**—highlighted the affective dimensions of data interpretation. Teachers' emotional responses to student performance data ranged from anxiety and guilt to pride and motivation. Negative emotions, such as fear of misjudgment or concern about student self-esteem, sometimes led to cautious or defensive interpretations. This aligns with Gearhart and Osmundson (2009), who noted that the emotional stakes of assessment can inhibit candid engagement with data. Moreover, the relational context, particularly teachers' connections with students, influenced how data were read and acted upon. Teachers frequently mentioned "softening" interpretations in light of personal knowledge about a student's background or challenges. This finding reinforces Coburn and Turner's (2011) assertion that data use in schools is inherently social and interpretive, shaped by professional judgment, values, and empathy.

Interestingly, the study also revealed that **trust in data sources** was a major factor in interpretive practices. Teachers tended to place greater trust in qualitative forms of data, such as classroom observations and student work samples, than in standardized test results or automated scoring tools. This preference suggests that the perceived validity and authenticity of data strongly mediate its use in instructional decision-making. Similar patterns were reported by Bennett (2011), who found that formative assessment data are more likely to influence teaching practices when they are seen as directly relevant and contextually grounded.

Finally, teachers' **motivation for data use**—whether intrinsic or extrinsic—shaped the extent and manner of their engagement. Teachers who viewed data interpretation as integral to their role described greater investment and reflection, while those who saw it as an external imposition reported minimal engagement. This finding echoes Datnow and Hubbard (2015), who emphasize that sustained, meaningful data use depends on alignment between teachers' professional identity and the purposes of assessment.

Collectively, these findings suggest that improving teachers' interpretation of formative assessment data requires more than just access to data or training in analysis techniques. It necessitates a systemic approach that addresses teacher beliefs, emotional readiness, organizational culture, and the broader educational infrastructure. The interaction between cognitive, contextual, and affective domains in shaping data use points to the need for integrated models of professional development that combine technical skill-building with reflective practice, collaborative inquiry, and emotional support.

Acknowledgments

We would like to express our appreciation and gratitude to all those who helped us carrying out this study.

Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adhered in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

References

- Bennett, R. E. (2011). Formative assessment: A critical review. *Assessment in Education: Principles, Policy & Practice*, 18(1), 5–25. <https://doi.org/10.1080/0969594X.2010.513678>
- Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, 5(1), 7–74. <https://doi.org/10.1080/0969595980050102>
- Brookhart, S. M. (2011). Educational assessment knowledge and skills for teachers. *Educational Measurement: Issues and Practice*, 30(1), 3–12. <https://doi.org/10.1111/j.1745-3992.2010.00195.x>
- Brown, G. T. L. (2011). Teachers' conceptions of assessment: Comparing primary and secondary teachers in New Zealand. *Assessment Matters*, 3, 45–70.

- Coburn, C. E., & Turner, E. O. (2011). Research on data use: A framework and analysis. *Measurement: Interdisciplinary Research and Perspectives*, 9(4), 173–206. <https://doi.org/10.1080/15366367.2011.626729>
- Datnow, A., & Hubbard, L. (2015). Teachers' use of assessment data to inform instruction: Lessons from the past and prospects for the future. *Teachers College Record*, 117(4), 1–26.
- Datnow, A., & Park, V. (2015). Five key lessons for policy makers about data-informed practice. *Phi Delta Kappan*, 97(4), 8–12. <https://doi.org/10.1177/0031721715619910>
- Datnow, A., & Park, V. (2018). *Data-driven leadership*. John Wiley & Sons.
- Datnow, A., Park, V., & Wohlstetter, P. (2007). Achieving with data: How high-performing school systems use data to improve instruction for elementary students. *Center on Educational Governance, University of Southern California*.
- Farrell, C. C., & Marsh, J. A. (2016). Metrics matter: How properties of data shape teachers' instructional responses. *Educational Administration Quarterly*, 52(3), 423–462. <https://doi.org/10.1177/0013161X16638429>
- Gearhart, M., & Osmundson, E. (2009). Assessment portfolios as opportunities for learning by teachers and students. *Journal of Educational Psychology*, 101(2), 211–221. <https://doi.org/10.1037/a0014316>
- Heritage, M. (2010). *Formative assessment: Making it happen in the classroom*. Corwin Press.
- Ingram, D., Louis, K. S., & Schroeder, R. G. (2004). Accountability policies and teacher decision making: Barriers to the use of data to improve practice. *Teachers College Record*, 106(6), 1258–1287. <https://doi.org/10.1111/j.1467-9620.2004.00379.x>
- Jimerson, J. B., & Wayman, J. C. (2015). Professional learning for using data: Examining teacher responses to data-based practices. *Teachers College Record*, 117(4), 1–42.
- Jimerson, J. B., Cho, V., & Wayman, J. C. (2013). Student-involved data use: Teacher practices and considerations for professional learning. *Teaching and Teacher Education*, 34, 228–238. <https://doi.org/10.1016/j.tate.2013.04.003>
- Kerr, K. A., Marsh, J. A., Ikemoto, G. S., Darilek, H., & Barney, H. (2006). Strategies to promote data use for instructional improvement: Actions, outcomes, and lessons from three urban districts. *American Journal of Education*, 112(4), 496–520. <https://doi.org/10.1086/505057>
- Mandinach, E. B., & Gummer, E. S. (2016). *Data literacy for educators: Making it count in teacher preparation and practice*. Teachers College Press.
- Marsh, J. A. (2012). Interventions promoting educators' use of data: Research insights and gaps. *Teachers College Record*, 114(11), 1–48.
- Nelson, T. H., Slavit, D., & Deuel, A. (2012). Lessons learned from a three-year mathematics teacher professional learning community. *Journal of Teacher Education*, 63(2), 122–135. <https://doi.org/10.1177/0022487111426436>
- Schildkamp, K., & Kuiper, W. (2010). Data-informed curriculum reform: Which data, what purposes, and promoting and hindering factors. *Teaching and Teacher Education*, 26(3), 482–496. <https://doi.org/10.1016/j.tate.2009.06.007>
- Schildkamp, K., Poortman, C. L., & Handelzalts, A. (2016). Data teams for school improvement. *School Effectiveness and School Improvement*, 27(2), 228–254. <https://doi.org/10.1080/09243453.2015.1056192>
- Schildkamp, K., Ehren, M. C. M., & Lai, M. K. (2020). *Data-based decision making in education: Challenges and opportunities*. Springer.
- van Geel, M., Keuning, T., Visscher, A., & Fox, J. P. (2016). Assessing the effects of a school-wide data-based decision-making intervention on student achievement growth in primary schools. *American Educational Research Journal*, 53(2), 360–394. <https://doi.org/10.3102/0002831216637346>
- Wiliam, D. (2011). *Embedded formative assessment*. Solution Tree Press.