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Every teacher should succeed with data literacy

More than its predecessor, ESSA calls on teachers to integrate data into their practice for the good of students. It is a complex yet ultimately achievable goal.

By Ellen B. Mandinach and Edith S. Gummer

For more than a decade, policy makers have emphasized the importance of data in education and promoted the goal of using data for continuous improvement. The No Child Left Behind law emphasized data, too, but that effort was centered on compliance and accountability. In contrast, the recently passed Every Student Succeeds Act (ESSA, 2015) moves education further along the path toward becoming the evidence-based and data-driven profession that policy makers have continually called for. They have stressed the need for hard evidence to undergird educational decisions rather than relying on anecdotes and intuitions.

Under ESSA, data use is expected at all levels of the education system — classrooms to schools to districts and to the state and federal levels. There is an increasing focus for states to take more responsibility for data; states must use data for teacher evaluation and for the evaluation of teacher preparation programs. The legislation explicitly states that policy makers and administrators must “facilitate data-based instructional decision making” (p. 294) and provide professional learning opportunities for educators to learn how to use data responsibly, i.e., to protect student privacy. There must be “instruction in the use of data and assessments to inform and instruct classroom practice” (p. 296).



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ESSA notes the need to use assessment data of all sorts (not just summative results) and goes further to include many sources of data such as behavior, motivation, attitude, attendance, and climate, among others. The diversity of data sources allows teachers to gain a complete understanding of students from performance to context. This means that teachers must continue to use data from many diverse sources to inform their classroom and instructional practice.

Teachers and data literacy

Teachers therefore must know how to use data. Becoming data literate is a skill set that educators must acquire and nurture throughout their careers (Mandinach & Gummer, 2016). Data literacy has been a focus of the professional organizations for teachers and teacher preparation programs. The Council for the Accreditation of Educator Preparation (CAEP), formerly the National Council for Accreditation of Teacher Education (NCATE), and the National Board for Professional Teaching Standards (NBPTS) have called for and supported spreading teacher data literacy (Breux & Chepko, 2015; Cibulka, 2013). An NCATE blue ribbon panel (2010) released a comprehensive set of recommendations for the future of teacher preparation intended to have a direct effect on training educators to use data. Teacher candidates need “opportunities to reflect upon and think about what they do, how they make decisions, and how they ‘theorize’ their work, and how they integrate their content knowledge and pedagogical knowledge into what they do,” the panel stated (p. 9). The report also said teacher preparation must provide “the opportunity to make decisions and to develop skills to analyze student needs and adjust practices using student performance data” (p. 10). More recently, the NBPTS convened an expert panel on assessment literacy and data literacy to help craft the new standards that will apply to board certification.

The Data Quality Campaign also convened an expert panel to advise the field about what it means for teachers to be data literate. The panel included representatives from most major education organi-

zations, as well as researchers and other stakeholders. The panel prepared a policy brief outlining why it is important for teachers to be able to use data and what data literate teachers look like (Data Quality Campaign, 2014). A more recent expert panel, at this writing, is working on action steps for the integration of data literacy into teacher preparation programs.

So, is data literacy important solely because policy makers say educators need to know how to use data? Our answer is a resounding no. Good teachers have been using data for a long time. However, the proliferation of data, diverse data sources, and the availability of technology to access and organize data have made the focus on effective teacher use of data more salient. Further, as educators seek to attain a professional reputation akin to other professions (e.g., medicine and business), the practice of engaging in evidence-based decision making has become even more pressing. The expectation is that teachers skilled in data use will develop more effective classroom and instructional practices, which ultimately will lead to improved student performance (Carlson, Borman, & Robinson, 2011; Konstantopoulos, Miller, & van der Ploeg, 2013; Mandinach, 2012).

Breaking down data literacy for teachers

As our work evolved, it became clearer that education lacked a definition of data literacy; the term was rarely used and often conflated with assessment literacy. Data literacy means different things to different stakeholder groups. Through meetings with experts and by examining state licensure and certification documents that identified requisite skill sets and knowledge that teachers should have, we began to define data literacy (Mandinach, Friedman, & Gummer, 2015; Mandinach & Gummer, 2012, 2013). We have posed a definition and designed a conceptual framework for a construct we call *data literacy for teachers* (Mandinach & Gummer, 2016). We define it as:

Data literacy for teaching is the ability to transform information into actionable instructional knowledge and practices by collecting, analyzing, and interpreting all types of data (assessment, school climate, behavioral, snapshot, longitudinal, moment-to-moment, etc.) to help determine instructional steps. It combines an understanding of data with standards, disciplinary knowledge and practices, curricular knowledge, pedagogical content knowledge, and an understanding of how children learn (Gummer & Mandinach, 2015, p. 2).

The conceptual framework first identifies three primary interacting domains: discipline-specific content knowledge, data use for teaching, and pedagogical content knowledge, and other domains such

as knowledge of learner characteristics and context.

As they develop instructional plans, teachers will balance the data, their knowledge of the pedagogy that is specific to their content area, and their understanding of how students can best learn that content.

Data, qualitative or quantitative, must be interpreted from within a particular content domain for it to make sense and be connected to subsequent teaching practices. Teachers must interpret the data while considering relevant learning progressions or similar content specifications within the domain. As they develop instructional plans, teachers will keep in mind the data, their knowledge of the pedagogy that is specific to their content area, and their understanding of how students can best learn that content. Then teachers must use the data to develop instructional plans. The resulting understanding, then, must be transformed into instructional actions by connecting to teachers' knowledge of pedagogy. Integrating these domains of knowledge makes the construct reflective of classroom practice. Understanding disciplinary specific knowledge and practices together with pedagogy are the warp across which the wealth of information from data are woven to illuminate the tapestry of learning. For example, a teacher is providing instruction on fractions. She gives a formative exercise that helps her identify students' understanding and misconceptions. Based on the pattern of results, she then can determine what instructional strategies are needed for the students who need help as well as the next steps for those who have demonstrated understanding of the topic.

Knowledge, skills, and tasks

We have identified five components that comprise the needed skills to transform data into actionable pieces of work (which are made up of 53 specific skills).

#1. Identify problems of practice and frame questions.

Typically the cycle begins by identifying a problem of practice and framing a question. For example, if certain students are having a problem understanding fractions, then the teacher might ask "why do I think these particular students are having difficulty? Is it that they don't understand the topic at a foundational level? How can I restructure what and how I'm teaching to facilitate student learning?"

#2. Use data.

Using data includes sets of knowledge and skills such as knowing what data are appropriate and actionable to the problem, knowing how to access or collect the right data, and understanding data quality properties.

#3. Convert data to information.

Transforming data into information requires knowledge and skills such as knowing how to manage and prioritize data, knowing how to examine, analyze, and interpret data, knowing how to drill down to different levels of data when appropriate, and knowing how to assess patterns and trends (e.g. item level, strand, etc.).

#4. Transform information into a decision.

This is really about the instructional process. The component includes knowledge and skills such as understanding the context of the decision, diagnosing, making instructional adjustments (e.g. planning, designing, differentiating, individualizing, and modifying instruction), and knowing how to determine the next steps.

#5. Evaluate outcomes.

The final component includes scrutinizing results, testing hypotheses, and considering the feedback loop among instruction, data, and learning.

Other aspects of data literacy warrant mentioning here. We call these dispositions. First is a belief in data use. Many teachers are still skeptical about using data. They are unclear they need data when they're doing just fine without them. Or they see data use as a passing fad that will go away at some point like other fads. Data have been given a bad reputation among some who link them solely to the testing movement. From that perspective, data are assessments, assessments are overused, and they take teachers away from instruction. Yet, if we think broadly about what data are, then almost everything that teachers do in the classroom really is data-based. Data may come from observations of students' attitudes, attention, or behavior.

Responsible use and collaboration

Another disposition is using data responsibly and ethically. This means understanding how to protect student privacy and confidentiality — an increasingly critical issue in education. Even well-intentioned educators may inadvertently engage in data breaches. If two teachers discuss a student in public and they are overheard, that would be a breach of student data privacy. All educators must be well-versed in responsible data use.

Teaching is no longer a solitary discipline where teachers go into their classrooms and close the door. A major part of data use is collaboration through data teams, professional learning communities, or other sorts of teaming. Participation in a data team, whether grade-level, course-level, or vertical, requires teachers to be open and willing to have frank discussions about successes and challenges in their classrooms. This requires a school culture that enables teachers to have

these kinds of discussions with trust and without fear of reprisals in their evaluations.

How is data literacy attained?

We have been attempting to address this question for the past six years. Providing professional development for current teachers would address only part of the issue. Professional development must be ongoing (Means, Padilla, & Gallagher, 2010). Yet preparation must begin early in a teacher's career and become an embedded skill set that carries across the years of teaching. This means teacher preparation programs must begin to provide courses on how to use data (Mandinach & Gummer, 2016).

Schools of education must begin to address teachers' data literacy by integrating data use throughout their curricula, through stand-alone courses, and in practical experiences. Integration must include data use as part of content, pedagogy, and methods courses. School districts then must provide ongoing professional development opportunities that reinforce good data practices.

Districts must recognize that data-driven decision making is not a passing fad and that their educators must be able to use data effectively and responsibly. Educators need to acquire the requisite sets of knowledge and skill, and they should consider data literacy when hiring new staff. They must create a conducive infrastructure to embed and embrace data use that includes data coaches, data teams, common planning time, an explicit vision for data use, appropriate technological tools, leadership, and opportunities for professional development and growth (Hamilton et al., 2009).

Teachers cannot become data literate on their own. They need help, beginning in preservice and continuing through their careers. Schools of education must step up to meet the challenge of integrating data literacy into their programs. The situation is reminiscent of the joke about how many psychologists it takes to change a light bulb? The answer: One, but the light bulb must want to change.

ESSA has made clear once again the importance of data use in education and that means educators must be data literate. The demand for data literate teachers creates a pull mechanism that motivates schools of education to change. Although data are not the panacea and can't solve all educational problems, developing evidence-based practices by teachers and administrators will hopefully enhance the effectiveness of educators. ■

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