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Using a Data Chat to Teach Instructional Interventions: Student Perceptions of Data Literacy in an Assessment Course

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Recent public policy and research aimed at addressing student-achievement accountability in education may make it prudent for teacher-education programs to explicitly address data literacy as a valid outcome for their graduates. This article examines the changes in perceptions of comfort toward data-literacy behaviors before and after an instructional intervention called a Data Chat for students in a teacher-preparation program. The results suggest that the intervention increased student perceptions of comfort in performing those data-literacy behaviors required for successful data use as a classroom teacher. We contend that data literacy is the new literacy for the next generation of teacher-education graduates.

INTRODUCTION

Recent public policy has encouraged the uses of standardized-test data for accountability in the educational realm. No Child Left Behind (2002) required that school districts use student assessment scores to track and report areas of strength and weakness to the public. This legislation required that data be tracked for institutional uses and state reporting and, in doing so, ushered in the current accountability reform era aimed at using standardized-test scores to measure educational progress. Several years later, Race to the Top (U.S. Department of Education, 2009a) introduced a new definition
of teacher effectiveness for teachers—student-achievement measures. Race
to the Top defined “effective teachers” to mean “teachers whose students
achieve acceptable rates (at least one level of an academic year) of stu-
dent growth” (U.S. Department of Education, 2009a, p. 12). Race to the
Top legislation built on the previous federal legislation by shepherding in
accountability for student achievement for the individual teacher. By 2011,
almost half of the states had passed state legislation aimed at including
student achievement in teacher evaluations (Piro, Wiemers, & Shutt, 2011).

With these state and national policies, individual teachers now have
an increasing responsibility to demonstrate measurable student learning for
their own evaluation systems. To add to this era of increasing responsibil-
ity for student-achievement outcomes, two states, Louisiana and Tennessee,
are now tracking the student achievement of the graduates of teacher-
education institutions (First to the Top, 2010; Noell & Burns, 2006). Individual
student achievement may be traced to an individual teacher, which may
in turn, be traced to the teacher-preparation institution that trained that
teacher. Additionally the Obama administration appears to be encourag-
ing all teacher-education institutions to join Tennessee and Louisiana in
reporting how their graduates affect student-learning outcomes with value-
added measures through the Higher Act (Sawchuck, 2012) and 11 other
states (Delaware, Florida, Georgia, Hawaii, Maryland, Massachusetts, North
Carolina, New York, Ohio, Rhode Island, Texas, and the District of Columbia)
are reporting or plan to report value-added measures for their teacher-
education preparation programs to the public (Crowe, 2011; Sawchuck,
2012).

Concurrent with public policy initiatives to use data for accountability,
researchers have examined standardized testing and other learning measures
to understand the impact that teachers have on student learning. Sanders and
Horn (1998) contended that value-added models for teacher evaluation con-
tral for outside influences, such as socioeconomic factors, peers, and school
factors, when measuring the impact that teachers have on student learn-
ing. In subsequent years, student achievement has been studied by other
researchers as the principal measure of teacher effectiveness (Harris & Sass,
2008; Rivkin, Hanushek & Kain, 2005; Rockoff, 2004), furthering the notion
that individual teachers make a significant difference in the performance
outcomes of their students. Stronge, Ward, and Grant (2011) found that “the
common denominator in school improvement and student success is the
teacher” (p. 351).

However, the manner in which schools actually use data may vary and
with that variance, data use and the outcomes of that data use for stu-
dents may also be dissimilar among teachers. Jacobs, Gregory, Hoppey, and
Hoppey (2009) found that there is a difference in the ability of teachers to
use data based on their experience and professional knowledge. Moreover,
school districts have responded with differing levels of implementation in
using data for instructional purposes. A study examining four school districts using data systems for instructional interventions provided recommendations to school districts to strengthen those divergent efforts (Supovitz, Foley, & Mishook, 2012). When examining how practicing teachers read and respond to their students’ Stanford Achievement Test 10 (SAT 10) scores, Atkinson (2012) found that teachers interpret data very differently. Jones (2008) indicated that assessment drives instruction and that professional development in data disaggregation and the use of data closes the achievement gap.

Educational accountability reforms aimed at using standardized-testing scores coupled with research connecting individual teachers to student achievement are influencing the perception that data should be instrumental in the learning process and that teachers may positively influence the achievement of their students by using that data. Data collection and use in schools is increasing. While data gathering happens in schools, use of that data for instructional interventions may not be occurring (U.S. Department of Education, 2009b) or it may be occurring haphazardly. One possibility for the lack of data-driven instructional interventions in schools is that practicing teachers may not have the training in their preparation programs to bridge their analysis of the data and to make instructional interventions based upon that data.

How may teacher-preparation programs help their graduates succeed in this new context of accountability? Recent policy changes aimed specifically at addressing student achievement for graduates of teacher-education institutions may make it prudent for teacher-education programs to explicitly address data literacy as a valid outcome for their graduates. Data literacy includes comprehending, interpreting, and understanding the ways data should be used for instructional interventions (U.S. Department of Education, 2009b). To understand how teacher candidates perceive using data for instruction, our inquiry explored student perceptions of comfort regarding data-literacy behaviors.

This article describes a research project that examined the perceptions of teacher candidates before and after an instructional intervention aimed at teaching the comprehension, interpretation, and use of data to make changes in instruction. In the next section, the authors examine their research methods and provide a detailed description of the instructional intervention used in the teacher-education assessment course under study.

**METHOD**

This study was grounded in a postpositivistic approach (Creswell, 1994; Phillips & Burbules, 2000). The research used a quasi-experimental research design without a control group, using pre/postsurvey analysis of an instructional intervention employing a no-randomized sampling. A professor/
researcher stance (Cochran-Smith & Lytle, 1993, 2009) situated the position of one researcher as the instructor of record for the assessment course in teacher education, with the other researcher maintaining an outside-researcher stance. The researchers followed Institutional Review Board protocols for working with human subjects for this study. The primary concern of this study was to examine the changes in perceptions of comfort that preservice teacher-education candidates, enrolled in a required assessment course, held toward data-literacy behaviors before and after an instructional intervention called a Data Chat. Our research question was, after an instructional intervention called The Data Chat in an assessment course, how would teacher-education candidates perceive their own level of comfort with data-literacy behaviors?

Survey Instrumentation

The U.S. Department of Education (2009b) described various data-comprehension, analysis, and use behaviors in a study conducted with practicing teachers. The data-use behaviors found in the U.S. Department of Education study formed the basis for the survey in this study, henceforth known as the study survey. The study survey measured participants’ attitudes at two different points: before instruction in a performance-based instructional intervention called the Data Chat and after that instruction. The study survey used a 4-point Likert scale to measure teacher-candidate perceptions of 15 items related to data comprehension, analysis, and use. Rating choices in the survey were the following: very little (VL); some (S); considerable (C); very great (VG); and not applicable (NA).

The researchers added one contextual data-literacy behavior to the data-literacy behaviors—using value-added scores—to the study survey, which was not used in the original Department of Education (2009b) study. Value-added models are a collection of complex statistical techniques that typically use multiple years of student test score data to estimate the effects of individual schools or teachers. The benefits and perils of value-added scores have been ardently debated in recent years (McCaffrey, Lockwood, Koretz, Louis, & Hamilton, 2004; RAND Research Brief, 2004). Some researchers have advised against using value-added models for measuring student achievement for teacher evaluations based on reliability and validity arguments (Braun, 2005; Kupermintz, 2003; Lockwood, Louis, & McCaffrey, 2002) and other methodological concerns (Amrein-Beardsley, 2008).

Irrespective of these warnings against using value-added scores for accountability purposes, in the state and school district of the study, the researchers collected value-added scores at the school-, classroom-, and individual-teacher levels to use for accountability purposes. In the study state, practicing teachers interpreted their own and their students’ value-added scores to improve instruction. In fact, in the year following data
collection for this study, value-added scores comprised up to 50% of a teacher’s individual evaluation (First to the Top, 2010). When value-added scores were reported within the data sets, the teacher candidates were required to analyze those scores within the instructional intervention or to investigate the value-added scores of their data set when publicly available on the state’s education department Web site. One study survey question asked candidates to rate their perception of comfort using value-added scores. No individual teacher value-added scores were publically available. See “Instructional Intervention” in a following section for a more in-depth look at the data sets that the teacher candidates analyzed.

Participants

Three sections of an assessment course in teacher education participated in the instructional intervention in the spring 2011 semester at a southeastern public university. Participants were juniors or seniors in their undergraduate programs at the time of the intervention; 74.3% of respondents were female. Table 1 presents the distribution of respondents’ ages with 15.4% under the age of 21 and 78.2% of respondents aged 28 or younger.

Table 2 presents the breakdown of educational focus. Approximately 55.1% of respondents identified themselves as majoring in elementary education; 42.3% of respondents indicate they were Grade 7–12 education minors with content majors; and 2.6% identified themselves as K–12 education minors comprised of Health & Human Performance, music, and theater majors.

For those respondents who indicated they had noneducation majors, Table 3 indicates their areas of academic focus. These participants had majors

<table>
<thead>
<tr>
<th>TABLE 1. Age of Respondents (n = 78)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
</tr>
<tr>
<td>18–20</td>
</tr>
<tr>
<td>21–28</td>
</tr>
<tr>
<td>29–36</td>
</tr>
<tr>
<td>37–44</td>
</tr>
<tr>
<td>45–54</td>
</tr>
<tr>
<td>Over 55</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 2. Major or Minor in Education and Grade Level of Certification (n = 78)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major</td>
</tr>
<tr>
<td>Elementary Education</td>
</tr>
<tr>
<td>K–12 Ed Minor</td>
</tr>
<tr>
<td>7–12 Ed Minor</td>
</tr>
</tbody>
</table>
TABLE 3. Major of Respondents with Majors in Noneducation Fields (n = 46)

<table>
<thead>
<tr>
<th>Minor</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math</td>
<td>30.4</td>
</tr>
<tr>
<td>History</td>
<td>28.3</td>
</tr>
<tr>
<td>English/Lang</td>
<td>21.7</td>
</tr>
<tr>
<td>Sciences</td>
<td>8.7</td>
</tr>
<tr>
<td>Other K–12 area</td>
<td>8.7</td>
</tr>
<tr>
<td>HPP/Music/Theater</td>
<td>2.2</td>
</tr>
</tbody>
</table>

in content areas with minors in education. The majority of respondents had majors in math (30.4%), history (28.3%), or English/Language (21.7%).

Instructional Intervention

In the United States, public schools are under increasing pressure to address issues of student achievement. These issues include teaching ways to make data-driven instructional choices. Teachers are under escalating demands to comprehend, to interpret, and to use assessment data to make instructional choices. The Data Chat is an instructional intervention, which closely followed the practices of a local educational agency model. Its purpose was to give teacher-education candidates experience in interpreting local data at the classroom level and to provide interventions based upon that data. As an instructional intervention, the researchers used a seven-step process aimed at increasing student achievement through data literacy. The Data Chat required that teacher candidates analyze recent student-assessment data in the form of standardized state tests, discover the strengths and weaknesses of the data set, determine which formative and summative assessments should be used to address those weaknesses identified within the data sets and create a plan for instructional strategies to address those weaknesses.

Steps of the Data Chat

The Data Chat allowed teacher candidates to collaborate in a group to reach competencies in data comprehension, interpretation, and use. There were seven steps to the Data Chat instructional intervention used in this study:

1. **Enlisting support from the local school districts.** The professor created a cooperative relationship with the assessment director at a local educational agency, who provided nonstudent-identified copies of school-wide and classroom-level data sets for the teacher candidates in the assessment course. The data sets came from statewide testing and end-of-course assessments.
2. **Creating grade-level or content-oriented teams.** Teams of teacher candidates simulated grade- or content-level teams.

3. **Analyzing the strengths and weaknesses of the data set.** The teacher candidates analyzed the data sets for strengths and weaknesses, using numeric data to support their analyses.

4. **Incorporating state standards and local curriculum guides.** The teacher candidates researched the state standards and local curriculum guides that applied to their data set generally and the substandards for weakness areas.

5. **Creating both formative and summative assessments.** The teacher candidates created weekly formative assessments and monthly summative assessments to gauge student learning in the determined weakness areas.

6. **Creating specific instructional strategies as interventions to address weaknesses.** The teacher candidates decided how they would address those weaknesses within the classroom through instructional interventions.

7. **Writing a final report.** The teacher candidates created a report of their data analyses and plan following the Data Chat.

The steps of the Data Chat loosely followed an Understanding by Design template (UbD), with standards and content driving the selection of assessments and the development of instructional strategies following the previous two steps (Wiggins & McTighe, 2005). Table 4 more fully distinguishes the steps of the Data Chat intervention used in the assessment course.

**Data Sets Used in the Data Chat**

The teacher candidates in an assessment course in teacher education analyzed statewide achievement tests at the fourth through eighth grade levels and Gateway tests for Grades 9 through 12 in varying content areas. Data sets included classroom, school-wide, and system data. Students were grouped according to grade level (K–6 grade-level teacher-education candidates) and analyzed a variety of content (reading/language arts, mathematics, science, and social studies) or content (4–8 or 9–12 grade-level secondary teacher candidates). These content areas included Algebra I, Mathematics Foundations II, English I and II, Biology I, and U.S. History. Data sets in every teacher-candidate content area were not available at the secondary level. When data in a content area was not available at the secondary level, teacher candidates chose a content group in which to work in the Data Chat.

**Data Collection and Analysis**

Initial data were collected 2 months into the assessment course and then 6 weeks after the instructional intervention of the Data Chat. Researchers
### TABLE 4. Steps of Data Chat Intervention

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The professor enlisted support from the local school districts for data sets. Local educational agencies collect data annually on their students. Data were nonstudent identified. Data sets for this instructional intervention included district, school, or individual classes in varying content and grade levels. Teacher education candidates in the assessment class were provided copies of those data sets.</td>
</tr>
<tr>
<td>2.</td>
<td>The professor created grade-level or content-oriented teams and teacher-education candidates were introduced to the data sets. Teams of 4–5 teacher-education candidates were used as simulated-grade or content-level teams. Students collaboratively analyzed the data set that was selected for their grade level/content area. The teacher-education candidates researched the assessment to understand how the tests were used in schools, when they were given, and general characteristics of the test. Data sets were further analyzed by value-added reports when they were publically available and when they were easily correlated with the criterion-referenced data set. In many instances, value-added data were not available, especially when the data set was provided at the class level.</td>
</tr>
<tr>
<td>3.</td>
<td>Teacher-education candidates analyzed the strengths and weaknesses of the data set. The data sets from the cooperating school district varied in reporting style, depending on the assessment and grade level. State assessments designated standards and level of proficiency (advanced, proficient, below proficient). Other assessment data included the Average Reporting Category Performance Index (RCPI) where whole-state data were compared to state, system, or school data. Lastly, value-added data were analyzed, when provided. The teacher-education candidates analyzed the data for strengths and weaknesses, using numeric data to support their analyses. Then, they provided numeric charts and graphs and a narrative, describing why they chose a particular strength or weakness. If a particular data set showed high proficiency, the teacher candidates addressed areas that may be improved to move students from proficient to expert levels. In addition, the teacher candidates identified smaller groups of students who were exhibiting nonproficient student-achievement levels and who may need to be targeted for instructional interventions. Teacher-education candidates’ analyses of the data included subgroups as they were reported.</td>
</tr>
<tr>
<td>4.</td>
<td>Teacher education candidates used state standards and local curriculum guides. Teacher-education candidates were asked to become familiar with the state standards that applied to their data set. They researched the standards that applied to their data set generally and the substandards for weakness areas, if given. Teacher-education candidates were asked to consider the following questions concerning the content: Where are these content areas found in the state standards? Are there substandards? When should the standards be addressed according to local curriculum guide calendars or pacing requirements? These resources were found online.</td>
</tr>
<tr>
<td>5.</td>
<td>Teacher-education candidates created both formative and summative assessments. Using formative assessments to inform teaching promotes student learning (Stiggins, 2005). In this step of the Data Chat, teacher-education candidates considered the assessment procedures they would incorporate as interventions based upon the strengths and weaknesses of the assessment data.</td>
</tr>
</tbody>
</table>

(Continued)
After student weaknesses had been identified, teacher-education candidates created assessment ideas for the time leading up to the next testing period. They created weekly formative assessments and monthly summative assessments to gauge student learning in the determined weakness areas. The assessments they created increased student learning through the school year so that when the next standardized tests were given, perceived weak areas had been directly addressed through both summative and formative assessments. State standards were correlated to each assessment.

6. Teacher-education candidates created specific instructional strategies as interventions to address weaknesses. Once weaknesses were identified and assessments constructed, the teacher-education candidates decided how they would address those weaknesses within the classroom. Questions they considered were the following: Which instructional strategies might be used to specifically address the weakness area? When would the district teachers use the instructional intervention? They were asked to create a minimum of three instructional interventions for each area of weakness, detailing each instructional strategy and why that strategy would impact the designated area of weakness. The research supporting the instructional strategy choice was cited, thus promoting the use of research-based instructional strategies. In addition, teacher-education candidates were required to detail differentiated instruction for each identified weakness. Instructional strategies were correlated to state standards.

7. Teacher-education candidates created a final report and presentation. The report included data-literacy group members, the type of data set, the specific test, when the test was given, strengths and weaknesses of student performance, numeric, graphical, and narrative descriptions of the weakness areas, formative and summative assessments to be given prior to the next testing period, and instructional strategies for interventions. In addition, the teacher-education candidates orally presented their results.

collected 78 surveys with 72 students completing both pre- and postsurveys. Our research question sought to determine how preservice teacher candidates perceived data-literacy behaviors before and after an instructional intervention whose focus was to teach participants how to understand, to analyze, and to use real school data effectively. Pre- and postscales were created by summing the numeric representation of each item’s Likert value (1–4). A paired \( t \) test comparison of the scales, \( t(56) = 12.81, p = .00 \), was conducted to determine participants’ comfort for the data-literacy behaviors before and after the instructional intervention.

RESULTS

Results indicate that participants perceived an increase in perceptions of comfort toward all data-literacy behaviors after the Data Chat intervention.
### Table 5. Data-Literacy Behavior and Percent Gain from Pre- to Posttest

<table>
<thead>
<tr>
<th>Question</th>
<th>Percentage of people who gained from pretest to posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulates numerical data for analysis and interpretation.</td>
<td>83.8</td>
</tr>
<tr>
<td>Maps between numerical data and a narrative representation of the data.</td>
<td>79.1</td>
</tr>
<tr>
<td>Maps between a narrative representation of the data and a graph or table.</td>
<td>75.8</td>
</tr>
<tr>
<td>Locates teacher or school-level value-added data.</td>
<td>71.6</td>
</tr>
<tr>
<td>Locates school, district, or statewide criterion-referenced data.</td>
<td>79.4</td>
</tr>
<tr>
<td>Identifies data set and assessment type.</td>
<td>76.6</td>
</tr>
<tr>
<td>Identifies instructional strengths based upon data.</td>
<td>70.1</td>
</tr>
<tr>
<td>Identifies instructional weaknesses based upon data.</td>
<td>70.6</td>
</tr>
<tr>
<td>Attends to distribution of scores and extreme quartiles, not just mean or portion above cut-score.</td>
<td>88.2</td>
</tr>
<tr>
<td>Appreciates effect of a few extreme scores on the mean.</td>
<td>65.7</td>
</tr>
<tr>
<td>Understands that student cohorts differ from year to year.</td>
<td>69.2</td>
</tr>
<tr>
<td>Identifies how to differentiate instruction based on data.</td>
<td>80.9</td>
</tr>
<tr>
<td>Develops formative assessments based upon instructional weakness.</td>
<td>74.6</td>
</tr>
<tr>
<td>Develops summative assessments based upon instructional weaknesses.</td>
<td>71.6</td>
</tr>
<tr>
<td>Applies varied instructional strategies/activities to address weaknesses based upon the data.</td>
<td>70.1</td>
</tr>
</tbody>
</table>

Table 5 illustrates the percentage gain from the pretest to the posttest for each survey item. Student having a higher rating of their “degree of comfort” for each data-literacy behavior on the posttest constitute a gain, as compared with their perception for the same item on the pretest. The majority of students indicated an increased comfort on each survey item (indicating a data-literacy behavior), with the highest percentage of students (88.2%) indicating a stronger awareness on the item “Attends to distribution of scores and extreme quartiles, not just mean or portion above cut score.” The item “Appreciates effect of a few extreme scores on the mean” reflects the lowest gain with 65.7% of the students indicating an increased comfort with that data-literacy behavior following the intervention. A majority of students (83.8%) indicated a stronger perception on the item “Manipulating numerical data for analysis and interpretation,” while 80.9% of students indicated that their confidence in “Differentiating instruction” increased based upon the Data Chat intervention and 74.6% of students report having more confidence with “Developing formative assessments” after the Data Chat intervention; 71.6% indicated more confidence in “Creating summative assessments.” Table 5 lists data-literacy behavior and percent gain from pre- to posttest.
Limitations and Next Steps

This study has several limitations. First, it describes one group of teacher candidates at one teacher-education institution. Second, the nonexperimental research design limits internal reliability. It is unknown whether the sample reporting of heightened perceptions of confidence of data literacy would result in increased student achievement versus a control group without the benefit of the instructional intervention. Thus, a causal relationship between the instructional intervention-teaching data-literacy behaviors and the student-achievement outcomes of those prepared with the Data Chat in teacher education cannot be established. Additionally, a history threat (A. Harris et al., 2006) to internal reliability is possible in that other concurrent events, such as teaching basic statistical methods as part of the assessment curriculum, may affect the perceptions of the teacher candidates in the study.

Perception research was an initial inquiry into using data literacy in teacher education. A subsequent analysis to determine the effectiveness of the Data Chat might follow teacher graduates, who were exposed to the intervention, and qualitatively explore their own uses of data in schools as practicing teachers. An additional experimental investigation, aimed at comparing the student outcomes of those teacher graduates trained with the Data Chat, with those who did not learn those data-literacy behaviors on the outcomes of student achievement may examine the reliability of the Data Chat for teacher-accountability purposes.

Results Conclusion

This study sought to investigate the influence of an instructional intervention called the Data Chat with teacher-education candidates participating in an assessment course. Results indicated that teacher-education candidates perceived significantly higher levels of comfort with all data-literacy behaviors, showing a gain in their awareness of comfort for each behavior measured by the survey. Limitations to the study include a contextual data set and threats to internal reliability. In the next sections, we discuss the implications of research and policy connecting student-achievement growth with teacher accountability for teacher education and conclude with a call for data literacy as the next literacy for teacher-education curricula.

DISCUSSION

In recent years, researchers have promoted teacher and teacher educators’ accountability for achievement outcomes of their students (Noell & Burns, 2006; Sanders & Horn, 1998) and public policy has reinforced the connection between student achievement and teachers. The Race to the
Top legislation defined “effective teachers as those whose students achieve acceptable rates of student growth” and provided substantive monies to adopt statewide policy, in part to evaluate teachers with student achievement data (U.S. Department of Education, 2009, p. 12). Moreover, appeals for linking student achievement with teachers and teacher-education preparation have come from within the profession. The National Council for the Accreditation of Teacher Education’s (NCATE) 2010 call to action, *Transforming Teacher Education through Clinical Practice*, promotes fostering collaborative relationships with school districts, longer residency programs for teacher educators, and “implementing accountability systems based on assessment measures of graduates’ and programs’ performance through value-added and other measures in state and district longitudinal data systems” (p. 25). One of the recommendations from the American Association of Colleges for Teacher Education (AACTE; 2011) suggested that teacher evaluation efforts should incorporate multiple measures of assessment including impact on student learning, classroom observations, peer reviews, and school-wide progress on meeting key indicators of success.

How are teacher education institutions responding to both internal and externals calls for linking student growth with teacher evaluations? A current study of 716 teacher educators at 4-year colleges in the United States titled *Cracks in the Ivory Tower: The Views of Education Professors Circa 2010* (Farkas & Duffet, 2010) suggested that few professors of education value the accountability goals of school districts. According to Farkas and Duffet, (2010), who investigated the policy views of education professors nationwide, “only 24 percent [of professors of education] believe it absolutely essential to produce teachers who understand how to work with the state’s standards, tests and accountability systems” (p. 4). If this research is accurate, there may be an uncoupling between the outcome goals of some teacher educators and the accountability realities for their teacher graduates who must work within their states’ accountability systems. Political accountability measures have demanded that teachers’ evaluations should be connected with student growth in over half of the states. As a result, teacher-education programs might consider more explicitly addressing the use and analysis of state or local data in teacher-education curricula to improve data-literacy efforts.

With the current educational climate relying heavily on the use of standardized-test data, there is an indication that practicing teachers may not have the training in their preparation programs to bridge their analysis of this data with the instructional interventions that can positively impact student performance. One of the most compelling arguments in support of including data literacy in teacher-education programs is accountability to the graduates of those programs. Teacher graduates’ evaluations may be directly tied to student-achievement measures within their first year as professional teachers as more states pass policy connecting teacher evaluations to student achievement.
outcomes. The most significant consequence of these recent public accountability measures for teacher educators is that program curricula must bridge the gap between teacher accountabilities for data literacy and their new graduates. Developing data-literacy curricula within teacher-education programs may enhance the prospects that teacher graduates may successfully read, interpret and use their own students’ data.

The Data Chat is just one instructional intervention that may be useful for teacher educators. Data literacy requires more than the reading, interpretation and use of standardized-testing data. Research regarding formative assessment from nonstandardized testing and performance-based assessments suggests that instructing teacher candidates in the processes of using ongoing data in their classroom is of value for promoting student learning (Stiggins, 2005).

Other instructional interventions to address data literacy, especially interventions that use teacher-made assessments on an ongoing basis, may be cultivated to augment teacher-education curricula. Teacher educators should continue to explore the most effective interventions to address data literacy. Moreover, teacher educators should continue to identify those data-literacy behaviors that result in the most effective influence on increasing student learning in the K–12 domain. We used many of the data-literacy behaviors that the U.S. Department of Education found helpful when exploring the ways that practicing teachers interacted with data (U.S. Department of Education, 2009b). Further collegial discussion concerning which data-literacy behaviors are of most value for new graduates in teacher education is essential. Developing common data-literacy standards would likely benefit teacher-training programs and their graduates throughout the United States.

CONCLUSION

What are the new literacies for the new millennium of teacher educators? Preparing teacher-education candidates for their future classroom responsibilities has never been more demanding. In addition to mastery of their academic content, teacher candidates are also expected to prepare their students to excel in the age of information fluency, to learn in a language that may not be their native language, to prepare for careers that have yet to be invented, to demonstrate at least a year’s worth of growth in every content area, and to stay abreast of each and every new idea that comes rolling down the hallway of the American schoolhouse.

In an era of increasing responsibility for student-achievement outcomes, teacher-preparation programs are adapting their programs to meet the changing needs of the field. New educational accountability policy measures, research associating individual teachers and the performance outcomes of their students, and local educational agencies’ need to use data have steered
teacher educators to yet another course of action as they prepare teacher-education candidates. We suggest that teacher preparation should consider orienting curricula to explicitly teach data literacy so that new educators comprehend, interpret and use data for instructional interventions. Data literacy has become the new literacy for the new millennium of teacher education.

REFERENCES


First to the Top Act, Pub.ch. No. 2, Senate Bill No. 7005 (2010).


APPENDIX 1: DATA-LITERACY SURVEY

The following behaviors refer to data comprehension, interpretation, and use for the purpose of increasing student achievement through data-driven instructional interventions.

Please respond to each item by indicating the degree of comfort you have for each data-literacy behavior. Individual responses will be kept confidential. Record your answers by marking the appropriate box for each item.

Key: very little (VL); some (S); considerable (C); very great (VG); not applicable (NA)

<table>
<thead>
<tr>
<th></th>
<th>VL</th>
<th>S</th>
<th>C</th>
<th>VG</th>
<th>NA</th>
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</thead>
<tbody>
<tr>
<td>1. Manipulates numerical data for analysis and interpretation.</td>
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<tr>
<td>2. Maps between numerical data and a narrative representation of the data.</td>
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<td>3. Maps between a narrative representation of the data and a graph or table.</td>
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<td>4. Locates teacher- or school-level value-added data.</td>
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<td>5. Locates school, district, or statewide criterion-referenced data.</td>
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<tr>
<td>6. Identifies data set and assessment type.</td>
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<tr>
<td>7. Identifies instructional strengths based upon data.</td>
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<tr>
<td>8. Identifies instructional weaknesses based upon data.</td>
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<tr>
<td>9. Attends to distribution of scores and extreme quartiles, not just mean or portion above cut-score.</td>
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<td>10. Appreciates effect of a few extreme scores on the mean.</td>
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<td>11. Understands that student cohorts differ from year to year.</td>
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<td>12. Identifies how to differentiate instruction based on data.</td>
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<td>13. Develops formative assessments based upon instructional weaknesses.</td>
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<tr>
<td>14. Develops summative assessments based upon instructional weaknesses.</td>
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<td>15. Applies varied instructional strategies/activities to address weaknesses based upon the data.</td>
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</table>

Please provide the following demographic information by circling the appropriate demographic area choice. It will be used for reporting purposes only and will not be used to identify individual responses.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
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</thead>
<tbody>
<tr>
<td>Age</td>
<td>18–20 Elementary Education</td>
<td>21–28 Special Education</td>
</tr>
<tr>
<td>Major/Minor</td>
<td>29–36 K–12 Education</td>
<td>37–44 Education minor</td>
</tr>
<tr>
<td></td>
<td>45–54 Education minor</td>
<td>Over 55</td>
</tr>
<tr>
<td>Minor Area (for noneducation majors)</td>
<td>English/ Language</td>
<td>History</td>
</tr>
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<td></td>
<td>HHP/ Music/ Theater</td>
<td>Math</td>
</tr>
<tr>
<td></td>
<td>Sciences</td>
<td>Other K–12 Area</td>
</tr>
</tbody>
</table>

HHP = Human Health Performance.