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How Nebraska Teachers Use and Perceive Summative, Interim, and Formative Data

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How Nebraska Teachers Use and Perceive Summative, Interim, and Formative Data

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Teachers have access to more data than ever before, including summative (state-level), interim (benchmark-level), and formative (classroom-level) data. Yet research on how often and why teachers use each type of data is scarce. The Nebraska Department of Education partnered with the Regional Educational Laboratory Central to conduct a study of teachers and principals in 353 Nebraska schools to learn about teachers' use and perceptions of summative, interim, and formative data and inform a state-level professional learning plan to support teachers' data use. The results indicated that 29 percent of teachers did not use summative data, 21 percent did not use interim data, and 6 percent did not use formative data. Among teachers who reported using each type of data, teachers used formative data almost weekly and interim data about monthly to tailor instruction, identify instructional content, recommend additional student support, and group students. Teachers used summative, interim, and formative data least often in discussions about student learning with principals, colleagues, parents, and students. Teachers with 12 or fewer years of experience in education reported using formative data more often than did teachers with 22 or more years of experience. Teachers' perceived competence in using data, their attitudes toward data, and their perceptions of organizational supports for using data (professional learning, principal leadership, and computer systems) were each positively associated with their use of data to inform instruction. When teachers reported greater perceived competence in using data, more positive attitudes toward data, or more organizational supports for using data, they more often used formative and interim data to inform instruction. Teachers with a more-advanced degree (education specialist or doctoral degree) reported feeling more competent in using data and having more positive attitudes toward data than did teachers with a bachelor's degree.

Why this study?

Since the start of the standards-based reform movement, state education agencies have developed accountability systems that use state-level, standardized summative assessments to measure student achievement against state content standards. However, policymakers, educators, and researchers have increasingly recognized the limitations and unintended consequences of using a state-level test as the sole data source for accountability purposes (Burger & Krueger, 2003; Hofman et al., 2015). For example, basing school accountability classifications only on state-level, standardized summative assessments might create a high-stakes environment in which teachers narrow the curriculum to only what the assessment covers ("teach to the test") and prioritize instructional support for students who are close to passing the assessment and are most likely to affect an accountability classification (Booher-Jennings, 2005; Datnow & Park, 2018).

Under the Every Student Succeeds Act of 2015, the Nebraska Department of Education was one of several state education agencies to shift from using a single, summative measure of student learning to using multiple assessment measures in an effort to form a more complete and accurate picture of student learning. This comprehensive approach typically consists of multiple, mutually supportive assessments that provide different types and levels of data—summative (state level), interim (benchmark level), and formative (classroom level)—to inform state policy, programs, and classroom instruction (see box 1 for definitions of key terms; Chappuis et al., 2009; Marsh et al., 2006).

For additional information, including background on the study, technical methods, and supporting analyses, access the report appendixes at https://go.usa.gov/xAXnM.

Box 1. Key terms

Actions. Actions are how teachers use data to inform instructional practice, referred to frequently in this report as "instructional actions." Teachers may take a variety of actions inside and outside the classroom based on assessment data, such as tailoring instruction to individual students' needs, identifying students who need further assistance, selecting instructional materials, organizing students in instructional groups, discussing data with students or parents, and meeting with other teachers about data (Datnow et al., 2007; Hamilton et al., 2009; Supovitz, 2012).

Formative assessment. The Nebraska Department of Education (2018b, p. 2) defines formative assessment as "[f]ormal and informal tools teachers use in the classroom to check their students' understanding and then adapt their teaching in the moment to what students need."

Types of formative assessments and teacher practices with formative data vary widely (Bennett, 2011). Generally, formative assessment is a process using formal and informal tools, as opposed to a specific test, that teachers implement during instruction to gather and interpret data about student learning and then use those data "in the moment" to direct classroom teaching and further student learning. Assessment typically occurs frequently during short cycles ranging from moment by moment to within and between lessons (Klute et al., 2017; Perie et al., 2007). Examples of formative assessments include teacher-developed quizzes, interactive class discussions, on-the-spot checks, and exit tickets (students write down one thing they learned on a note card and hand it to the teacher when they leave the classroom), among many other types of real-time assessments that provide teachers with immediate feedback. Information from a short-cycle formative assessment process can address a question such as "What instruction can I provide to help this student learn now?" (Gong, 2010).

Interim assessment. The Nebraska Department of Education (2018b, p. 2) defines interim assessment as "[a]ssessments administered at intervals between instruction (typically fall/winter/spring) to help teachers better understand student learning needs and determine growth toward learning targets." The Nebraska Department of Education uses MAP Growth, created by the Northwestern Evaluation Association (NWEA), as the state's interim assessment. This report uses "interim data" to refer to data derived from the NWEA MAP Growth interim assessment.

Interim assessments are designed to inform classroom-level and district-level decisions about student learning relative to a defined set of academic goals or benchmarks (Farley-Ripple et al., 2020). Administration typically occurs within a medium-cycle timeframe (for example, at the beginning, middle, and end of the school year) and is likely directed by the school or district (Perie et al., 2007). Results can be aggregated and reported across classrooms or at the school, district, or state level, which allows for comparing results and tracking progress across these levels (Farley-Ripple et al., 2020). Interim assessments tend to be more formal than formative assessments and can include assessments created by states, districts, or assessment publishers. Information from periodically administered interim assessments can address questions such as "What effect has a program or intervention had on student learning?" "What are areas of strengths and deficits of students at the beginning, middle, and end of a school year?" and "Are students on track to meet end-of-year benchmarks?" (Gong, 2010).

Nebraska school accountability classifications. By considering multiple indicators of school performance, the Nebraska Department of Education (2018a) classifies each Nebraska school into one of four levels: excellent, great, good, and needs improvement. The indicators include statewide math and English language arts assessment scores and trends, graduation rates, student absenteeism rates, and English learner students' progress toward proficiency. The Nebraska Department of Education uses this classification system to strategically target resources and support to schools most in need of improvement (see appendix A).

Summative assessment. The Nebraska Department of Education (2018b, p. 2) defines summative assessment as "[c]ulminating assessments measuring student performance against state content area standards." The Nebraska Student-Centered Assessment System (NSCAS) summative assessments are criterion-referenced, meaning that they measure student performance against a fixed set of criteria for the state content area standards. The NSCAS includes the following summative assessments: NSCAS English language arts, math, and science assessments for grades 3–8; the ACT for grade 11; and the English Language Proficiency Assessment for the 21st Century for English learner students. Teachers administer these summative assessments once a year. This report uses "summative data" to refer exclusively to data derived from the NSCAS summative assessments and not from other classroom-based measures teachers might use summatively, such as chapter or unit tests, research projects, or performance portfolios.

State-level standardized summative assessments are typically used as an accountability measure of student performance compared with defined content standards or a group of students, such as a national or state sample of students in the same grade (Perie et al., 2007). Information from state-level standardized summative assessments can address questions such as "How do students in this school perform on state tests?" "What does student performance look like at the end of the year?" and "How is student performance changing over time?" (Gong, 2010).

Through a multiple-assessment approach, teachers can access summative, interim, and formative data, each of which provide different information that can inform different kinds of instructional decisions (Marsh et al., 2006). For example, state-level, standardized summative assessment data, collected once a year, can provide information about students' performance at the end of the year and changes in students' achievement over time related to state learning standards (Gong, 2010). Interim assessment data, collected at intervals during the school year, can help teachers monitor students' rates of growth toward state, district, and school benchmarks and adjust instructional plans, program administration, and resource allocation to meet the unique needs of individual students (Chappuis & Stiggins, 2008; Hamilton et al., 2009; Perie et al., 2007). Formative data, collected "in the moment" during instruction, can help teachers plan which materials to use in class, group students for instruction, tailor instruction for individual students, and identify additional instructional supports (Datnow et al., 2007; Lachat & Smith, 2005; Supovitz, 2012).

The Nebraska Department of Education (2018b) developed a multiple-assessment approach, the Nebraska Student-Centered Assessment System (NSCAS), which identifies summative, interim, and formative assessments as measures of student learning. These include state-level, standardized summative assessments for English language arts, math, science, college readiness, and English language proficiency; Northwestern Evaluation Association's MAP Growth interim assessment; and classroom-based formative assessments. The NSCAS is intended to support teachers in using multiple assessments to measure what students know and need to learn and adjust instruction to help students stay on track with state content standards. To this end, supporting teachers' data use by providing a clearly defined vision and plan for professional learning opportunities is a key component of the NSCAS.

Given the Nebraska Department of Education's investment in the NSCAS, department leaders were committed to developing a state-level professional learning plan to support its use. The leaders partnered with the Regional Educational Laboratory Central to conduct a study of how teachers used and perceived three types of data—summative, interim, and formative—that were at the core of Nebraska's multiple-assessment approach. The study employed the Teacher Data Use Survey (Wayman et al., 2016) to measure how often teachers used data from the NSCAS standardized summative assessments, the MAP Growth interim assessment, and classroom-based formative assessments; how they used these data to guide instruction; what their general perceptions and attitudes about data were; and how those perceptions compared with principals' perceptions of teachers' data use. Department leaders were also interested in learning whether teachers' data use varied by teacher characteristics such as highest degree earned and years of experience in education, or by school characteristics, including Nebraska school accountability classifications, which are based on school performance indicators (see boxes 1 and 2 for more information on teacher and school characteristics and see appendix A for a summary of the literature on teachers' data use and teacher and school characteristics).

Understanding how teachers use and perceive data can help Nebraska education leaders (department staff and professional learning service providers) develop a data-informed vision and plan for state-level professional learning to support teachers' data use. The results can help Nebraska education leaders identify areas in which teachers might need more support, such as understanding the purposes of each type of assessment, interpreting data from each assessment, and using data to inform instruction. The findings can also help Nebraska education leaders determine whether and how to differentiate their professional learning support based on, for example, school accountability classification or teachers' highest degree earned or years of experience.

Research questions

This study addressed five research questions to examine Nebraska teachers' use of summative, interim, and formative data as well as their perceptions of and attitudes toward data:

1. How do Nebraska teachers report using summative, interim, and formative data?

2. Are Nebraska principals' attitudes about data and perceptions of teachers' data use similar to teachers' reports of their own attitudes and data use?

3. How does teachers' use of data relate to teachers' perceived competence in using data, attitudes toward data, and perceptions of organizational supports for using data?

4. How do teachers' use of data, perceived competence in using data, attitudes toward data, and perceptions of organizational supports for using data vary by teacher characteristics?

5. How do teachers' use of data, perceived competence in using data, attitudes toward data, and perceptions of organizational supports for using data vary based on Nebraska school accountability classifications (that is, excellent, great, good, and needs improvement) for the 2018/19 school year?

For information on sources, sample, and methods used to address the research questions, see box 2 and appendix B.

Box 2. Data sources, sample, and methods

Data sources. This study used two sources of data: administrative data from the Nebraska Department of Education and survey data from the Teacher Data Use Survey (TDUS; Wayman et al., 2016).

Administrative data included school-level and teacher-level variables. School-level variables included school level (elementary, middle, or high); accountability classification (excellent, great, good, or needs improvement); and Title I status (schools that receive federal funds under Title I, Part A, of the Every Student Succeeds Act; U.S. Department of Education, 2018). Teacher-level variables included:

- Highest degree earned: bachelor's degree (or less[1]), master's degree, or more-advanced degree (an education specialist or doctoral degree).
- Special education endorsement: whether a teacher held a special education endorsement.
- Core subject teacher: whether a teacher taught subjects such as general elementary, English language arts, math, science, or history/social studies at the time of survey administration. Teachers were considered noncore subject teachers if they taught any other subject, such as fine arts, health/physical education, or a foreign language, at the time of survey administration.
- Years of experience in education: number of years in education. For analyses, years of experience were converted into quartiles: 5 or fewer years, 6–12 years, 13–21 years, or 22 or more years.

Survey data included teachers' and principals' responses to the TDUS (see appendixes C and D). The TDUS measured teachers' actions with summative, interim, and formative data; their perceived competence in using data; their attitudes toward data; and their perceptions of organizational supports for using data (see appendix E). The principal version of the survey included similarly worded items that measured principals' perceptions of teachers' data use (see appendix E). Each scale is described below.

The Actions with Data scale in the TDUS measured the frequency of specific actions that teachers reported taking with summative, interim, and formative assessment data. These actions included identifying instructional content to use in classes, tailoring instruction to individual students' needs, discussing data with students or parents, and meeting with other teachers about data.[2] The survey focused on the assessments used in Nebraska: the Nebraska Student-Centered Assessment System summative assessments and MAP Growth interim assessments. The survey did not reference a specific formative assessment because formative assessments include a variety of formal and informal tools.[3] Respondents rated items on a four-point frequency scale.

The Competence in Using Data scale in the TDUS included items that prompted respondents to consider whether they were proficient in various aspects of data use. When answering these items, respondents were prompted to think more generally about their data use to inform education practice rather than about a specific type of data (that is, summative, interim, or formative). Example items included "I am good at using data to diagnose student learning needs" and "I am good at adjusting instruction based on data." Respondents rated items on a four-point agreement scale.

The Attitudes toward Data scale in the TDUS included two subscales: Attitudes toward Data and Data's Effectiveness for Pedagogy. The Attitudes toward Data subscale included items such as "I think it is important to use data to inform education practice" and "I like to use data." The Data's Effectiveness for Pedagogy subscale included items such as "Data help teachers plan instruction" and "Students benefit when teacher instruction is informed by data." Respondents rated items on a four-point agreement scale. When answering these items, respondents were prompted to think more generally about using data to inform education practice rather than about a specific type of data (that is, summative, interim, or formative).

The Organizational Supports scale in the TDUS included three subscales: Computer Data Systems, Support for Data Use, and Principal Leadership. The Computer Data Systems subscale included items about various characteristics of respondents' data systems, such as "I have the proper technology to efficiently examine data." The Support for Data Use subscale included items about various support structures for teachers, such as "I am adequately supported in the effective use of data." Finally, the Principal Leadership subscale included items about actions that principals and assistant principals take with data, such as "My principal or assistant principal(s) encourages data use as a tool to support effective teaching." Respondents rated items on a four-point agreement scale. When answering these items, respondents were prompted to think more generally about using data to inform their education practice rather than about a specific type of data (that is, summative, interim, or formative).

Sample. The study team examined survey responses from 3,572 teachers and 171 principals across 353 schools. These respondents represented 35 percent of the teachers and 48 percent of the principals who were sent the survey. The study team applied nonresponse weights to generate findings that were likely representative of the entire group of educators originally surveyed (see appendix B for details on this process and characteristics of the analytic samples).

Survey administration. The Nebraska Department of Education (NDE) sent invitations to complete the online survey to all teachers and principals in selected schools in March 2019. Survey recipients received three follow-up reminders. To address common challenges with self-reported data, NDE sent recipients a letter from the Nebraska commissioner of education stating that the survey results would be used to plan ongoing professional learning support for data use and would not be used for accountability purposes. NDE also assured recipients that their identities and confidentiality would be protected and that principals would not receive individual teachers' survey results or know which teachers completed the survey. To promote memory recall and minimize the time between assessment and survey completion, NDE administered the survey at a time during the 2018/19 school year when teachers had had the opportunity to use summative, interim, and formative data.

Analyses. To address the first two research questions, the study team calculated descriptive statistics, including scale means and standard deviations of survey responses from teachers and principals. The study team followed the TDUS guide (Wayman et al., 2016), which suggests that using scale means is appropriate when making comparisons across survey scales and survey versions. Mean differences of 0.25 or larger are presented in this report. For example, on a four-point scale in which 1 indicates strongly disagree, 2 indicates disagree, 3 indicates agree, and 4 indicates strongly agree, the difference between a teacher mean rating of 2.50 and a principal mean rating of 2.75 would meet the threshold for reporting.

To address the remaining research questions, the study team used multilevel regression models. Multilevel models account for teachers being clustered within schools. It is important to account for this because teachers in the same schools are likely to be more similar to one another than to teachers in other schools. The models controlled for school characteristics that could relate to teachers' data use, including school level (elementary, middle, or high) and Title I status. The models also controlled for teachers' background characteristics, including highest degree earned, years of experience in education, special education endorsement, and teaching assignment in a core subject. For research question 3, which examined associations between teachers' actions with data and teachers' perceptions of and attitudes toward data, the report includes only associations that were significant at $p < .01$ or better. For research questions 4 and 5 the report presents regression-adjusted means to describe differences between groups of teachers with particular characteristics. All statistically significant differences of 0.25 or larger between subgroups are described in the report.

The report describes teachers' data use and associations between school characteristics and teachers' use of, attitudes toward, and perceptions of data. The analyses do not support any causal claims. Therefore, no inferences are made about the effects of teacher or school characteristics on teachers' use of, attitudes toward, or perceptions of data.

Notes

1. Only 0.3 percent of the sample had less than a bachelor's degree (for example, a certificate).

2. There might be other actions that teachers take with summative, interim, or formative data but that this study did not measure.

3. A possible study limitation is that because the survey did not provide a definition of formative assessments, teachers might have responded to survey questions based on different interpretations of what constitutes a formative assessment. The Nebraska Department of Education provides teachers with a definition of formative assessments (see box 1), but teachers might or might not have had this definition in mind when completing the survey.

Findings

This section presents findings for each of the five research questions. Supporting analyses are in appendix C, and additional analyses of Teacher Data Use Survey data are in appendix D.

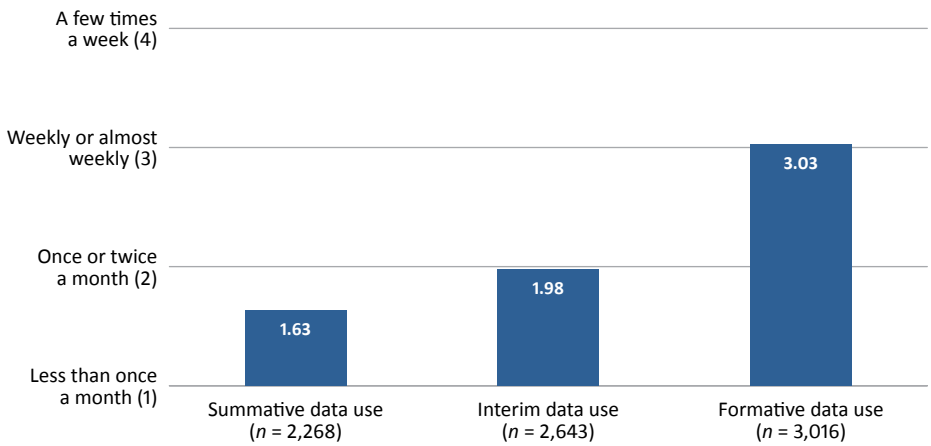
Not all Nebraska teachers used summative, interim, and formative data to inform instruction, but teachers who did use data used formative data more often than summative and interim data

About 29 percent of teachers reported that they did not use summative data, 21 percent reported that they did not use interim data, and 6 percent reported that they did not use formative data.

Among teachers who reported using each type of data, use of summative, interim, and formative data was consistent with how often each assessment is typically administered. That is, teachers used formative data from ongoing classroom-based formative assessments most often and used summative data from the annual state assessment least often. However, teachers reported using summative and interim data with a frequency that surpassed how often each assessment is typically administered. For example, teachers administer state summative assessments once a year, whereas the mean for teachers' use of summative data (1.63) was about once a month (figure 1). For interim assessments, typically administered three times a year, the mean for teachers' use of interim data (1.98) was about once or twice a month. For formative assessments, which teachers generally administer on an ongoing basis, the mean for teachers' use of formative data (3.03) was weekly or almost weekly.

Nebraska teachers used formative data almost weekly and interim data about monthly to inform a variety of instructional actions (figure 2). The means for teachers' instructional actions with formative data corresponded to weekly or almost weekly for tailoring instruction to individual students' needs (2.96), identifying instructional content (2.92), developing recommendations for additional instructional support (2.88), and grouping students for targeted instruction (2.69). In comparison, the means for teachers' taking these instructional actions with interim data corresponded to monthly or almost monthly, and summative data less than once a month.[1]

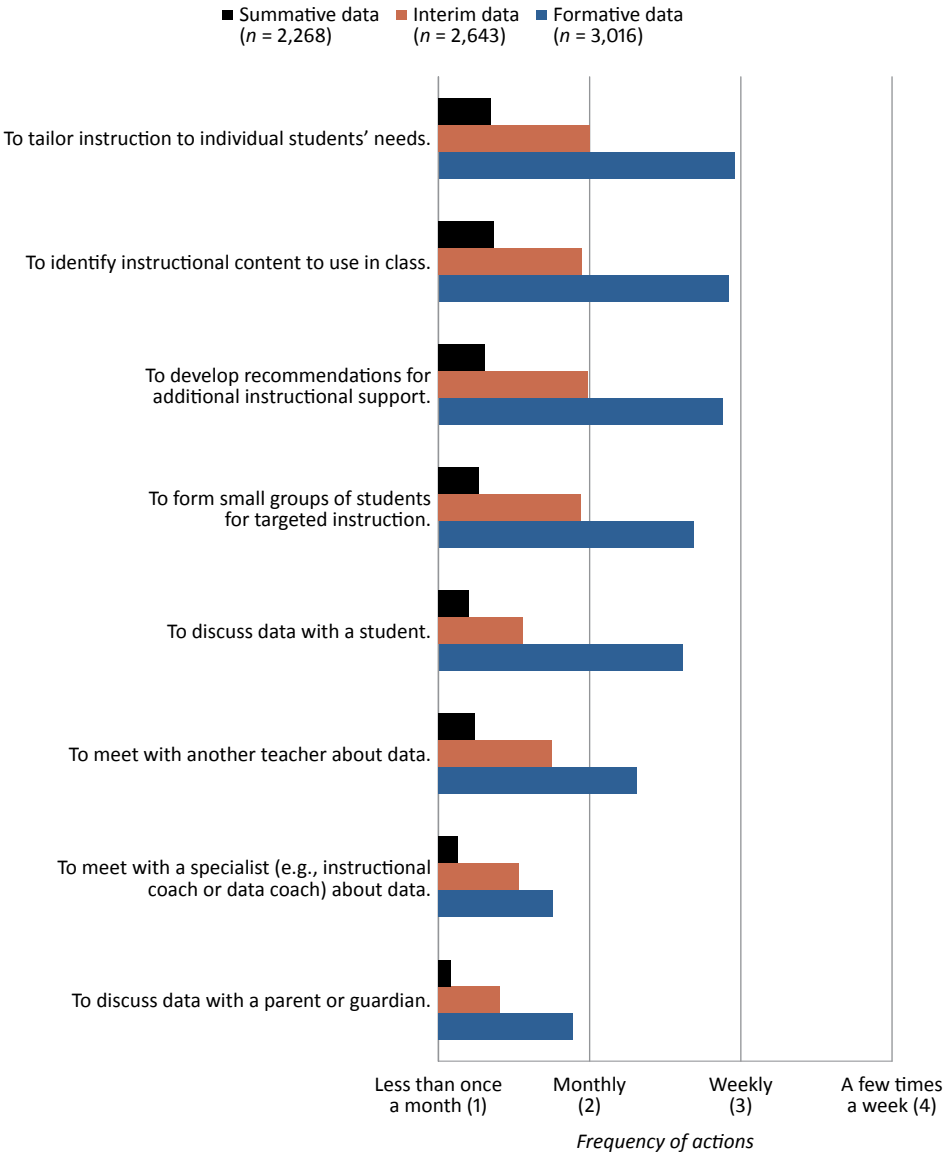
Figure 1. Teachers used formative data more often than summative and interim data, 2019



Source: Authors' analysis of 2019 data from the Teacher Data Use Survey administered by the Nebraska Department of Education.

1. See table C5 in appendix C for item-level means of actions with summative, interim, and formative data on the same rating scale (that is, with the summative rating scale recoded to the rating scale for interim and formative data for ease of comparison). See table D6 in appendix D for the original means for actions with summative data.

Figure 2. Teachers took instructional actions with formative data more often than with interim and summative data, 2019



Note: Frequency of actions with summative data was measured on a scale in which 1 = one or two times a year, 2 = a few times a year, 3 = monthly, and 4 = weekly. To make visual comparisons using the same survey scale, ratings for summative data were recoded to the interim and formative response scale. A rating of 4 (weekly) on the summative scale was recoded as a 3 (weekly or almost weekly) on the interim/formative scale, a rating of 3 (monthly) was recoded as a 2 (once or twice a month), and a rating of 2 or 1 was recoded as a 1 (less than once a month).

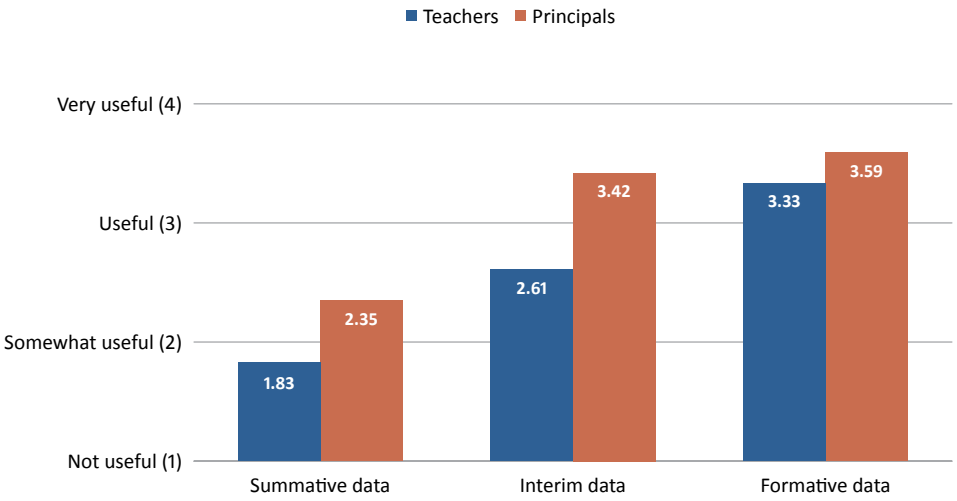
Source: Authors' analysis of 2019 data from the Teacher Data Use Survey administered by the Nebraska Department of Education.

Teachers used the three types of data least often to guide discussions with students, other teachers, instructional specialists, and parents or guardians. In particular, these findings suggest that teachers discussed data about student learning with parents or guardians less than monthly.

Principals had more positive perceptions of and attitudes toward data than teachers did

On average, principals and teachers differed in their ratings of the usefulness of summative and interim data, but they had similarly favorable ratings of the usefulness of formative data to inform teachers' practice (figure 3). Both principals and teachers perceived summative data to be less useful than interim and formative data for

Figure 3. Teachers and principals had different perceptions of the usefulness of summative and interim data and similar perceptions of the usefulness of formative data, 2019



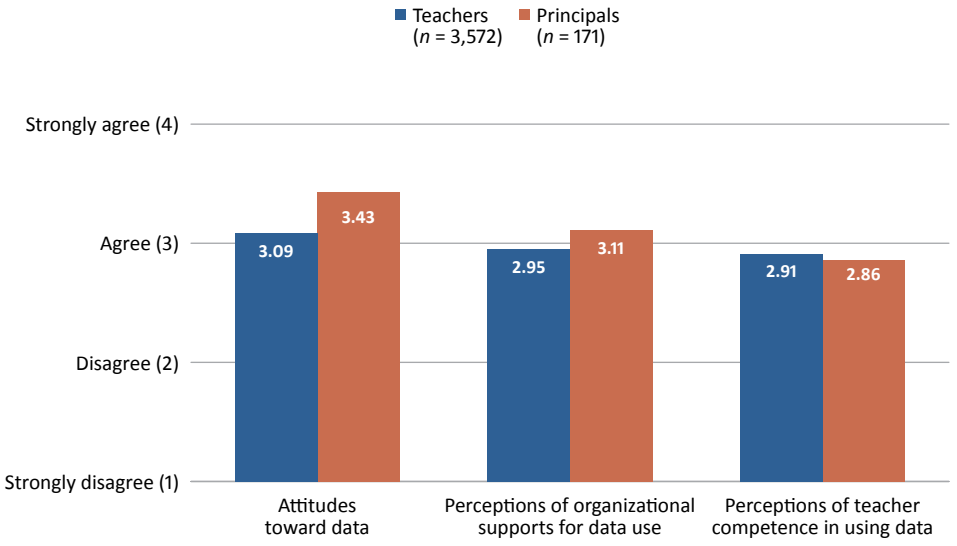
Note: For teachers *n* = 3,216 for summative data, *n* = 3,340 for interim data, and *n* = 3,203 for formative data. For principals *n* = 171 for summative data, *n* = 168 for interim data, and *n* = 164 for formative data.

Source: Authors' analysis of 2019 data from the Teacher Data Use Survey administered by the Nebraska Department of Education.

informing teacher practice. However, principals' mean rating of summative data (2.35) was more positive than somewhat useful, and teachers' mean rating (1.83) was less positive than somewhat useful. Principals' perceptions of interim data represented a mean rating of useful to very useful to inform teacher practice (3.42). On the other hand, teachers' perceptions of interim data corresponded to a mean rating of somewhat useful to useful to inform practice (2.61).

Principals and teachers provided similar ratings, on average, of their perceptions of teacher competence in using data, their attitudes toward data, and their perceptions of organizational supports for using data (figure 4).

Figure 4. Teachers and principals were similar in their perceptions of teacher competence in using data and of organizational supports for using data, but differed in their attitudes toward data, 2019



Source: Authors' analysis of 2019 data from the Teacher Data Use Survey administered by the Nebraska Department of Education.

Perceptions about teacher competence in using data were comparable among principals (mean of 2.86) and teachers (mean of 2.91). For the Competence in Using Data scale, both principals and teachers provided similar ratings on statements about teachers being good at using data to diagnose student learning needs, adjusting instruction based on data, planning lessons, and setting student learning goals (see table C9 in appendix C for item-level means).

Although both principals and teachers reported positive attitudes toward data, principals' attitudes toward teachers' data use were more positive (mean of 3.43) than were teachers' attitudes toward their own data use (mean of 3.09). Specifically, on the Attitudes toward Data scale, principals' attitudes toward data were more positive than were teachers' attitudes on statements about liking to use data; believing that students benefit when instruction is informed by data; believing that using data helps them be better educators; and finding data useful, important to educational practice, and helpful in planning instruction (see table C7 in appendix C for item-level means).

Ratings of organizational supports for using data were similar among principals (mean of 3.11) and teachers (mean of 2.95), including perceptions of teachers' access to professional learning support for using data, principals' leadership for data use, and computer data systems (see figure 4). Principals' and teachers' perceptions of principals' support for teachers' data use and computer systems that support data use were comparable, although their ratings differed on four items. Specifically, principals' ratings were more positive than teachers' ratings on items about principals discussing data with teachers, principals creating protected time for using data, teachers having the proper technology for using data, and computer systems providing access to data (see table C8 in appendix C for item-level means).

Teachers' self-reported use of data was positively associated with their perceived competence in using data, their attitudes toward data, and their perceptions of organizational supports for using data

The associations between teachers' reported data use and their perceived competence in using data, their attitudes toward data, and their perceptions of organizational supports for using data varied slightly by the type of data (summative, interim, or formative). Ratings on the Competence in Using Data and Organizational Supports scales were statistically significantly and positively associated with teachers' reported use of all three types of data (table 1). Teachers who reported greater perceived competence in using data or more organizational

Table 1. Teachers' perceived competence in using data and of organizational supports for using data were statistically significantly and positively associated with their reported use of summative, interim, and formative data, 2019

Perceptions about data scales	Use of summative data	Use of interim data	Use of formative data
Competence in Using Data	0.19***	0.23***	0.30***
Attitudes toward Data	0.06	0.08	0.13***
Organizational Supports	0.20***	0.22***	0.14***

*** Significant at $p < .001$.

Note: Coefficients are from two-level multiple regression models that accounted for the nesting of teachers within schools. Coefficients describe the amount of change that would be expected in the data use variables with a one-point increase in the perceptions variables. For example, teachers who reported that, on average, they agreed with the statements about competence in using data (a rating of 3) would be expected to have "use of summative data" ratings that were 0.19 point higher than the ratings by teachers who reported, on average, that they disagreed with the statements about competence in using data (a rating of 2). Separate models were fit for summative data (n = 2,277 teachers in 350 schools), interim data (n = 2,665 teachers in 351 schools), and formative data (n = 3,013 teachers in 353 schools). Sample sizes varied across models because teachers were asked about their use of a particular type of data only if they reported having access to that type of data. All models controlled for the following variables: teachers' highest degree earned, special education endorsement, core subject, and years of experience, as well as the school level and Title I status of their schools. See tables C10–C12 in appendix C for complete model results.

Source: Authors' analysis of 2019 data from the Teacher Data Use Survey administered by the Nebraska Department of Education.

supports for using data also reported taking more frequent instructional actions informed by summative, interim, and formative data. Teachers' attitudes toward data were statistically significantly and positively associated with only their reported use of formative data. That is, when teachers reported having more positive attitudes toward data, they indicated that they more often used formative data to inform instruction.

Teachers' highest degree earned was positively associated with their perceived competence in using data and their attitudes toward data

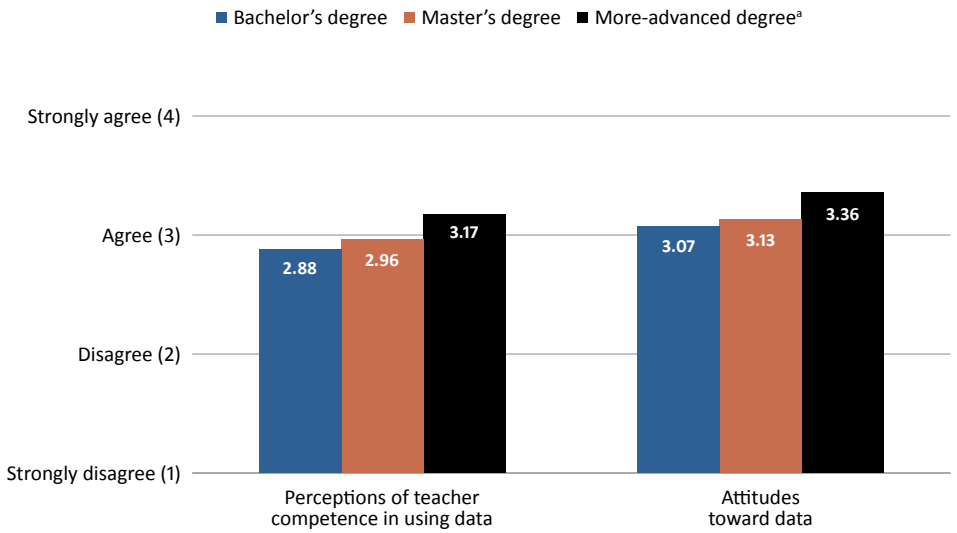
Teachers who had a more-advanced degree reported greater perceived competence in using data than did teachers who had a bachelor's degree (figure 5). The difference was statistically significant. On average on the four-point Competence in Using Data scale, teachers with a more-advanced degree had a perceived competence rating of 3.17, and teachers with a bachelor's degree had a rating of 2.88, where 2 indicated disagreement, 3 indicated agreement, and 4 indicated strong agreement with the statements on the scale.

Teachers' attitudes toward data followed a similar pattern. Teachers with a more-advanced degree reported more positive attitudes toward data than did teachers who had a bachelor's degree (see figure 5). This difference was statistically significant. The mean rating of attitudes toward data for teachers with a more-advanced degree was 3.36. On average on the four-point Attitudes toward Data scale, teachers with a bachelor's degree had a rating of 3.07, where 3 indicated agreement and 4 indicated strong agreement with the statements on the scale.

Teachers with 12 or fewer years of experience in education reported using formative data more often than did teachers with 22 or more years of experience

Teachers with the least amount of experience, 5 or fewer years, reported using formative data most often, on average (2.65), followed by teachers with 6–12 years of experience (2.56; figure 6). The differences between each of these groups and teachers with the most experience, 22 or more years, were statistically significant. On a

Figure 5. Teachers with a more-advanced degree reported greater perceived competence in using data and more-positive attitudes toward data than did teachers with a bachelor's degree, 2019

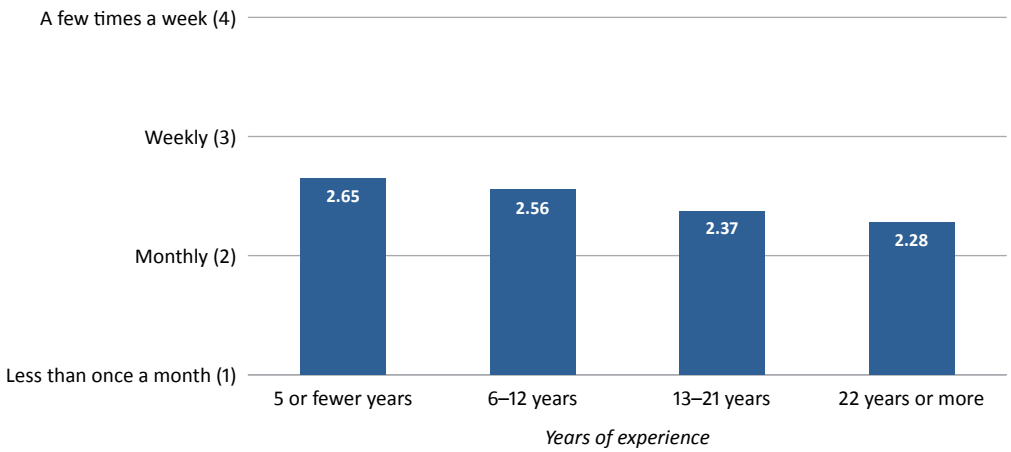


Note: Adjusted means were calculated from two-level multiple regression models that accounted for the nesting of teachers within school (n = 3,572 teachers in 353 schools). All models controlled for the following variables: teachers' highest degree earned, special education endorsement, core subject, and years of experience, as well as the school level and Title I status of their schools. See tables C13–C16 in appendix C for complete model results.

a. Includes education specialist degree and doctoral degree.

Source: Authors' analysis of 2019 data from the Teacher Data Use Survey administered by the Nebraska Department of Education.

Figure 6. Teachers with the least experience used formative data more often than did teachers with the most experience, 2019



Note: Adjusted means were calculated from a two-level multiple regression models that accounted for the nesting of teachers within schools (n = 3,013 teachers in 353 schools). All models controlled for the following variables: teachers' highest degree earned, special education endorsement, core subject, and years of experience, as well as the school level and Title I status of their schools. See tables C23 and C24 in appendix C for complete model results.

Source: Authors' analysis of 2019 data from the Teacher Data Use Survey administered by the Nebraska Department of Education.

four-point scale measuring frequency, teachers with 22 or more years of experience reported using formative data the least often (2.28), where 2 indicated once or twice a month and 3 indicated weekly. Teachers' responses for frequency of summative and interim data use were more similar across the years of experience categories. No differences of .25 or greater were observed between the years of experience categories for summative and interim data (see tables C19–C22 in appendix C).

Teachers working in schools with different accountability classifications had similar survey responses

Teachers' responses for frequency of summative, interim, and formative data use; perceived competence in using data; attitudes toward data; and organizational supports were similar across school accountability classifications (excellent, great, good, or needs improvement; see tables C25–C36 in appendix C).

Implications

Leaders at the Nebraska Department of Education can consider the following implications as they develop professional learning plans for building teachers' capacity to use data from multiple, complementary assessments for instructional decisionmaking.

Considering principals' support and perceptions of teachers' data use

To help teachers use summative, interim, and formative data, state education leaders could encourage principals to provide the necessary organizational supports for effective data use in their schools (Gerzon & Guckenburg, 2015; Schildkamp et al., 2019). Overall, Nebraska teachers in this study had positive perceptions about the organizational supports available to them to use data, including support from principals. However, when considering the professional learning needs of teachers and principals, Nebraska education leaders might want to address the areas in which teachers' perceptions of data use in general were not as positive as principals' perceptions. These areas, such as principals creating protected time for using data and discussing data with teachers, could suggest opportunities for principals to convey to teachers the importance and value of using data to inform instruction.

Other findings, such as principals perceiving summative and interim data to be more useful than teachers perceive them to be, offer an opportunity to explore why their perceptions differ. Because this study found that teachers' perceptions of and attitudes toward data were positively associated with the actions they reported taking with data, principals' support for professional learning in these areas might be helpful in changing teachers' instructional practice (Datnow & Hubbard, 2016; Reeves, 2017).

Building capacity for data conversations and inquiry

Nebraska education leaders might consider providing professional learning to support teachers in discussing data with colleagues and parents to address problems of practice and inform instructional decisionmaking. In examining the actions teachers take with data, this study found that teachers reported using summative, interim, and formative data least often to support discussions with other teachers and specialists such as instructional coaches or data coaches, who typically have more experience in using data. They also engaged parents in discussions about student learning based on data less than monthly. In addition, teachers' ratings were less positive than principals' ratings about principals discussing data in general with teachers.

These findings point to a possible opportunity to expand teachers' data use by building their capacity to engage in collaborative data conversations with other teachers, specialists, principals, and parents aimed at collectively solving problems of practice. Engaging in data conversations can help teachers examine and understand data, shape how they perceive data, and aid them in determining what instructional actions to take (Beck & Nunnaley, 2020; Bocala et al., 2014; Datnow & Hubbard, 2016). Resources such as *Five Steps for Structuring Data-Informed Conversations and Action in Education* (Kekahio & Baker, 2013) might help teachers, specialists, and principals engage more frequently and purposefully in data conversations that inform instruction and involve parents in understanding student learning.

Understanding the process teachers use to translate data into instructional action, as well as the ways principals can support that process, might be an important area for Nebraska education leaders to explore further through research and professional learning support. Although this study measured how often teachers discussed data with others, it did not measure how those conversations might have informed instructional decisions or whether they occurred as part of a cycle of inquiry. When teachers engage in data-informed decisionmaking as part of a cycle of inquiry, they follow a systematic process for identifying a learning problem; setting a purpose or forming questions to address the problem; collecting, analyzing and interpreting data; taking action to change instruction; measuring whether the instructional changes worked; and then repeating the process (Kippers et al., 2018; Lipton & Wellman, 2012; Mandinach & Gummer, 2016b).

Determining whether teachers' perceived competence represents actual competence in using data

By measuring teacher data competence, Nebraska education leaders could determine whether teachers' perceived competence in using data reflects their actual proficiency based on the state's well-defined data competencies (Nebraska Department of Education, 2013). This study measured teachers' perceived competence in using data, which was positive overall regardless of school accountability classification, but it did not measure teachers' actual competence in using data. Nebraska education leaders might consider developing direct assessments of teachers' actual competence in using data and comparing results to their perceived competence in using data. For example, assessment items could be added to existing district or state teacher evaluation rubrics so that administrators could use the rubrics to assess teachers' data competence. Administrators could use information about teacher data competencies to develop a data-informed professional learning plan that focuses on areas in which Nebraska teachers need to improve the most. Education leaders in other states might consider how assessments of teachers' perceived competence in using data and their actual competence in using data can inform state-level professional learning plans for their data use.

Education leaders in Nebraska might also consider strategies that could help close the gap in perceived competence in using data between teachers who hold a more-advanced degree and those who hold a less-advanced degree (van Geel et al., 2017). This study found that teachers with a more-advanced degree reported greater perceived competence than did teachers with a bachelor's degree. One possible strategy to close this gap is to create a statewide plan that articulates a coordinated system of support for building teachers' competence in using data through preservice, in-service, and classroom-based professional learning support (Mandinach & Gummer, 2012; Mandinach & Jimerson, 2016). This multipronged approach could involve state credentialing and licensure agencies as well as teacher preparation programs to help ensure that teachers develop the knowledge and skills they need to use data effectively, regardless of education degree (Mandinach & Gummer, 2016a).

Researching how teachers understand the intended purposes of using multiple assessments

Further research could focus on how teachers understand the intended purposes of using summative, interim, and formative assessment data and how this understanding shapes their use and perceptions of the usefulness of those data. Previous research has shown that teachers' understanding may influence how often they use each type of data and how they perceive the usefulness of the data (Farley-Ripple et al., 2020; Gong, 2010). For example, the current study found that teachers used classroom-based formative data more often and perceived formative data to be more useful than summative and interim data. It also found that 29 percent of teachers did not use summative assessment data and 21 percent did not use interim assessment data. In addition, because teachers typically develop their own formative assessments, researching the variation in how teachers use formative assessments could inform statewide guidance on what constitutes high-quality formative assessments. Research results also could inform how Nebraska education leaders communicate a state-level vision of the intended purposes for using data from summative, interim, and formative assessments as part of the Nebraska Student-Centered Assessment System.

When developing professional learning plans for teachers' data use, state leaders could help teachers elevate their use of summative, interim, and formative data for their intended purposes by offering training on how different types of data can inform different types of decisions. Although this study measured teachers' use of summative, interim, and formative data, these are not the only types of data that teachers might use to inform instructional decisions. In addition, in professional learning plans, state education leaders might also address how teachers can use other types of data, such as behavioral data, student perceptual data, and student demographic data, for different purposes (Gummer & Mandinach, 2015; Hamilton et al., 2009).

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