Forum Guide to Taking Action with Education Data

National Forum on Education Statistics

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National Cooperative Education Statistics System

The National Center for Education Statistics (NCES) established the National Cooperative Education Statistics System (Cooperative System) to assist in producing and maintaining comparable and uniform information and data on early childhood, elementary, and secondary education. These data are intended to be useful for policymaking at the federal, state, and local levels.

The National Forum on Education Statistics (the Forum) is an entity of the Cooperative System and, among its other activities, proposes principles of good practice to assist state and local education agencies in meeting this purpose. The Cooperative System and the Forum are supported in these endeavors by resources from NCES.

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Foreword

The National Cooperative Education Statistics System

The work of the Forum is a key aspect of the National Cooperative Education Statistics System. The Cooperative System was established to produce and maintain, with the cooperation of the states, comparable and uniform education information and data that are useful for policymaking at the federal, state, and local levels. To assist in meeting this goal, the National Center for Education Statistics (NCES), within the U.S. Department of Education, established the Forum to improve the collection, reporting, and use of elementary and secondary education statistics. The Forum deals with issues in education data policy, sponsors innovations in data collection and reporting, and provides technical assistance to improve state and local data systems.

Development of Forum Products

Members of the Forum establish task forces to develop best practice guides in data-related areas of interest to federal, state, and local education agencies. They are assisted in this work by NCES, but the content comes from the collective experience of the state and school district task force members who review all products iteratively throughout the development process. Documents prepared, reviewed, and approved by task force members undergo a formal public review. This public review consists of focus groups comprised of representatives of the product's intended audience, review sessions at relevant regional or national conferences, or technical reviews by acknowledged experts in the field. In addition, all draft documents are posted on the Forum website prior to publication so that any interested individuals or organizations can provide feedback. After the task force oversees the integration of public review comments and reviews the document a final time, publications are subject to examination by members of the Forum standing committee that is sponsoring the project. Finally, the entire Forum (approximately 120 members) reviews and formally votes to approve all documents prior to publication. NCES provides final review and approval prior to publication.

Contents

Overview

This is the Introduction to a series of briefs intended to serve as a guide to the skillful and appropriate use of education data. The purpose of this resource is to provide readers with practical information about the knowledge, skills, and abilities needed to identify, access, interpret, and use data to improve instruction in classrooms and the operation of schools, local education agencies (LEAs, also known as school districts), and state education agencies (SEAs).

To be used effectively, data need to be accurate, accessible, understandable, timely, and actionable.

Introduction: Expectations are Rising

Countless pieces of data are collected each day about students and their educational experiences, including information about attendance, classroom participation, assessment results, grades, responses to test questions, and discipline referrals. Other data are collected about schools and districts, such as student enrollment, program participation, staff characteristics, and facility condition. Additional data are collected about states, including the number and types of schools, revenues and expenses, program availability, and teacher licensure. These data are used for a wide range of purposes and are frequently summarized, aggregated and disaggregated, and otherwise combined to describe the educational status of students, schools, school districts, and states.

Data-driven decisionmaking is a term that was commonly referenced in the 1990s—as if it was a new concept ushered in by the application of innovative technologies like spreadsheets, databases, electronic data exchange, and the more widespread use of computers in general. But, while powerful, data-driven decisionmaking is only part of the equation for school success… data-driven action is what really improves education. For example, determining that migrant children are underserved in rural schools is only part of an effective solution; data-driven action must follow to allocate funding for after-school programs that will address the service deficiency and better meet the educational needs of the students.

All data use should occur within the context of an organization's data governance policies, which help to ensure proper oversight, high quality collection, suitable access, effective management, and appropriate use.

The truth is that education professionals have been using actionable data for a long time, but in many cases these "data" were mostly observational or anecdotal in nature. For example, an astute teacher might recognize when there were a lot of misspelled words in a writing assignment, indicating that the class needed more spelling instruction; a good principal would discern when too many fights were occurring in a particularly narrow hallway, indicating that a hall monitor was needed or students should be rerouted; and a wise administrator would notice if fifth graders across the entire school district were missing the same types of questions on a standardized math test, suggesting that the curriculum might need to be modified to strengthen a particular unit.

Not all data lead to useful information.

Not every combination of data produces information that helps an education organization in a meaningful way. For example, an advocacy group in one state took advantage of readily available technology to cross tabulate all data published by its SEA in order to create a volume of "indicators" for comparing the state's schools and districts. Because the organization included all available data elements and aggregates, the report included meaningless "indicators" such as Paper Towel Use per Student Mile Bused.

In an era of diminishing public resources, the effective use of data is about being efficient: once an education organization has gone to the effort of collecting data, failing to use the information to inform instructional, administrative, and policy-related activities is uneconomical, unwise, and a waste of a valuable information resource. Conversely, appropriate action, based on the right data at the right time, can lead education organizations to greater efficiency, educators to greater effectiveness, and students to greater academic achievement.

The Evolving Nature of Data Use

Intuition: Putting experience to use in recognizing anecdotal data (e.g., observing students, schools, and programs, and using anecdotal evidence to characterize performance, as occurs when a teacher recalls that Johnny keeps misusing capital letters in his writing assignments and may need a review lesson).

Compliance: Using data to determine whether an organization has met established requirements (e.g., reporting associated with funding streams such as special education or migrant education).

Accountability: Reporting outcomes on any of a range of performance metrics for which an education agency is responsible (e.g., the academic proficiency of student groups).

Decisionmaking: Relying on data to inform conclusions (e.g., instructional, operational, and policy choices).

Evaluation: Using data to assess the results of choices and actions (e.g., relying on data to inform an evaluation of the effectiveness of a reading program).

Data Use that Informs Action: Changing behavior based on what the data suggest (e.g., implementing interventions based on trends and outcomes identified through data)... and the goal of this document.

Data Experts and Data Users

Most data users don't need to become data experts, but they should possess the basic skills necessary to effectively use available data to make decisions and take actions related to their job responsibilities.

Education organizations often employ professional staff who are skilled in the collection, management, and reporting of education data, but most data users are not data experts—nor do they need to be. Instead, data users need to have the knowledge, skills, and abilities necessary to identify, access, understand, analyze, interpret, and use education data as appropriate to perform their respective duties in a school, district office, or state education agency. Although the specific knowledge, skills, and abilities needed to be a proficient data user may vary by role and organization, all key stakeholders in the education enterprise should be able to effectively incorporate data into their decisionmaking and actions. Responsible data users understand both the meaning and limitations of data, especially in light of changing policies, regulations, and practices governing data collection.

The Cycle of Data Use

Data use, like any process, involves a series of steps that build upon one another to achieve a desired goal. With respect to education data, the goal is to take action to improve the education system and student learning. The recommendations in this document are based

on a conceptual diagram of the cycle of data use that is intended to help readers appreciate the ways in which they will apply data use skills to accomplish their work in education organizations (figure 1). This cycle of data use consists of five primary phases or activities: (1) seek information; (2) access/gather data; (3) analyze/interpret data; (4) act; and (5) evaluate. Such a framework can serve as the basis for systematic data use for education stakeholders and will be revisited in each of the audience-specific briefs in this series.

Each step in the data use cycle supports the ultimate purpose of data use: taking action to improve the education system and student learning.

Figure 1. The Cycle of Data Use

This cycle serves as the framework for organizing content in Briefs I, II, and III.

Data Meaning: Even superficially similar terms can have very different meanings. For example

- "class size" is not the same as "student/teacher ratio";
- "completion rate" is not the same as "graduation rate"; and
- program "eligibility," "enrollment," "participation," and "completion" are not identical terms.

Data Limitations: There are logical, statistical, and common sense limits to the appropriate use of most types of data. For example

- many datasets reflect counts on specific collection dates and are not necessarily representative of conditions at other times in the same school year;
- private school students and homeschooled students are not necessarily included in many data collections and reports; and
- policy choices can strongly affect data values—in some districts, for example, students may be counted as in attendance if they are present during homeroom, while other districts maintain attendance for each class period throughout the school day.

1. Seek Information

Effective data users must refine their inquiries to meaningful and achievable units of analysis. They often begin by trying to recognize gaps between what they currently know and what they would like to know about their students, teachers, classrooms, curricula, programs, schools, districts, and states. Identifying these data "gaps" and subsequently trying to find information that fills those gaps leads a data user toward different sets of data depending on the information gap being addressed. As such, the design of a systematic data use process begins with key questions that support this most critical step in the wise and appropriate use of data for action: information seeking. Information seeking refers to the process of finding the right data to address the specific information needs at hand. For example, a very basic "information seeking" skill tells a teacher who is concerned about a sixth grade student's multiplication skills to look at the child's fifth grade math scores rather than the results of a recent spelling test. A more fine-tuned information seeker might know to look at the third quarter interim assessment results from the fifth grade, which focused on multiplication skills, rather than the summative assessment that covered a broad range of content standards. The point is that "information seeking" helps to appropriately fill the gap between what is currently known and what needs to be known by identifying the information (data) that most accurately, validly, and reliably provide the specific information needed to address the question(s) at hand. Steps in the information seeking process include

- ✓ recognizing when information is needed to inform a decision and direct an action;
- ✓ defining a meaningful and achievable scope of concern/unit of analysis;
- ✓ clearly articulating the issue at hand as a critical question;
- ✓ assessing what relevant data are already available;
- ✓ identifying "gaps" in currently available data;
- ✓ identifying potential barriers to finding the information and ways to overcome them;
- ✓ seeking additional data that are accurate, valid, reliable, timely, and relevant; and
- ✓ relying on data that are frequently valuable to education stakeholders including
  - enrollment data;
  - demographic data;
  - performance data;
  - engagement data;
  - health data;
  - college and career readiness data;
  - teacher data;
  - program data;
  - food and nutrition data;
  - financial data;
  - transportation data;
  - school data;
  - early childhood data;
  - college and university data; and
  - workforce data.

2. Access/Gather Data

Many people mistakenly believe that data are only collected in response to compliance and accountability mandates, but the reality is that data are collected for many purposes. Education data are collected to inform school operations, program management, resource allocation, and, not the least of all, instructional choices. In fact, many data collections are designed specifically to answer an organization's real-world questions and information gaps (as described in step 1 above). As such, the role of a prospective data user is to gather data that are most relevant to the questions they wish to address. Gathering data might require a new data collection but, in many cases, it is often about accessing data that have already been collected by someone else. By actively searching for data that best relate to the key questions (information gaps) at hand, stakeholders can gain access to powerful information that will, when appropriately used, better inform the decisions they make while carrying out their educational responsibilities. Steps to accessing/gathering data include

- ✓ identifying whether the needed data already exist;
- ✓ collecting the data, which often means gaining access to relevant data that have already been collected by someone else; and
- ✓ learning about the data, such as applicable definitions, limitations, timeliness, formatting, other data sets, etc., to ensure that the user fully understands the information (these "data about the data" are commonly referred to as metadata).

3. Analyze/interpret Data

How a user analyzes data will depend largely on the questions that have been asked (Step 1: Seek Information), their access to data needed to answer the questions (Step 2: Access/Gather Data), the analytical skills of the user, and the tools available to support analysis and interpretation (from paper reports to spreadsheets and software programs). The goal of analysis and interpretation is to derive logically (or statistically) sound evidence to inform decisionmaking and action. Oftentimes, this includes answers to questions related to what is working and what's not, what is changing over time, and what information is or is not available. Tasks related to analysis and interpretation include

- ✓ formatting the data in a manner that enables necessary analysis and interpretation; and
- ✓ determining the constraints of the data, such as the
  - unit of analysis (e.g., individual or aggregate)
  - data design (e.g., random sampling, comparison of cohorts and peers, etc.)
  - timeframe (e.g., a "snapshot" in time or longitudinal/trend data)
  - data purposes (e.g., formative versus summative assessment)
  - data quality (e.g., accuracy, reliability, timeliness, and completeness)
  - data bias (e.g., is the source an advocacy group or an objective researcher?)
  - data misuse (e.g., are these data often confused with other types of data , such as average class size and student/teacher ratio?); and
  - producing logically (or statistically) sound and defensible conclusions.

Data use to inform decisionmaking, not decisionmaking to inform data use.

It may be tempting to make a decision and then search only for those data that support it. Such "cherry picking" of data is an inappropriate and unethical use of data and is inconsistent with the principle of sound data use.

The proof of skilled data use is the application of insights from data in a practical and actionable way to improve the education system.

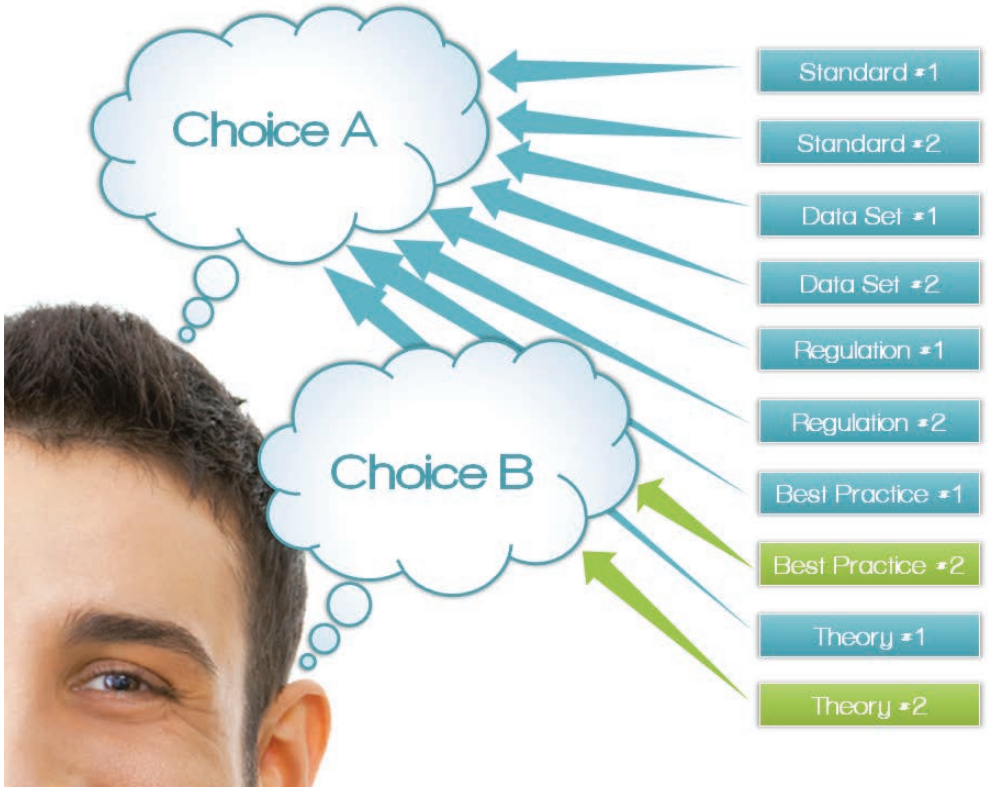

Figure 2. Analysis includes looking for patterns in the data. Rather than finding one piece of data and using it to make a generalization or draw conclusions that are beyond the scope of the single data point, identify multiple data sources that inform the analysis of the questions—a process sometimes referred to as "triangulation."

4. Act

This document defines data use as the systematic process of identifying information needs, gathering data, and analyzing and interpreting information for the purpose of taking action to answer a question, address a problem, or change a situation. It should be noted, however, that the skilled use of education data is a necessary, but not sufficient, component of improving teaching and learning. Other important information resources include a stakeholder's real-world experience, relevant laws and regulations, organizational policies and processes, and even theoretical research. Taken together, this body of information can help data users determine appropriate answers to their key questions, and enable the application of these insights in a practical and actionable way to improve educational processes.

Once a stakeholder has an adequate understanding of data meaning and limitations (see Step 3: Analysis/Interpretation), ethics often play a key role in determining appropriate and inappropriate use.[1] For example, inappropriate uses of data include

[1] For more information about the ethical use of education data, see the Forum Guide to Data Ethics, available at *http://nces.ed.gov/forum/pub_2010801.asp*.

- ✗ teachers using a single assessment score as the predominant component for evaluating a student;
- ✗ principals using past summative assessment scores to exclude certain students from future testing; guidance counselors using demographic or socioeconomic data as the primary predictor of individual academic potential; and
- ✗ state program administrators using geographic location as the sole criteria for awarding competitive grants to schools.

Appropriate uses of the same data might include

- ✓ using a body of fair and relevant factors to evaluate students;
- ✓ using past summative assessment scores to identify students in need of supplemental instructional services prior to future testing;
- ✓ using demographic or socioeconomic data to encourage and embrace diversity in school settings and recognizing the unique potential of each individual student; and
- ✓ using a comprehensive set of indicators to determine the fair allocation of program funds to schools across the state.

The cycle of data use presented in figure 1 is iterative in nature. Evaluation leads to more information seeking and effectively starts the cycle over again.

5. Evaluate

The cycle of data use presented in figure 1 is iterative in nature. Acting on data in a responsible manner can change the status quo—and wise data users will want to evaluate whether such change improves the situation. Sometimes this type of evaluation generates new questions or data needs that arise in response to data-informed action. Effective evaluation efforts often address questions such as

- ✓ To what extent has the initial issue been resolved effectively?
- ✓ What new concerns have arisen?
- ✓ Which factors are understood sufficiently and which warrant additional investigation?
- ✓ Have new data gaps (needs) been identified?

If the issue has been effectively addressed by data-informed action, it might be appropriate to share your experience with others and encourage them to use data to help with similar situations. If the issue hasn't been fully resolved, the cycle of data use repeats itself. When this occurs, stakeholders may need to engage the data cycle process again from the beginning (Step 1: Seek Information).

Skills Required to Effectively Analyze and Interpret Data

In order for data to be used to inform action, education stakeholders must feel secure about their ability to access, analyze, and use data in classroom, school, district, and state agency settings. Developing this confidence requires that stakeholders know enough about the data to ascertain their quality and applicability. They must also have a command of basic analytical skills needed to properly interpret and attribute meaning to the data. This includes the following core knowledge, skills, and abilities:

- understand what the data mean;
- view the data in an appropriate context;
- recognize the nature of the collection tool;
- identify bias in the collection source;
- assess the quality of the data;
- appreciate the assumptions and limitations of the data;
- comprehend the significance of error or uncertainty in the data;
- discern meaning in tabular and graphical data; and
- know how to effectively question data/report authors.

✓ Understand what the data mean. "Metadata" refer to "data about data"[2] and can include management items (e.g., definitions, formulas, usage restrictions, timeliness, and mandates), reporting information (e.g., anticipated use, key words, quality metrics), and technical information (e.g., field lengths, permitted values, translation history). High quality metadata deliver too much value to dismiss them as anything less than an essential information management tool, and they are the backbone of efficient, accurate, and useful data systems. Unfortunately, metadata are not accessible to data users unless the organization provides this access—generally through the development and implementation of a data dictionary or a more comprehensive metadata system. Such systems, when accompanied by a robust training program, serve as a critical link in an organization's efforts to improve data use. *Skills needed: Ensuring that data users have access to, and understand, metadata is an organizational responsibility—from the development and implementation of an appropriate metadata system to relevant and robust staff training. Education professionals will need to learn how to access and navigate such a system, as well as understand any data or technical terms included in the metadata system (e.g., business rules, permitted values, and translation history).*

[2] For more information about metadata, see the Forum Guide to Metadata: The Meaning Behind Education Data, available at *http://nces.ed.gov/forum/pub_2009805.asp*.

What Do the Data Mean?

The Graduation Rate in many states includes only those students receiving regular, standard, endorsed, or advanced diplomas. In contrast, the Completion Rate is generally used to measure graduates as well as students who receive a high school equivalency certificate, certificate of completion, or attendance certificate. The meaning of these similar data terms clearly depends on how the terms "graduate" and "completer" are defined, and anyone using the information would benefit from clear and accurate definitions for the terms.

✓ View the data in an appropriate context. Because a single piece of data cannot possibly supply all the information needed to assess the status of, or change in, an education system, painting an accurate picture of the education enterprise requires a body of relevant data, with each individual data element imparting a complementary piece of the puzzle. For example, when evaluating trends in student performance data, it may be appropriate to consider data on student mobility rates, class size, teacher assignment, and instructional expenditure per pupil. When such a body of data is developed, the result is a well-integrated, multidimensional data set with an analytical value that may be much greater than the sum of its parts. *Skills needed: Data users should become data literate in the broadest sense, developing an awareness of different types of data that might be relevant to the types of questions that arise in their work. Good usage also requires developing analytical skills that permit the integration of data from across the education domain. Such integration is not necessarily quantitative in nature (literally combining data into new data sets), but can instead relate to the qualitative skill of assimilating various perspectives to inform decisionmaking and action.*

Why is context critical?

A graduation rate of 40 percent might seem low, but what if it was at a school that specialized in trying to retain students who were at risk for dropping out? In such a case, context is critically important for interpreting a 40 percent graduation rate as tremendously successful in such a setting.

✓ Recognize the nature of the collection tool. Not all data collection tools are created equal. In fact, skilled researchers sometimes produce data sets that are intentionally limited in their applicability because of choices made while designing the instrument. Depending on the scope of the project and purpose of the data, such a limitation can be entirely acceptable under certain circumstances. For example, a sample survey may be less expensive than a universe collection, but the findings may not be applicable to a broader population. Similarly, interim assessments can provide very important information about how well students have learned material in a given unit, but these assessments, by their nature, aren't designed to be measures of content mastery for the purpose of grading at the course level. *Skills needed: Understanding the nature of a collection tool can be*

a complex undertaking. It is critical that data users have a thorough appreciation of the significant differences between major categories of collections (e.g., sample surveys versus universe collections) and assessments (e.g., interim versus summative assessments).While this knowledge is important to the fundamental tasks of being an education professional and should be learned in pre-service training, professional development on these topics is appropriate for many data users.

✓ Identify bias in the collection source. Some organizations publish data about an issue for the purpose of advancing a specific position or philosophy. As such, data users need to evaluate the trustworthiness of their data sources. For example, might a report about the effectiveness of a particular instructional resource be viewed differently if the data originated in an objective source (e.g., another local education agency using an independent evaluator) as opposed to being published by the company that sells the product? Similarly, it is possible that a group with a policy agenda might present data that support a particular position rather than a more balanced and objective evaluation of an issue. *Skills needed: Unlike some data skills that are heavily quantitative or analytical in nature, effectively evaluating the trustworthiness of a data source is mostly a function of effort: taking the time to research and apply common sense when evaluating the source.*

Do I really need to understand error?

The effects of error measures can have substantial impacts on the actions of teachers. For example, depending on the uncertainty of the measures, students hovering just above and just below proficiency on state assessments may be equally at risk to score below proficient on future assessments.

Timely data are useful data.
Acting on ten-year-old data is not likely to improve future educational outcomes. Make sure that the data you are using are timely enough to accurately describe current status and conditions.

✓ Assess the quality of the data. Education professionals have access to a wide range of data to help inform action. However, not all data are of comparable quality, and even when a data source is unbiased, it doesn't mean that the data being presented are valid. Consider, for example, a research paper from a doctoral candidate who, in spite of good intentions, is still developing the expertise needed to collect, analyze, and present data that are accurate and reliable. Similarly, sometimes the results of a first time collection reflect the unfamiliarity of the organizations responding to a new form (e.g., new business rules, terms that may not be well defined, and elements that have not previously been collected or reported), which can have a negative effect on data quality. *Skills needed: Assessing the validity and reliability of data may require considerable analytical training, but even a novice data user can improve the likelihood of sound usage by taking a few moments to consider some basic logical requirements of good data quality:*[3]

- *Is the source of the data valid (i.e., is it a good tool for measuring the issue at hand)? For example, an end-of-year science assessment that only tests content from the last*

[3] For more information about data quality, see the *Forum Guide to Education Indicators*, available at *http://nces.ed.gov/forum/pub_2005802.asp*.

eight weeks of the academic calendar is not likely to be a valid measure of student learning for the year.

- *Is the source of the data reliable (consistent)? For example, if a survey were to be administered to similar groups on different days, how likely is it that respondents would provide the same responses? If it is not likely to generate similar findings, the instrument may not be reliable and the quality of the data is uncertain.*
- *What utility do the data have? If the data have been collected, but never used by the stakeholders, then data quality may be questionable.*

✓ Appreciate the assumptions and limitations of the data. Data may be collected in a manner that constrains their applicability for use. Oftentimes, information about data meaning, format, and usage are available as metadata. For example, a "cohort graduation rate" is intended for assessing student success with respect to meeting the expectations for a regular diploma, but it is not a good measure of the number of students who completed high school in a particular year because it excludes students who did not graduate on time and students who earn certificates of attendance or high school equivalency degrees. Similarly, the results of a norm-referenced test are usually not a good instrument for evaluating changes to the instructional program precisely because norm-referenced instruments are intentionally designed to be relatively stable around a normal curve and less sensitive to variation in instructional practices. Good data use requires an understanding of the assumptions and limitations of each piece of data. *Skills needed: Inquire about information related to the collection, source, and definitions of the data. This may be available online or as part of a report, but may also require discussion with data managers and data stewards who can verify that the data are being used appropriately.*[4]

Trends (multiple points of data pointing toward the same general trend/conclusion) are more powerful than single data points that aren't supported by other data.

✓ Comprehend the significance of error and/or uncertainty in data. The statistical nature of some data collections (sample surveys, assessment results, etc.) means that some measurements reflect a certain amount of uncertainty. Confidence intervals and other methods of describing this uncertainty provide important information about the limits of data accuracy. While all data users do not need to understand the statistical methods for calculating error, they should understand that measurements often have limits to their accuracy. *Skills needed: While calculating error requires considerable statistical training, even a novice data user can improve the likelihood of sound usage by taking a few moments to consider the implications of error measures.*

[4] *Forum Guide to Building a Culture of Quality Data: A School and District Resource*, available at *http://nces.ed.gov/forum/pub_2005801.asp*.

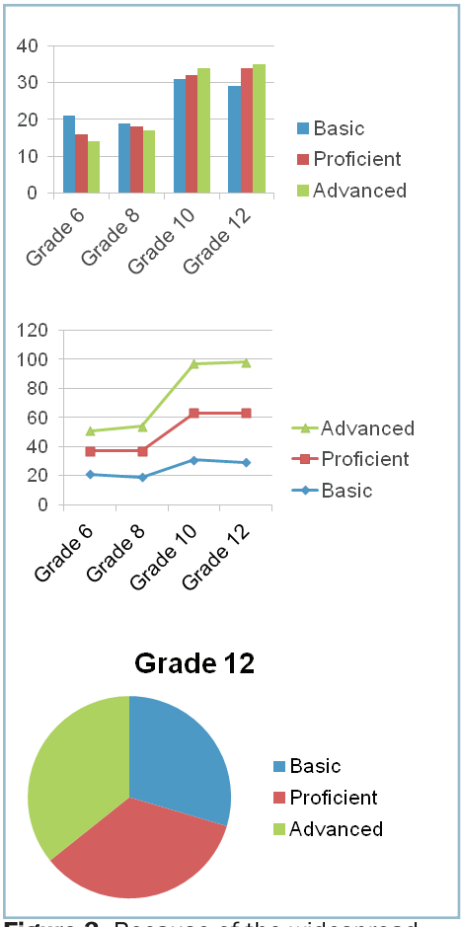

Figure 3. Because of the widespread use of tabular and graphical data, data users should become comfortable with, and even skilled at, analyzing data in tables and figures.

✓ Discern meaning in tabular and graphical data. Tabular data refers to the presentation of data in rows and columns, a practice that is common in education data reporting as well as many other fields. Graphs and figures are another frequently used method of presenting data. While graphs can, theoretically, occur in multiple dimensions, most reporting of education data focuses on two dimensions, usually referred to as the x- and y-axes in graphs. Other common graphical presentations include bar graphs, pie charts, and area charts. *Skills needed: Because of the widespread use of tabular and graphical data, data users should become comfortable with, and even skilled at, analyzing data in tables and figures. Interpreting tabular data requires that a user pay close attention to column and row titles as well as footnotes and other appended materials that often are included in tables to help clarify the presentation and meaning of the data. Reading a graph can be fairly straightforward, but understanding the relationship between the x- and y-axis data points requires some background knowledge. For example, the commonly cited statistical adage "correlation is not causation" is particularly applicable to graphical data—just because there appears to be a visual relationship between points on a graph does not mean that one variable caused the other to occur. As with tabular data, graphical data appear frequently in the field of education (e.g., an outcome measure reported over time). Similarly, pie charts and area charts are frequently used as a way of presenting data in a format that is more intuitively understood by users than tables of raw data.*

✓ Know how to effectively question data/report authors. Many data users do not feel they have the authority to question the "experts" who produce research reports and data sets. After all, these researchers often have advanced degrees in research and evaluation, statistics, education policy, or other fields of specialization. Nonetheless, when a data report or research finding is not clearly presented, at least with respect to the practitioners' needs, it is entirely appropriate for a data user to contact the source of the data to request clarification or correction. *Skills needed: Unlike some data skills that are heavily quantitative or analytical in nature, effectively questioning a data source is mostly a function of effort and confidence.*

A Question-Driven Approach to Data Use

This document recommends a question-driven approach to data use. For any given scenario that requires a stakeholder to use data to take action, the following questions can help to evaluate data needs and analysis—and inform decisionmaking and action. Table 1 presents an application of these questions in an example scenario.

- ✓ What do I want to know?
- ✓ What data might be relevant?
- ✓ How will I access the relevant data?
- ✓ What skills and tools do I need to analyze the data?
- ✓ What do the data tell me?
- ✓ What are my conclusions?
- ✓ What will I do?
- ✓ What effects did my actions have?
- ✓ What are the next steps?

In a 2007 survey, less than two-thirds of teachers reported using data from a student data system even a few times a year to track individual student test scores, estimate whether students were making adequate progress, identify gaps in skill development, or inform student placement in courses or special programs.[5]

Data Use Recommendations for Key Audiences

Education data are growing in quantity, quality, and value. When appropriately used to guide action, data can be a powerful tool for improving school operations, teaching, and learning. Education stakeholders who possess the knowledge, skills, and abilities to appropriately access, analyze, and interpret data will be able to use data to take action that benefits students, schools, and the entire education enterprise. See appendix A for examples of online resources that are readily available to enterprising individuals who understand the value of strong data use skills.

Whether data users have access to sophisticated data analysis solutions or simple reporting tools, this document is intended to provide helpful guidance for using data to take action. The briefs that accompany this Introduction are written for three key education audiences: Educators, School and District Leaders, and State Program Staff. Other likely audiences of this document include early childhood education leaders, higher education leaders, social services agencies, federal education staff, education policymakers, researchers, parents, and other education stakeholders.

[5] Source: U.S. Department of Education, available at *http://www.ed.gov/about/offices/list/opepd/ppss/reports.html#edtech*

Table 1. An illustration of how the question-driven approach to data use can be applied by teachers.[6]

Data Use Cycle	Framework	Scenario	Comments
	Scenario	A teacher observes that a student is not adding fractions properly.	An example of an academic situation that is likely to occasionally arise in a classroom setting.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know… Why is the student adding fractions incorrectly and what needs to be done to improve this skill?	Additional/secondary questions may also be relevant.
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include… ☒ observational and anecdotal data ☐ behavioral/discipline data ☒ homework and classwork records	Although there may be a wealth of data that could be evaluated, the scenario may warrant only a small subset of data for analysis. The selected boxes indicate the most relevant options to address this example/scenario.
	How will I access the relevant data?	Based on the relevant data, I will… ☒ consult the student's portfolio ☐ interview the student's parents about observational and anecdotal data	You may already have access to these data sources; other needs may require gathering data you do not already have. The process for accessing these data may vary by organization. The selected boxes indicate the most relevant options to address this example/scenario.
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to… ☒ relate, combine, and balance data from different sources ☒ assess the data quality and limitations	Don't be too quick to form an opinion based on one or even a few pieces of data. Use techniques such as triangulation to assimilate and evaluate the body of data in order to develop conclusions.
	What do the data tell me?	Based on this analysis, the data suggest… ☐ inconsistent or conflicting results ☐ an isolated event ☒ a trend	Is there a correlational relationship in the data? Is there a cause-effect relationship in the data? If it is a single incident, the teacher may choose to note it but do nothing more at this time. The selected boxes indicate the most relevant options to address this example/scenario.
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude… The student missed several lessons when the concept was originally being taught and the student shows only partial understanding.	If it is not a problem that requires action, then it is the end of the story. If it is a problem that requires action, then more information becomes necessary.
	What will I do?	Based on this conclusion, actions I will take include… ☐ find more information from other sources ☒ teach the material again or differently	What support is currently available to the student? Are there interventions I can propose to help the student? The selected boxes indicate the most relevant options to address this example/scenario.
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that… ☐ the student does not demonstrate improvement ☒ the student demonstrates that he or she now adds fractions at an appropriate skill level	At a later point in time, I can assess whether my action (based on data use) changed the situation. The selected boxes indicate the most relevant options to address this example/scenario.
	What are the next steps?	Based on my evaluation, I will… ☒ observe whether the student continues to demonstrate adequate mastery of fractions	If the situation is not completely resolved, the educator may wish to identify what specific issues still need to be addressed and return to the beginning of the data use cycle to seek new information that will inform action.

[6] In some cases, you may collapse these steps in your day-to-day application of this framework. For example, if you have taught a student for several months, you might already know the student's profile. In other instances, you may wish to rely on this framework more precisely as you formally analyze the data.

Forum Guide to Taking Action with Education Data

Brief 1: Data Use for Educators

National Forum on Education Statistics

Brief I: Data Use for Educators

Educators use data to better address student needs and classroom management

As an educator, you collect and use data all the time. Often, these data are real-time and observational in nature. For example, you might ask students to raise their hands if they think they know the meaning of a vocabulary word, or you might look over their shoulders at answers they are calculating on a math problem—and you are using these observational data to determine your next actions in the classroom. Particularly good teachers with a lot of experience may even be able to assess whether students understand the material just by watching the class's response to certain instructional cues. Just as these examples of "informal" data use help to improve teaching and learning in the classroom, other data can be used to actively inform instructional planning, classroom management, curriculum choices, and communication with school and district administrators.

With the recent development of more robust data systems, ranging from classroom data dashboards to statewide longitudinal data systems, educators have access to more data than ever before. The challenge is to use these data to improve teaching and learning rather than being overwhelmed by the possibilities of data use.

Educators access and analyze data for many reasons. For example, with the right data, you can

- ✓ identify areas of the curriculum in which a class or individual students are succeeding or struggling;
- ✓ modify instruction for individuals or groups of students based on their learning needs, and adjust or adapt lesson plans or assignments as needed to differentiate classroom-level needs (e.g., revisit content areas, slow or speed up the pace of the curriculum, or enrich coursework);
- ✓ set or adjust classroom-level improvement goals;
- ✓ identify practices that have shown the most positive effect on student learning;
- ✓ identify students demonstrating signs of engagement or disengagement and how it affects their behavior and academic performance;
- ✓ collaborate with (and learn from) other educators when data suggest they are particularly effective in certain subjects or with specific instructional practices; and
- ✓ communicate effectively with school administrators, district leaders, and peers in other classrooms.

Data use in the classroom is not new. Historically, educators have been asked to use data to answer a wide range of questions:

- ✓ *Instruction*: e.g., Do these spelling (or other subject matter area) test results suggest that a student is ready to proceed to the next lesson, or should I provide some review exercises?
- ✓ *Classroom Management*: e.g., How many milk orders do I need for my kindergarten class today?
- ✓ *Compliance*: e.g., Am I giving enough time to vocabulary lessons to meet the district's stated policy on minutes on task?
- ✓ *Accountability*: e.g., Is my class achieving our performance goals?

Steps to seeking information include

- ✓ Recognizing when information is needed to inform a decision and direct an action.
- ✓ Defining a meaningful and achievable scope of concern/unit of analysis.
- ✓ Clearly articulating the issue at hand as a critical question.
- ✓ Assessing what relevant data are already available.
- ✓ Identifying "gaps" in currently available data.
- ✓ Identifying potential barriers to finding the information and ways to overcome them.
- ✓ Seeking additional data that are accurate, valid, reliable, timely, and relevant.

The Cycle of Data Use

How do people use data?

Wise data use should help to increase the effectiveness of an educator's primary purpose: instructing students. The cycle of data use presented in figure 1.1 has data use to inform action as its primary goal. As such, the cycle is based on a framework consisting of five iterative phases (or activities): (1) seek information; (2) access/gather data; (3) analyze/interpret data; (4) act; and (5) evaluate. Such a framework can serve as the basis for the systematic use of education data in classrooms and schools.

Figure 1.1 The Cycle of Data Use. For a deeper discussion about the cycle of data, see the Introduction to the series Forum Guide to Taking Action with Education Data, available at *http://nces.ed.gov/forum/publications*.

1. Seek Information

"What data do I have versus what data do I need?"

"Wise data use" requires that educators be efficient in their search for useful data. To be effective, data use should be driven by well-defined questions. For example, rather than trying to find data to address a very broad question such as, "How can I improve reading?" it is likely that a more precisely worded question, such as "Are students demonstrating that they are comprehending reading tasks?" will enable you to find more relevant data to inform planning and action.

When faced with such a question, ask yourself, "What information do I need (and not currently have) to answer this question?" Identifying these gaps will point you toward different types of data depending on the information gap you hope to address. For example, with the question above about reading comprehension, in addition to formative assessment results (data you already have), you might seek data related to language and language arts, such as vocabulary scores, language fluency, language proficiency, and reading data from previous years of schooling.

2. Access/Gather Data

"What data do I have and what data can I get?"

As an educator, what data do you use from national, state, regional, district, or school data systems? Are these data accessible via downloadable data files, grade books, reports, spreadsheets, a data warehouse, a student management system's portals, dashboards, analysis instruments, or graphical visualization tools? In addition to information collected about students (e.g., observations, informal assessments, homework assignments, etc.), you may be able to access a host of data from annual summative assessments and more frequent interim and formative assessments, as well as demographic, attendance, discipline, program participation, and other datasets. Depending on your information needs, these may be aggregate level (e.g., grade-level or building-level) or individual-level (e.g., Student First Name), snapshot or longitudinal in nature, observational or recorded, and may be in the form of raw numbers for analysis or customized reports that present data specifically for the easy use of educators.

For example, suppose a parent challenges the final grade given to a student in a course you teach. As the educator responsible for the grade, you might be expected to explain your decision. In this scenario, it is likely that the data access/gathering phase might focus on a host of data from your electronic grade book, including exam scores, quiz scores, and homework points. However, many teachers also include other sources of information when calculating grades, including class attendance (from the student management system), class participation (from handwritten notes), projects and presentations (from a portfolio), and academic improvement over time (from the student record system). Collecting these data often requires engaging numerous data sources, and sometimes the challenge is not

Steps to accessing/ gathering data include

- ✓ Identifying whether the needed data already exist.
- ✓ Collecting the data, which often means gaining access to relevant data that have already been collected by someone else.
- ✓ Learning about the data, such as applicable definitions, limitations, timeliness, formatting, other data sets, etc. (often referred to as metadata), to ensure that you fully understand the information.

in finding the data, but understanding them (see Step 3: Analyze/Interpret Data). Gaining access to data may also be a challenge if you request personally identifiable data. You should always consider whether de-identified or aggregate data would meet your needs.

3. Analyze/Interpret Data

"What do the data suggest?"

Having access to needed, relevant data is necessary, but not sufficient, for appropriate data use. You must also be able to skillfully analyze and take appropriate action based upon the information to change instructional or classroom management practices. Research has shown these data skills to be the areas of training that teachers are the least likely to receive,[7] but strengthening these skills is possible through individual effort as well as thoughtful professional development targeted to educators by local and state education agencies. Educators who are good data users usually understand

- ✓ the meaning of the data (e.g., interim assessment results are not the same as summative assessment results);
- ✓ commonly used measures for school and student performance reporting (e.g., a scale score is not the same as a percentile score);
- ✓ basic statistical concepts (e.g., mean, median, and mode);
- ✓ trends (e.g., multiple points of data pointing toward the same general trend or conclusion are more powerful than one or two data points that aren't supported by other data);
- ✓ common presentation formats (e.g., tabular reports as well as graphs and charts);
- ✓ assumptions that limit the appropriate use of data (e.g., a good reading score does not automatically mean that the student is strong in all language arts areas); and
- ✓ the value of collaborating with colleagues (e.g., instructional staff relying on data staff to advance understanding).

Failure to understand these aspects of data can result in either ignoring data completely when making decisions or, perhaps worse, using data confidently but incorrectly (e.g., misinterpretation, over-interpretation, or inappropriate application).

Steps to analyzing and interpreting data include

- ✓ Formatting the data in a manner that enables sound analysis and interpretation.
- ✓ Determining any limitations on, or constraints to, data use, including consideration of the data's
  - purpose;
  - quality;
  - bias; and
  - timeliness.
- ✓ Reviewing whether conclusions are logically and statistically sound and defensible.

[7] On the NETTS teacher survey (U.S. Department of Education 2009), the majority of teachers with access to student data systems reported that they use the systems to provide information to parents (68 percent), track individual test scores, and monitor student progress (both 65 percent). Less common uses of data—reported by just over a third of the teacher survey respondents—were identifying promising practices (39 percent), informing student placement in courses or special programs (37 percent), and assessing test taking needs (36 percent). Source: U.S. Department of Education, Office of Planning, Evaluation, and Policy Development, Use of Education Data at the Local Level From Accountability to Instructional Improvement, Washington, D.C., 2010, available at *http://www2.ed.gov/rschstat/eval/tech/use-of-education-data/use-of-education-data.pdf*.

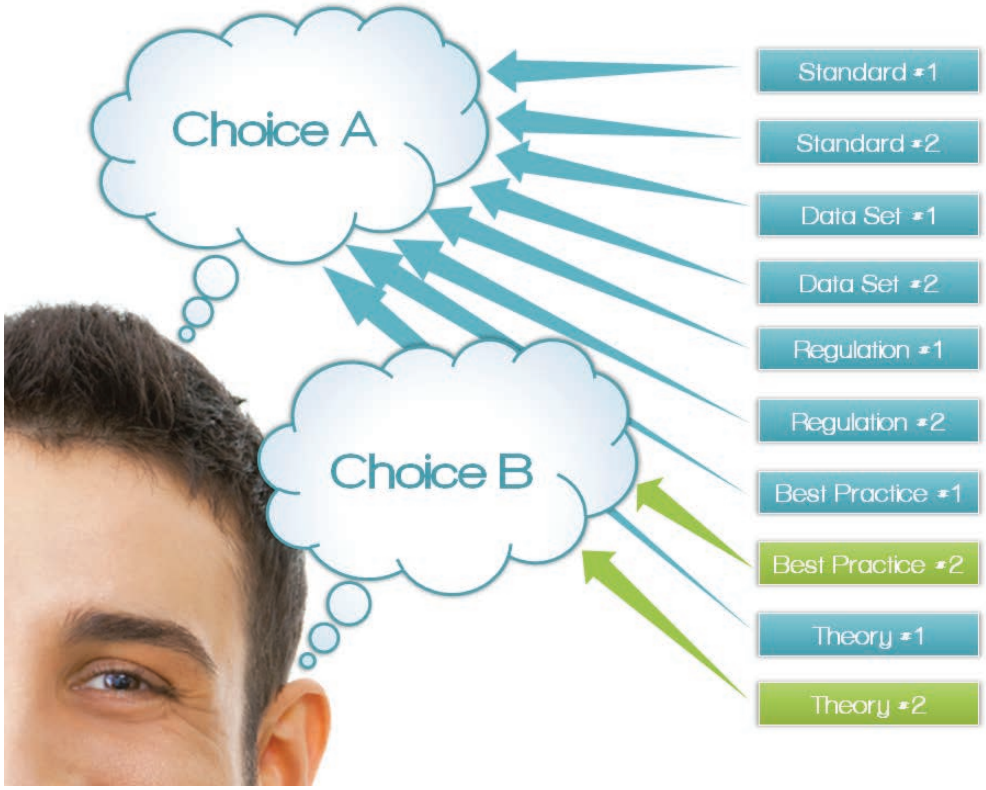

Figure 1.2 Analysis includes looking for patterns in the data. Rather than finding one piece of data and using it to make a generalization or draw other conclusions that are beyond the scope of the single data point, identify multiple data sources that inform the analysis of the questions—a process sometimes referred to as "triangulation."

4. Act

"How can data be acted upon to improve educational processes and outcomes?"

By definition, "actionable" data refer to information that allows a decision to be made and action to be taken. When you, as an educator, are data literate, you are able to supplement your education expertise and personal experience in the classroom with the right data for the right purposes: to improve instruction and performance. For example, assessments in many states are used to determine whether academic performance targets are being met for accountability purposes. However, those same assessments often generate item response data for individual students or groups of students. When assessments are designed to provide meaningful feedback at this level, teachers, instructional support staff, and building principals can work with data staff to identify concepts that students have mastered, as well as those topics that may warrant review. This analysis can occur for an individual student, groups of students (e.g., by common subgroups such as race/ethnicity, language learners, and socioeconomic status), and at the classroom and grade levels. Trends in these data can then be used to assess the relative strengths and weaknesses of the curriculum and various instructional strategies. Based on these findings, you may even change or supplement the curriculum as necessary to better meet the specific learning needs of your students and classes.

5. Evaluate

"Has the issue changed for the better?"

Actionable data are powerful tools that often lead to change. The question is whether this change is for the better and whether the situation has improved sufficiently to have adequately addressed the original concern. For example, if you apply the data use cycle to help a student improve reading comprehension, it is critical to learn whether the student did, in fact, improve. But it is equally important to assess whether that improvement resulted in the student achieving expected growth targets rather than just building rudimentary skills that are still not satisfactory. As such, determining whether the original issue has been adequately addressed is an important component of the data use process. This type of evaluation often includes consideration of the following types of questions:

- ✓ How effectively has the initial issue been resolved?
- ✓ What new concerns have arisen?
- ✓ Which factors are understood sufficiently and which warrant additional investigation?
- ✓ Have new data gaps (needs) been identified?

If the issue has been effectively addressed by data-informed action, then you may wish to share your experience with colleagues and encourage them to use data to deal with similar problems. If the issue hasn't been fully resolved, the cycle of data use repeats (see Step 1: Seek Information).

Critical Data Use Skills

As an educator, you were trained to teach students and assess academic progress. Data are becoming increasingly relevant to these duties. Some fundamental knowledge, skills, and abilities needed to effectively analyze and interpret data—and thus use education data effectively—include

- ✓ Understand what the data mean. Is a completion rate the same as a graduation rate? Do completion rate data in a table refer to a point in time during a particular academic year, or an average over several years? Data users have difficulty knowing what the data really mean unless they understand data definitions, how the data are collected and formatted, and other usage guidance and limitations. Data about data are often referred to as "metadata."[8]

- ✓ View data in an appropriate context. Data users should avoid jumping to a conclusion based on a single piece of data without being sure they understand the context of the data. When you evaluate data, think about complementary information that paints a richer picture of a student's education experience. For

[8] *Forum Guide to Metadata: The Meaning Behind Education Data*, available at *http://nces.ed.gov/forum/pub_2009805.asp*.

example, if you notice that a student misbehaves every day at 11:00 a.m. during language arts class, it is possible that the student doesn't like language arts, but given that the behavior occurs at the same time each day, it is also possible that something other than language arts is the problem. Could it relate to external factors such as the student not eating breakfast in the morning or anxiety prior to the lunch hour where, perhaps, the student is being bullied? The point is that the inappropriate behavior occurs within the broader context of the student's life, and remedying the situation may require data that reflect that broader context.

What Do the Data Mean?

The Graduation Rate in many states includes only those students receiving regular, standard, endorsed, or advanced diplomas. In contrast, the Completion Rate is generally used to measure graduates as well as students who receive a high school equivalency certificate, certificate of completion, or attendance certificate. The meaning of these similar data terms clearly depends on how the terms "graduate" and "completer" are defined, and anyone using the information would benefit from clear and accurate definitions for the terms.

✓ Recognize the nature of the collection tool. Most data collection tools are designed to generate data for a specific purpose. For example, some assessments measure skill development across a broad spectrum, others evaluate content mastery relative to a standard criteria, and still others are used to rank student performance relative to other students. Similarly, some reading assessments are especially sensitive to skill development in emerging readers but less effective indicators of progress being made by strong readers. Thus, each type of assessment is constructed for a different purpose, which should inform how the results are used.

Why Does Context Matter?

Temperature is a measurement most people think they understand, but to correctly interpret it as information requires additional context.

- What is the scale? Degrees Celsius or Fahrenheit?
- Is it the high or low temperature for the day?
- Is it the current temperature, yesterday's temperature, or tomorrow's predicted temperature?

This context is critical to using the piece of data as information. In its absence, "28" could mean 28° Fahrenheit as the day's high temperature (brrr, is it cold) or 28° Celsius (the equivalent of 82° Fahrenheit) as tomorrow's predicted low temperature (wow, will it ever be a scorcher).

- ✓ Identify bias in the collection source. Be wary of data sources that may have a bias. For example, what if you were given data that showed that buying a piece of instructional software could substantially raise your district's reading scores? As an educator, would you view the data differently if the data originated in an objective source (e.g., a colleague in the neighboring district) as opposed to being published by the company that sells the product?

Do I really need to understand error?

The effects of error measures can have substantial impacts on the actions of teachers. For example, depending on the uncertainty of the measures, students hovering just above and just below proficiency on state assessments may be equally at risk to score below proficient on future assessments.

- ✓ Assess the quality of the data. Data quality will limit the effectiveness of actions based on data. In other words, are your data accurate, reliable, and timely? For example, an end-of-year science assessment that only tests content from the last eight weeks of the academic calendar is not likely to be a valid measure of student learning for the entire year. Similarly, if a survey were to be administered to similar groups on different days, how likely is it that respondents would reliably provide the same responses? If it is not likely to generate similar findings, the instrument may not be reliable and the quality of the data is uncertain.[9]

Timely data are useful data. Acting on ten-year-old data is not likely to improve future educational outcomes. Make sure that the data you are using are timely enough to describe current status and conditions.

- ✓ Appreciate the assumptions and limitations of data. Oftentimes, information about data meaning, format, and usage are available as metadata (data about data). For example, the results of a norm-referenced test are designed to reflect a normal curve, meaning that such an assessment is usually not a good tool for evaluating changes to the instructional program. Good data use requires an understanding of the assumptions and limitations of each piece of data. As an educator who needs to act on data, you should expect to collaborate with data managers, data stewards, or other staff responsible for explaining the intricacies of data elements, formulae, definitions, formats, and meaning.

- ✓ Comprehend the significance of error and/or uncertainty in data. While calculating error requires considerable statistical training, even a novice data user can improve the likelihood of sound usage by taking a few moments to consider the implications of error measures. As an educator, you should understand that confidence intervals and other methods of describing uncertainty provide important information about the limits of data accuracy.

[9] *Forum Curriculum for Improving Education Data: A Resource for Local Education Agencies,* available at *http://nces.ed.gov/forum/pub_2007808.asp.*

- ✓ Discern meaning in tabular and graphical data. Because of the widespread use of tabular and graphical data in school, district, and state reporting, you will want to become comfortable with, and skilled at, analyzing data in these formats. Interpreting tabular data requires that you pay close attention to column and row titles, as well as footnotes and other appended materials, which often provide the context in which to interpret meaning. Reading a graph can be fairly straightforward, but understanding the relationship between the x- and y-axis requires some training. For example, the commonly cited statistical maxim, "correlation is not causation" is particularly applicable to graphical data—just because there is a visual relationship between points on a graph does not mean that one variable caused the other to occur.

- ✓ Know how to effectively question data/report authors. Sometimes the class roster you receive from the district is wrong. Other times, research reports draw conclusions that don't seem obvious from the data. How does an educator deal with inaccurate, misleading, or poorly presented data? Unlike some data skills that are heavily quantitative or analytical in nature, effectively questioning a data source is mostly a function of effort and confidence. When a data report or research finding appears to be inaccurate, misleading, or unclear to you, a practicing educator, then it is entirely appropriate to contact the source of the data to politely and professionally request clarification or correction. In addition to addressing your immediate concerns, you may help the author make the data more accurate, understandable, and actionable for the entire education community.

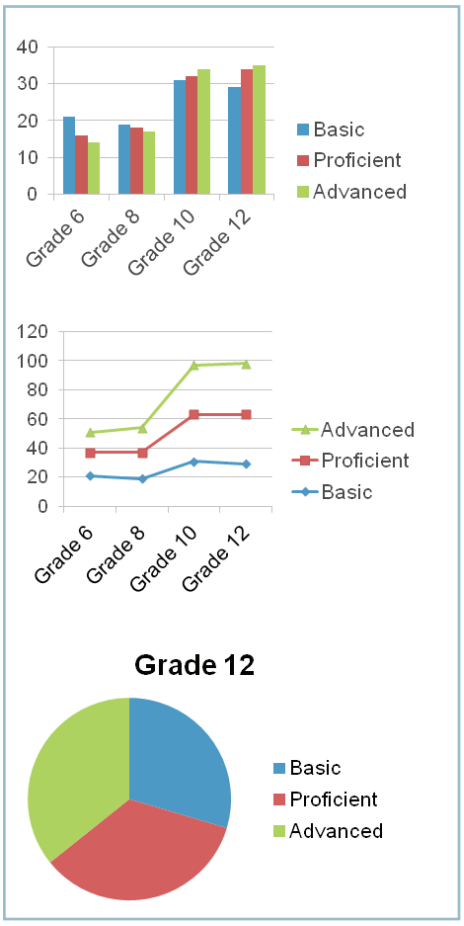

Figure 1.3. Because of the widespread use of tabular and graphical data, data users should become comfortable with, and even skilled at, analyzing data in tables and figures.

Training and Skill Development

Ideally, educator preparation programs would begin the process of developing data use skills. Current professionals might receive informal support through peer-to-peer study and professional learning communities. A great deal of information concerning the processes and techniques that support good data use can also be found online by enterprising individuals who understand the value of strong data use skills. More formally, professional development opportunities might include training that emphasize topics such as recognizing whether data are within acceptable ranges, identifying patterns or trends in the data, and applying this information to solve real-world problems. Similarly, trainers with data expertise can develop a staff's quantitative skills, such as appreciating the meaning of error measures; calculating the amount of change in a variable presented in charts, tables, and graphs; and interpreting the significance of statistical summaries of large data.

A Question-Driven Approach to Data Use

Using the skills described in the previous section, educators can rely on a question-driven approach to data use for nearly any scenario that requires making a data-informed decision and taking data-informed action.

- ✓ What do I want to know?
- ✓ What data might be relevant?
- ✓ How will I access the relevant data?
- ✓ What skills and tools do I need to analyze the data?
- ✓ What do the data tell me?
- ✓ What are my conclusions?
- ✓ What will I do?
- ✓ What effects did my actions have?
- ✓ What are the next steps?

Tables 1 and 2 illustrate how these questions can be applied to example scenarios commonly seen by educators.

Table 1. An illustration of a question-driven approach to data use for various scenarios facing educators (example 1)[10]

Data Use	Framework	Scenario	Comments
	Scenario	A teacher observes that a student's math performance is declining.	An example of an academic situation that is likely to occasionally arise in a classroom setting.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know… Is the declining math performance part of a broader pattern of declining performance or related to a specific issue?	Additional/secondary questions may also be relevant.
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include… ☒ observational and anecdotal data ☐ health information ☐ family information ☐ behavioral/discipline data ☒ homework and classwork records ☒ interim benchmarks ☒ past math test results ☒ classroom assessments (projects, quizzes) ☒ historical end-of-year math tests ☐ other assessment data ☐ student attendance records ☐ teacher assignment/attendance data	Although there may be a wealth of data that could be evaluated, the scenario may warrant only a small subset of data for analysis.
	How will I access the relevant data?	Based on the relevant data, I will… ☒ consult colleagues about observational and anecdotal data ☒ reflect on my recent experiences with the student ☒ consult the student's portfolio to review past work ☒ query the student information system for interim benchmark data ☒ use my gradebook to review the student's homework data ☐ ask the student's parents about observational/anecdotal data	You may already have access to these data sources; other needs may require gathering data you do not already have. The process for accessing these data may vary by organization.
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to… ☒ understand the context and how the data are presented ☒ organize the data in a way that applies to this situation ☒ relate, combine, and balance information from different sources ☒ assess the data quality and limitations	Don't be too quick to form an opinion based on one or even a few pieces of data. Use techniques such as triangulation to assimilate and evaluate the body of data in order to develop conclusions.
	What do the data tell me?	Based on this analysis, the data suggest… ☐ inconsistent or conflicting results ☐ an outlier ☐ an isolated event ☒ a trend	Is there a correlational relationship in the data? Is there a cause-effect relationship in the data?

[10] In some cases, you may collapse these steps in your day-to-day application of this framework. For example, if you have taught a student for several months, you might already know the student's profile. In other instances, you may wish to rely on this framework more precisely as you formally analyze the data.

Table 1. An illustration of a question-driven approach to data use for various scenarios facing educators (continued)

Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude… The student missed a fundamental concept that was taught at the beginning of the year and is showing only partial understanding.	If it is not a problem that requires action, then it is the end of the inquiry. If it is a problem that requires action, then more information becomes necessary.
	What will I do?	Based on this conclusion, actions I will take include… ☐ find more information (check other data sources) ☐ teach the material again (doing again rather than differently) ☒ spend extra time with the student ☒ send extra practice exercises home ☐ recommending changes to the curriculum ☒ communicate with: ☒ the student ☐ the student's parents ☒ instructional support staff ☐ curriculum advisors	What support is currently available to the student? Are there interventions I can propose to help the student?
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that… ☐ the student did not demonstrate improvement ☐ the student demonstrated partial improvement ☒ the student demonstrated that he or she now understands the concept at an appropriate skill level	At a later point in time, I can assess whether my action (based on data use) changed the situation.
	What are the next steps?	Based on my evaluation, I will… ☒ continue to monitor the situation ☒ observe whether the student continues to demonstrate adequate mastery of fractions ☒ determine whether additional intervention is needed ☒ observe whether other students are having this problem ☒ if other students are not having this problem, then the response (action) will likely focus on the individual student ☒ if other students are having this problem, then the response (action) may be an instructional or curriculum issue ☒ evaluate whether subsequent questions have arisen and, if necessary, use this question-driven approach to data use to advance the inquiry	If the situation is not completely resolved, the educator may wish to identify what specific issues still need to be addressed and return to the beginning of the data use cycle to seek new information that will inform future action.

Table 2. An illustration of a question-driven approach to data use for various scenarios facing educators (example 2)[11]

Data Use Cycle	Framework	Scenario	Comments
	Scenario	A 5th grade teacher is preparing an instructional plan for the upcoming school year and wants to know whether last year's plan was effective.	A common occurrence for educators. Good teachers often customize previously successful instructional plans to meet the learning needs of incoming students.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know… Did the students in my classroom last year demonstrate sufficient academic progress?	Subsequent questions include: What is the academic and behavioral profile of individual students in the class? Are there particular academic and behavioral situations to accommodate? What modifications should I make to last year's instructional plan?
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include… ☒ Academic performance data ☒ 4th grade summative assessments ☒ 5th grade summative assessments ☒ Academic growth data ☒ Baseline performance data ☒ Past trajectory performance data ☐ Previous classroom experience data ☐ Anecdotal data concerning the strengths weaknesses of teachers ☒ Program participation data ☒ Students identified as having special learning needs ☒ Standards data ☐ Mobility data ☐ Attendance data ☐ Discipline data ☒ Curriculum data ☒ Curriculum changes	Although there may be a wealth of data that could be evaluated, the scenario may warrant only a small subset of data for analysis.
	How will I access the relevant data?	Based on the relevant data, I will… ☐ consult colleagues about observational and anecdotal data ☒ reflect on my recent experiences with the students ☒ consult the students' portfolio to review past work ☐ query the student information system for interim benchmark data ☒ query the student information system for summative data ☒ query the student information system for program participation data ☐ use my gradebook to review the students' homework data	You may already have access to these data sources; other needs may require gathering data you do not already have. The process for accessing these data may vary by organization.

[11] In some cases, you may collapse these steps in your day-to-day application of this framework. For example, if you have taught a student for several months, you might already know the student's profile. In other instances, you may wish to rely on this framework more precisely as you formally analyze the data.

Table 2. An illustration of a question-driven approach to data use for various scenarios facing educators (continued)

Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to… ☒ understand the context and how the data are presented ☒ organize the data in a way that applies to this situation ☒ relate, combine, and balance information from different sources ☒ assess the data quality and limitations	Don't be too quick to form an opinion based on one or even a few pieces of data. Use techniques such as triangulation to assimilate and evaluate the body of data in order to develop conclusions.
	What do the data tell me?	Based on this analysis, the data suggest… ☒ the students in my classroom last year demonstrated sufficient academic progress ☐ the students in my classroom last year did not demonstrate sufficient academic progress ☒ there are curriculum changes that demand changes to the instructional plan ☐ there are not curriculum changes that demand changes to the instructional plan	Are there gaps in the data? In other words, are data that would be helpful to evaluate missing or otherwise unavailable? If so, who needs to be told this information so that it can be corrected in the future?
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude… ☐ the instructional plan from last year was not effective ☒ the instructional plan from last year was effective ☒ curriculum changes need to be integrated into the instructional plan	If it is not an issue that requires action, then it is the end of the story. If it is an issue that requires action, then more information becomes necessary.
	What will I do?	Based on this conclusion, actions I will take include… ☐ do not modify last year's instructional plan ☒ make focused /specific changes to last year's instructional plan ☐ create a new instructional plan ☐ identify deficiencies in the curriculum ☐ find more information (check other data sources)	Although the instructional plan may appear to be successful, it is possible that changes to the curriculum could warrant updates to the plan.
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that… ☒ the revised instructional plan is appropriate for the new class ☐ the revised instructional plan is not appropriate for the new class	At a later point in time, I can assess whether my action (based on data use) was successful.
	What are the next steps?	Based on my evaluation, I will… ☒ observe whether students in the class continue to demonstrate sufficient academic progress ☒ assess the specific needs of future incoming classes	If the situation is not completely resolved, the educator may wish to identify what specific issues still need to be addressed and return to the beginning of the data use cycle to seek new information that will inform future action.

Conclusions

High quality and timely data are powerful tools for improving teaching, learning, and the entire education enterprise. Thoughtful application of the frameworks, principles, and questions recommended in this Brief will help educators use data to inform decisionmaking and actions related to individual students, groups of students, classes, lesson plans, curricula, and other critical aspects of the business of educating students, managing classrooms, and operating schools. The Practical Exercise below provides a resource for applying these recommendations when dealing with actual issues or illustrative scenarios. While these skills can be developed by individual educators and should be a component of pre-service education, skill development at a staff level will be enhanced by the delivery of professional development curricula around this area of growing importance for faculty and staff. Many educators will benefit from collaborating with colleagues when completing these data use scenarios.

Practical Exercise for Educators: Using What You've Learned

Educators face a wide range of issues that require that they make decisions each and every day. Following the question-driven approach to data use described in Brief I, work individually or brainstorm with colleagues to complete the tables below. Be as realistic as possible in your responses, using real data sources, practices, and people in your organization so as to make the scenario as useful as possible.

Data Use Cycle	Framework	Scenario	Comments
	Scenario	An elementary school teacher is preparing an instructional plan for the upcoming school year.	A common occurrence for educators.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know…	
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include…	
	How will I access the relevant data?	Based on the relevant data, I will…	
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to…	
	What do the data tell me?	Based on this analysis, the data suggest…	
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude…	
	What will I do?	Based on this conclusion, actions I will take include…	
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that…	
	What are the next steps?	Based on my evaluation, I will…	

Scenario 2

Data Use Cycle	Framework	Scenario	Comments
	Scenario	A high school teacher noticed that a student is unable to complete his homework because of required skills that seem to be below grade level.	A common occurrence for educators.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know…	
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include…	
	How will I access the relevant data?	Based on the relevant data, I will…	
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to…	
	What do the data tell me?	Based on this analysis, the data suggest…	
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude…	
	What will I do?	Based on this conclusion, actions I will take include…	
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that…	
	What are the next steps?	Based on my evaluation, I will…	

Insert Your Own Scenario Table

Data Use Cycle	Framework	Scenario	Comments
	Scenario		
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know…	
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include…	
	How will I access the relevant data?	Based on the relevant data, I will…	
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to…	
	What do the data tell me?	Based on this analysis, the data suggest…	
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude…	
	What will I do?	Based on this conclusion, actions I will take include…	
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that…	
	What are the next steps?	Based on my evaluation, I will…	

Forum Guide to Taking Action with Education Data

Brief 2: Data Use for School and District Leaders

National Forum on Education Statistics

Brief II: Data Use for School and District Leaders

School and district leaders use data to better meet school and district needs

As a leader in your school or school district, you collect and use data all the time. You might need to know student enrollment, class assignments, and staffing plans to order supplies for a school campus. Alternatively, maybe you need to make staff assignments based on student course taking patterns and teacher qualifications. Perhaps you are responsible for tracking daily attendance for a truancy intervention program. Or, your responsibilities may include state and federal data collections, grant management reporting, or graduation certifications. The bottom line is that school and district leaders access and analyze data for a wide range of reasons—many of which are critically important to the day-to-day and ongoing operation of buildings, campuses, and districts. If, for example, you can't access contact information for substitute teachers in a timely manner, there may be a district administrator who unexpectedly finds himself supervising a classroom full of students rather than handling other pressing management and planning duties.

With the development of more robust data systems, ranging from building-level data dashboards to statewide longitudinal data systems, school and district leaders have access to more data than ever before. The challenge is to use the data to improve school and district management and operations rather than being overwhelmed by the possibilities of meaningful data use.

With the right data, properly applied, you can

- ✓ track student performance based on course taking history, school characteristics, teacher assignments, instructional choices, program participation, and demographic background;
- ✓ identify students who are demonstrating signs of engagement or disengagement and how it affects their behavior and academic performance;
- ✓ study the relationship between teacher characteristics, student growth, and teacher effectiveness;
- ✓ establish, target, and evaluate appropriate staff development programs;
- ✓ compare budgeted to actual expenditures by account class and create projections for future spending; and
- ✓ collaborate and communicate more effectively with peers in other schools and districts.

Data use by administrators is not new. School and district leaders have always been asked to use data to answer a wide range of questions:

- ✓ *Instruction*: e.g., Do test results and course enrollment patterns suggest that I need to hire more math teachers?
- ✓ *Classroom Management*: e.g., Are there enough computers to meet the state's online testing requirements?
- ✓ *Compliance*: e.g., Are my building's third grade teachers dedicating enough time to spelling instruction to meet the district's stated policy on minutes on task?
- ✓ *Accountability*: e.g., Will our high schools meet academic performance targets for all student groups?

The Cycle of Data Use

How do people use data?

Wise data use can increase the effectiveness of school and district leaders' primary purpose—operating and managing effective and efficient education organizations. The cycle of data use presented in figure 2.1 has data use to inform action as its primary goal. As such, the cycle is based on a framework consisting of five iterative phases (or activities): (1) seek information; (2) access/gather data; (3) analyze/interpret data; (4) act; and (5) evaluate. Such a framework can serve as the basis for the systematic use of education data in schools and districts.

Figure 2.1. The Cycle of Data Use. For a deeper discussion about the cycle of data, see the Introduction to the series Forum Guide to Taking Action with Education Data, available at *http://nces.ed.gov/forum/publications*.

1. Seek Information

"What data do I have versus what data do I need?"

To be effective and efficient, data use should be driven by well-defined questions that are intended to improve the operations and management of schools and districts. For example, rather than trying to find data to address a very broad question such as, "How can I improve building efficiencies?" it is likely that a more precisely worded question such as, "How have school building utility budgets changed over the past five years?" will enable you to find more relevant data to inform your planning and action.

When faced with such a question, ask yourself, "What information do I need (and not currently have) to answer this question?" Identifying these gaps will point you toward different types of data depending on the information gap you hope to address. For example, with the question above about utility costs, in addition to expenses (data you already have), you might seek data related to building size, the condition of HVAC systems, energy savings programs at the building level, and even weather conditions during the period of interest.

2. Access/Gather Data

"What data do I have and what data can I get?"

As an education leader, what data do you use from national, state, regional, district, or school data systems? Are these data accessible via downloadable data files, grade books, reports, spreadsheets, a data warehouse, a student management system's portals, dashboards, analysis instruments, or graphical visualization tools? In addition to the information collected by schools and districts (e.g., attendance data, performance data, curriculum data, staffing data), other entities sometimes issue reports about school- and district-level fiscal status, facility conditions, long-term planning, etc.[12] Depending on your information needs, these may be aggregate level (e.g., grade-level or building-level) or individual-level (e.g., Student First Name), snapshot or longitudinal in nature, observational or recorded, and may be in the forms of raw numbers for analysis or customized reports that present data specifically for planning purposes.

For example, school and district leaders often are charged with determining which high school students are on track to graduate with a regular diploma—information that can help instructional staff provide assistance to those students who are in a position to possibly graduate but who are at risk for not earning a regular diploma with their classmates. If this is your job, where do you begin looking for the data you will need to accomplish the task? In this scenario, it is likely that the data access/gathering phase might focus on a host of transcript data from your student information system, including grade level, credits earned, requirements met, grade point averages, and grades earned in core classes. However, many

Steps to the information seeking process include

- ✓ Recognizing when information is needed to inform a decision and direct an action.
- ✓ Defining a meaningful and achievable scope of concern/unit of analysis.
- ✓ Clearly articulating the issue at hand as a critical question.
- ✓ Assessing what relevant data are already available.
- ✓ Identifying "gaps" in currently available data.
- ✓ Identifying potential barriers to finding the information and ways to overcome them.
- ✓ Seeking additional data that are accurate, valid, reliable, timely, and relevant.

Be thoughtful consumers of data. Realize that some data are particularly sensitive to change—e.g., district enrollment can vary simply because of the date of collection. Verify quality (accuracy, timeliness, etc.) before using data to take action.

[12] The Common Core of Data (CCD) is a program of the U.S. Department of Education's National Center for Education Statistics that annually collects fiscal and non-fiscal data about all public schools, public school districts, and state education agencies in the United States. CCD data can be accessed and customized using a variety of tools available at *http://nces.ed.gov/ccd/*.

Steps to accessing/ gathering data include

- ✓ Identifying whether the needed data already exist.
- ✓ Collecting the data, which often means gaining access to relevant data that have already been collected by someone else.
- ✓ Learning about related data, such as other data sets, applicable definitions, limitations, timelines, formatting, other data sets, etc., (often referred to as metadata) to ensure that you fully understand the information.

seasoned administrators know that other factors can strongly influence a student's success during his or her senior year. Other sources of information might focus on a student's daily engagement and disengagement (from class records maintained by teachers), behavioral referrals (from discipline systems), participation in a dropout prevention program (from grant program records), plans following graduation (from the results of a survey), and family stability (from anecdotal information gathered by guidance counselors).

Collecting these data often requires engaging numerous data sources, and sometimes the challenge is not in finding the data, but understanding them—including, for example, recognizing appropriate and spurious relationships between data about student engagement, discipline, family stability, and academic persistence (see Step 3: Analyze/Interpret Data). Gaining access to data may also be a challenge if you request personally identifiable data. You should always consider whether de-identified or aggregate data would meet your need.

3. Analyze and Interpret Data

"What do the data suggest?"

Having access to needed, relevant data is necessary, but not sufficient, for appropriate data use. You must also be able to skillfully analyze and take appropriate action based upon the information to improve school and district management and operational practices. Education leaders who are good data users usually understand

- ✓ the meaning of the data (e.g., "completion rate" is not the same as "graduation rate" and "dropout rate" is not 100 percent minus the "graduation rate");
- ✓ commonly used measures for student performance reporting (e.g., a scale score is not the same as a percentile score);
- ✓ basic statistical concepts (e.g., mean, median, mode);
- ✓ trends (e.g., multiple points of data pointing toward the same general trend or conclusion are more powerful than one or two data points that aren't supported by other data);
- ✓ common presentation formats (e.g., tabular reports as well as graphs and charts);
- ✓ assumptions that limit the appropriate use of data (e.g., a good reading score does not automatically mean that the student is strong in all language arts areas); and
- ✓ the value of collaborating with colleagues (e.g., instructional staff relying on data staff to improve understanding).

Failure to understand these aspects of data can result in either ignoring data completely when making decisions or, perhaps worse, using data confidently but incorrectly (e.g., misinterpretation, over-interpretation, or inappropriate application).

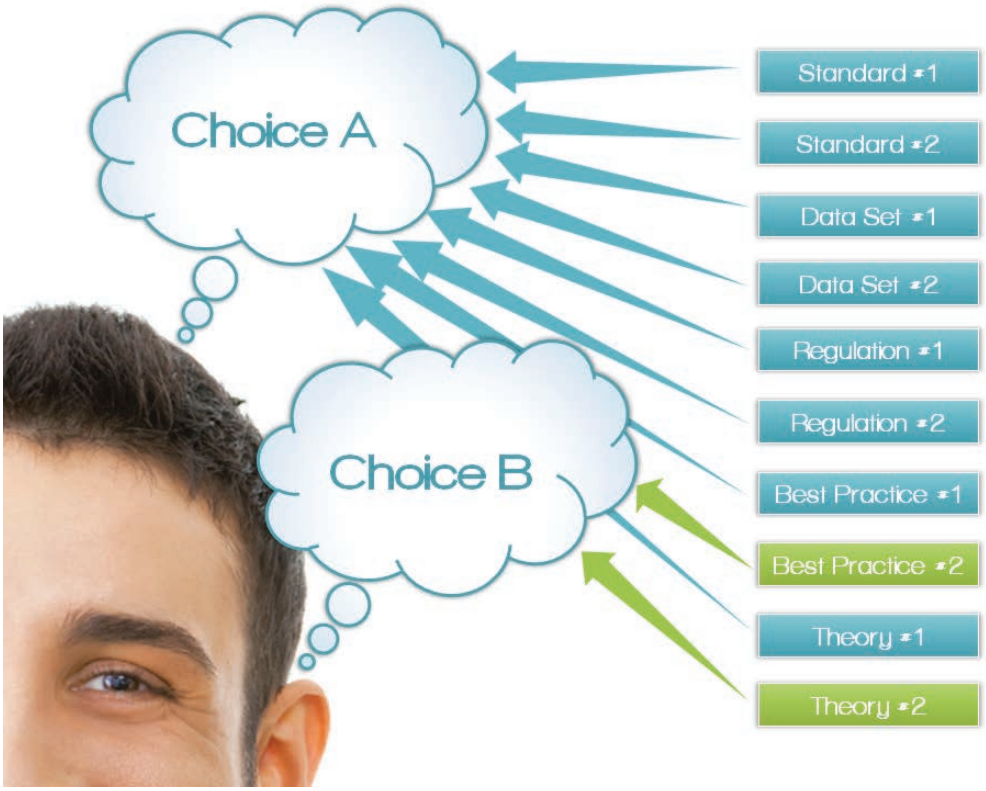

Figure 2.2. Analysis includes looking for patterns in the data. Rather than finding one piece of data and using it to make a generalization or draw other conclusions that are beyond the scope of the single data point, identify multiple data sources that inform the analysis of the questions—a process sometimes referred to as "triangulation."

Steps to the analysis and interpretation process include

- ✓ Formatting the data in a manner that enables sound analysis and interpretation.
- ✓ Determining any limitations on, or constraints to, data use including consideration of the data's
  - purpose;
  - quality;
  - bias; and
  - timeliness.
- ✓ Reviewing whether conclusions are logically and statistically sound and defensible.

4. Act

"How can data be acted upon to improve educational processes and outcomes?"

By definition, "actionable" data refer to information that allows a decision to be made and action to be taken. When you, as a school or district leader, are data literate, you are able to supplement your education expertise, management skills, and personal experience in schools and districts with the right data for the right purposes: to improve the management and operations of the education enterprise.

For example, assessments in many states are used to determine whether academic performance goals are being met for accountability purposes. However, those same assessments often generate item response data for individual students or groups of students. When assessments are designed to provide meaningful feedback at this level, school and district leaders can work with instructional staff to identify concepts that students are mastering, as well as those in which performance is below proficient. This analysis can occur for an individual student, groups of students (e.g., by common subgroups such as race/ethnicity, language learners, and socioeconomic status), and at the classroom and grade levels. Trends in these data can then be used to assess the relative strengths and weaknesses of the curriculum, various instructional strategies, and even individual

teachers in need of professional development or who might serve as expert resources for others. Based on these findings, you may even change or supplement the curriculum and instructional support tools as necessary to better meet the specific needs of your schools, staff, and students.

5. Evaluate

"Has the issue changed for the better?"

Actionable data are powerful tools that often lead to change. The question is whether this change is for the better, and whether the situation has improved sufficiently to have adequately addressed the original concern. For example, if you apply the data use cycle to evaluate the district's math curriculum, it is critical to know whether math skills and performance are improving across the student population (as well as within particular subgroups). In addition to determining whether there is academic improvement, you may also wish to assess whether there is sufficient progress—that is, whether the student population is achieving expected growth targets rather than just improving basic skills that are still not satisfactory. As such, determining whether the original issue has been adequately addressed is an important component of the data use process. This type of evaluation often includes consideration of the following types of questions:

- ✓ How effectively has the initial issue been resolved?
- ✓ What new concerns have arisen?
- ✓ Which factors are understood sufficiently and which warrant additional investigation?
- ✓ Have new data gaps (needs) been identified?

If the issue has been effectively addressed by data-informed action, then you may wish to share your experience with colleagues and encourage them to use data to deal with similar problems. If the issue hasn't been fully resolved, the cycle of data use repeats itself (see Step 1: Seek Information).

Critical Data Use Skills

Data are becoming increasingly relevant to the core management duties of school and district leaders. Some fundamental knowledge, skills, and abilities needed to effectively analyze and interpret data—and, thus, use education data effectively—include

- ✓ Understand what the data mean. Is program participation the same as program completion? Do program participation data in a table refer to a point in time during a particular academic year or an average over several years? Data users have difficulty knowing what the data really mean unless they understand data definitions, how the data are collected and formatted, and other usage guidance and limitations. Data about data are often referred to as "metadata."[13]

[13] *Forum Guide to Metadata: The Meaning Behind Education Data*. Available at *http://nces.ed.gov/forum/pub_2009805.asp*.

What Do the Data Mean?

The Graduation Rate in many states includes only those students receiving regular, standard, endorsed, or advanced diplomas. In contrast, the Completion Rate is generally used to measure graduates as well as students who receive a high school equivalency certificate, certificate of completion, or attendance certificate. The meaning of these similar data terms clearly depends on how the terms "graduate" and "completer" are defined, and anyone using the information would benefit from clear and accurate definitions for the terms.

- ✓ View data in an appropriate context. Data users should avoid jumping to a conclusion based on a single piece of data without being sure they understand the context of the data. When you evaluate data, think about complementary information that paints a richer picture of the education experience. For example, if you notice that class-level assessment scores don't fully measure the effectiveness of a teacher, you might argue for a teacher evaluation system that incorporates other factors such as classroom observations, course load, co-teachers, and student characteristics. The point is that the teaching and learning occur within the broader context of a school and community setting, and the data that might help to inform the situation should reflect that broader context.

Why Does Context Matter?

Temperature is a measurement most people think they understand, but to correctly interpret it as information requires additional context.

- ✓ What is the scale? Degrees Celsius or Fahrenheit?
- ✓ Is it the high or low temperature for the day?
- ✓ Is it the current temperature, yesterday's temperature, or tomorrow's predicted temperature?

This context is critical to using the piece of data as information. In its absence, "28" could mean 28° Fahrenheit as the day's high temperature (brrr, is it cold) or 28° Celsius (the equivalent of 82° Fahrenheit) as tomorrow's predicted low temperature (wow, will it ever be a scorcher).

- ✓ Recognize the nature of the collection tool. Most data collection tools are designed to generate data for a specific purpose. For example, some assessments measure skill development across a broad spectrum, others evaluate content mastery relative to a standard criteria, and still others are used to rank student performance relative to other students. Similarly, some reading assessments are especially sensitive to skill development in emerging readers, but less effective indicators of progress being made by strong readers. Thus, each type of assessment is constructed for a different purpose, which should inform how the results are used for school improvement and planning.

- ✓ Identify bias in the collection source. Be wary of data sources that may have a bias. For example, what if someone shared data from a study that showed that buying a piece of instructional software would substantially raise your district's reading scores? As a school or district leader, would you view the data differently if it originated in an objective source (e.g., another local education agency using an independent evaluator) as opposed to being published by the company that sells the product?

Do I Really Need to Understand Error?

The effects of error measures can have substantial impacts on the actions of teachers. For example, depending on the uncertainty of the measures, students hovering just above and just below proficiency on state assessments may be equally at risk to score below proficient on future assessments.

Timely data are useful data. Acting on ten-year-old data is not likely to improve future educational outcomes. Make sure that the data you are using are timely enough to describe current status and conditions.

- ✓ Assess the quality of the data. Data quality will limit the effectiveness of actions based on data. In other words, are your data accurate, reliable, and timely? For example, an end-of-year science assessment that only tests content from the last eight weeks of the academic calendar is not likely to be a valid measure of student learning for the entire year. Similarly, if a survey were to be administered to similar groups of students on different days, how likely is it that respondents would reliably provide the same responses? If it is not likely to generate similar findings, the instrument may not be reliable and the quality of the data is uncertain.[14]
- ✓ Appreciate the assumptions and limitations of data. Oftentimes, information about data meaning, format, and usage are available as metadata (data about data). For example, the results of a norm-referenced test are designed to reflect a normal curve, meaning that such an assessment is usually not a good instrument for evaluating the success of changes to the instructional program. Good data use requires an understanding of the assumptions and limitations of each piece of data. As a school or district leader who needs to act on data, you should expect to collaborate with data managers, data stewards, or other staff charged by the organization to understand the intricacies of data elements, code sets, formulae, definitions, formats, and meaning.[15]
- ✓ Comprehend the significance of error and/or uncertainty in data. While calculating error requires considerable statistical training, even a novice data user can improve the likelihood of sound usage by taking a few moments to consider the implications of error measures. As a school or district leader, you

[14] *Forum Curriculum for Improving Education Data: A Resource for Local Education Agencies,* available at *http://nces.ed.gov/forum/pub_2007808.asp.*

[15] *Forum Guide to Building a Culture of Quality Data: A School and District Resource,* available at *http://nces.ed.gov/forum/pub_2005801.asp.*

should understand that confidence intervals and other methods of describing uncertainty provide important information about the limits of data accuracy.

- ✓ Discern meaning in tabular and graphical data. Because of the widespread use of tabular and graphical data in school, district, and state reporting, you will want to become comfortable with, and skilled at, analyzing data in these formats. Interpreting tabular data requires that you pay close attention to column and row titles, as well as footnotes and other appended materials, which often provide a context in which to interpret meaning. Reading a graph can be fairly straightforward, but understanding the relationship between the x- and y-axis requires some training. For example, the commonly cited statistical maxim "correlation is not causation" is particularly applicable to graphical data—just because there is a visual relationship between points on a graph does not mean that one variable caused the other to occur.

- ✓ Know how to effectively question data/report authors. Sometimes the fiscal data you receive from the state education agency is wrong. Other times, research reports draw conclusions that don't seem obvious from the data. How does a school or district leader deal with inaccurate, misleading, or poorly presented data? Unlike some data skills that are heavily quantitative or analytical in nature, effectively questioning a data source is mostly a function of effort and confidence. When a data report or research finding appears to be inaccurate, misleading, or unclear to you, a practicing administrator, then it is entirely appropriate to contact the source of the data to politely and professionally request clarification or correction. In addition to addressing your immediate concerns, you may help the author make the data more accurate, more understandable, and more actionable for the entire education community.

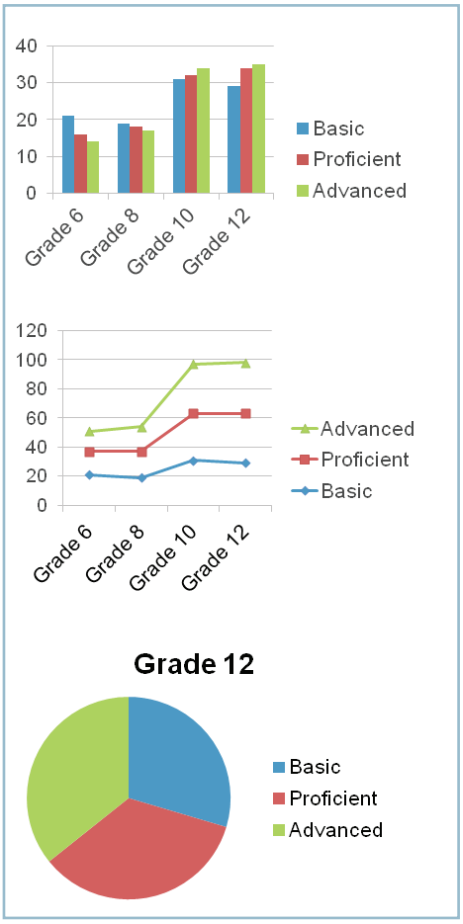

Figure 2.3. Because of the widespread use of tabular and graphical data, data users should become comfortable with, and even skilled at, analyzing data in tables and figures.

Training and Skill Development

Ideally, administrator preparation programs would begin the process of developing data use skills. Current professionals might receive informal support through peer-to-peer study and professional learning communities. A great deal of information concerning the processes and techniques that support good data use can also be found online by enterprising individuals who understand the value of strong data use skills. More formally, professional development opportunities might include training that emphasizes topics such as recognizing whether data are within acceptable ranges, identifying patterns or trends in the data, and applying this information to solve real-world problems. Similarly, trainers with data expertise can develop a staff's quantitative skills, such as appreciating the meaning of error measures; calculating the amount of change a variable presented in charts, tables, and graphs; and interpreting the significance of statistical summaries of large data.

A Question-Driven Approach to Data Use

Using the skills described in the previous section, school and district leaders can rely on a question-driven approach to data use for nearly any scenario that requires making a data-informed decision and taking data-informed action.

- ✓ What do I want to know?
- ✓ What data might be relevant?
- ✓ How will I access the relevant data?
- ✓ What skills and tools do I need to analyze the data?
- ✓ What do the data tell me?
- ✓ What are my conclusions?
- ✓ What will I do?
- ✓ What effects did my actions have?
- ✓ What are the next steps?

Table 1 and table 2 illustrate how these questions can be applied to example scenarios commonly seen by school and district leaders.

Table 1. An illustration of a question-driven approach to data use for various scenarios facing school and district leaders (example 1)[16]

Data Use Cycle	Framework	Scenario	Comments
	Scenario	A school leader is planning course schedules for the upcoming school year.	A common occurrence for school and district leaders. Good school and district leaders often customize previously successful course schedules to meet the learning needs of incoming students.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know… Are student needs and available resources sufficiently similar to last year to warrant not changing the instructional plan?	Subsequent questions include: What is the academic and behavioral profile of individual students? What is the aggregate profile of the grade/school? If the plan does need to be modified, what student, staff, and school needs must be accommodated? What modifications should I make to last year's successful course offering schedule?

[16] In some cases, you may collapse these steps in your day-to-day application of this framework. For example, if you have taught a student for several months, you might already know the student's profile. In other instances, you may wish to rely on this framework more precisely as you formally analyze the data.

Table 1. An illustration of a question-driven approach to data use for various scenarios facing school and district leaders (continued)

Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include… ☒ Curriculum data ☒ Has the curriculum been changed? ☒ Academic performance data ☒ Enrollment projection data ☒ Previous classroom experience data ☒ Which courses should be offered to keep students on pace/level? ☒ Program participation data ☒ Have individual students been identified as having special learning needs? ☒ Budget data ☒ Do we have more or fewer resources? ☒ Staff data ☐ Building data ☒ Fiscal data ☐ Community input	Although there may be a wealth of data that could be evaluated, the scenario may warrant only a small subset of data for analysis.
	How will I access the relevant data?	Based on the relevant data, I will… ☒ consult colleagues about observational and anecdotal data ☒ reflect on my recent experiences with the grade/school ☐ consult a student's portfolio to review past work ☐ query the student information system for interim benchmark data ☒ query the student information system for summative data ☐ use my gradebook to review the homework data ☒ invite parents and community members to share opinions about needs and expectations	You may already have access to these data sources; other needs may require gathering data you do not already have. The process for accessing these data may vary by organization.
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to… ☒ understand the context and how the data are presented ☒ organize the data in a way that applies to this situation ☒ relate, combine, and balance information from different sources ☒ assess the data quality and limitations	Don't be too quick to form an opinion based on one or even a few pieces of data. Use techniques such as triangulation to assimilate and evaluate the body of data in order to develop conclusions.
	What do the data tell me?	Based on this analysis, the data suggest… ☒ student/school needs comparable to previous year ☐ student/school needs not comparable to previous year ☐ resources/budgets comparable to previous year ☒ resources/budgets not comparable to previous year	Are there gaps in the data? In other words, are data that would be helpful to evaluate missing or otherwise unavailable? If so, who needs to be told this information so that it can be corrected in the future?

Table 1. An illustration of a question-driven approach to data use for various scenarios facing school and district leaders (continued)

Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude that… ☐ it is necessary to modify the course schedule based on student/school needs ☒ it is not necessary to modify the course schedule based on student/school needs ☐ it is necessary to modify the course schedule based on decrease in available resources ☒ it is necessary to modify the course schedule based on decrease in available resources	If it is not an issue that requires action, then it is the end of the story. If it is an issue that requires action, then more information becomes necessary.
	What will I do?	Based on this conclusion, actions I will take include… ☐ find more information (check other data sources) ☒ increase class size in order to avoid reducing course offerings ☐ request changes in staffing to improve capacity to teach new courses ☐ decrease the number of courses offered ☒ ask for more resources so that course schedules reflect student/school need	Multiple actions may be selected. For example, the school or district leader may choose to increase class size while simultaneously requesting additional resources so that class sizes could remain unchanged.
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that… ☒ the revised course offering is appropriate for the needs and resources ☐ the revised course offering is not appropriate for the needs and resources	At a later point in time, I can assess whether my action (based on data use) was successful.
	What are the next steps?	Based on my evaluation, I will… ☒ monitor whether resource availability changes ☒ observe whether grade/school populations continue to demonstrate sufficient academic progress ☒ evaluate whether subsequent questions have arisen and, if necessary, using this question-driven approach to data use to advance the inquiry	If the situation is not completely resolved, the school or district leader may wish to identify what specific issues still need to be addressed and return to the beginning of the data use cycle to seek new information that will inform future action.

Table 2. An illustration of a question-driven approach to data use for various scenarios facing school and district leaders (example 2)[16]

Data Use Cycle	Framework	Scenario	Comments
	Scenario	A district leader is evaluating teachers.	A common occurrence for school and district leaders. Good school and district leaders often consider a range of factors when assessing staff performance.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know… How are each of my teachers performing?	Subsequent questions include: What is the academic and behavioral profile of individual students in the class/school? Are there particular academic and behavioral situations to accommodate?
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include… ☒ student performance (individual and class level assessment scores) ☒ classroom observations ☐ peer review ☒ teacher attendance ☒ past evaluations (e.g., accomplishing prior goals and/or remediation) ☒ course load, course type considerations ☐ other assignment-related factors ☐ class/student characteristics ☐ participation in professional development ☒ student/parent reviews and/or complaints	Although there may be a wealth of data that could be evaluated, the scenario may warrant only a small subset of data for analysis.
	How will I access the relevant data?	Based on the relevant data, I will… ☒ consult colleagues about observational and anecdotal data ☐ reflect on my recent experiences with the teacher/class/grade/school ☒ review each teacher's portfolio to review past work ☒ review each teacher's HR file ☒ review each teacher's professional development records ☐ query the student information system for interim benchmark data ☒ query the student information system for summative data ☐ use my gradebook to review the homework data ☒ invite parents and community members to share opinions	You may already have access to these data sources; other needs may require gathering data you do not already have. The process for accessing these data may vary by organization.

[16] In some cases, you may collapse these steps in your day-to-day application of this framework. For example, if you have taught a student for several months, you might already know the student's profile. In other instances, you may wish to rely on this framework more precisely as you formally analyze the data.

Table 2. An illustration of a question-driven approach to data use for various scenarios facing school and district leaders (continued)

Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to… ☒ understand the context and how the data are presented ☒ organize the data in a way that applies to this situation ☒ relate, combine, and balance information from different sources ☒ assess the data quality and limitations	Don't be too quick to form an opinion based on one or even a few pieces of data. Use techniques such as triangulation to assimilate and evaluate the body of data in order to develop conclusions.
	What do the data tell me?	Based on this analysis, the data suggest… ☒ generally adequate teacher performance ☐ a record of variable performance ☐ unacceptable teacher performance ☐ unclear results	Are there gaps in the data? In other words, are data that would be helpful to evaluate missing or otherwise unavailable? If so, who needs to be told this information so that it can be corrected?
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude… ☒ the teachers performed within desired expectations ☐ the teachers did not perform within desired expectations	Teachers are evaluated individually and results can be aggregated to inform broad planning tasks.
	What will I do?	Based on this conclusion, actions I will take include… ☒ find more information (check other data sources) ☒ identify specific topics or skills that may warrant special emphasis in professional development ☐ modify the teacher's assignment ☐ recommend the termination of the employee's teaching contract	Although the performance of a teacher may be acceptable, it is possible that participation in targeted professional development could further improve performance.
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that… ☒ the teachers are performing adequately ☐ the teachers are not improving	At a later point in time, I can assess whether my action (based on data use) was successful.
	What are the next steps?	Based on my evaluation, I will… ☒ continue to monitor the situation ☒ observe whether the teachers continue to demonstrate adequate performance ☒ evaluate whether subsequent questions have arisen and, if necessary, using this question-driven approach to data use to advance the inquiry	If the situation is not completely resolved, the school or district leader may wish to identify what specific issues still need to be addressed and return to the beginning of the data use cycle to seek new information that will inform future action.

Conclusions

High quality and timely data are powerful tools for improving the management and operation of the entire education enterprise. Thoughtful application of the frameworks, principles, and questions recommended in this Brief will help school and district leaders use data to inform decisionmaking and actions related to individual students, groups of students, classes, buildings, campuses, districts, and other critical aspects of the business of educating students, managing classroom, and operating schools. The Practical Exercise below provides a resource for applying these recommendations when dealing with actual issues or illustrative scenarios. While these skills can be developed by individuals, skill development at a staff level will be enhanced by the delivery of professional development curricula around this area of growing importance for school and district leaders. Many school and district leaders will benefit from collaborating with colleagues when completing these data use scenarios.

Practical Exercise for School and District Leaders: Using What You've Learned

School and district leaders face a wide range of issues that require that they make decisions each and every day. Following the question-driven approach to data use described above, work individually or brainstorm with colleagues to complete the tables below. Be as realistic as possible in your responses—using real data sources, practices, and people in your organization so as to make the scenario as useful as possible.

Data Use Cycle	Framework	Scenario	Comments
	Scenario	An elementary school principal is making staffing assignments for the upcoming school year.	A common occurrence for educators.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know…	
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include…	
	How will I access the relevant data?	Based on the relevant data, I will…	
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to…	
	What do the data tell me?	Based on this analysis, the data suggest…	
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude…	
	What will I do?	Based on this conclusion, actions I will take include…	
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that…	
	What are the next steps?	Based on my evaluation, I will…	

Scenario 2

Data Use Cycle	Framework	Scenario	Comments
	Scenario	A high school principal needs to allocate resources to different support programs that serve a wide range of fluctuating student populations and needs.	A common occurrence for educators.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know…	
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include…	
	How will I access the relevant data?	Based on the relevant data, I will…	
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to…	
	What do the data tell me?	Based on this analysis, the data suggest…	
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude…	
	What will I do?	Based on this conclusion, actions I will take include…	
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that…	
	What are the next steps?	Based on my evaluation, I will…	

Insert Your Own Scenario Table

Data Use Cycle	Framework	Scenario	Comments
	Scenario		
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know…	
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include…	
	How will I access the relevant data?	Based on the relevant data, I will…	
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to…	
	What do the data tell me?	Based on this analysis, the data suggest…	
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude…	
	What will I do?	Based on this conclusion, actions I will take include…	
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that…	
	What are the next steps?	Based on my evaluation, I will…	

Forum Guide to Taking Action with Education Data

Brief 3: Data Use for State Program Staff

National Forum on Education Statistics

Brief III: Data Use for State Program Staff

State program staff use data to better manage state and federal programs

As a program area administrator at a state education agency, you are responsible for allocating funds for program services, identifying best practices for program delivery, and ensuring compliance with relevant state and federal program requirements. As such, it is likely that you collect and use data all the time. Whether you work in early childhood, special education, career and technical education, or any of a wide range of program areas, you probably need to know the number and demographic characteristics of eligible students from across the state, as well as the number and characteristics of those children actually enrolled and receiving program services. You may also need to develop business rules to maximize program effectiveness and efficiency, or perhaps your responsibilities include reporting descriptive data about the program sites to state or federal oversight bodies.

The bottom line is that state program staff access and analyze data for a wide range of reasons—many of which are critically important to the day-to-day and ongoing operation and management of education programs and support services across a state. If, for example, you can't determine how much money was allocated to a program site, state auditors might submit an unfavorable report to the legislative body that funds the program—meaning that some eligible participants may not be able to participate in future years.

With the recent development of more robust data systems, ranging from program-level data dashboards to statewide longitudinal data systems, state program staff have access to more data than ever before. With the right data, properly applied, you can

- ✓ track student eligibility and participation at the school, building, or site level;
- ✓ identify program participants based on demographic backgrounds and other common subgroups;
- ✓ evaluate the effectiveness of a program (e.g., relative to program goals and milestones);
- ✓ compare budgeted to actual expenditures by account class and create projections for future spending; and
- ✓ communicate more effectively with colleagues in other states, programs, schools, districts, and sites.

State program staff focus on a wide range of service areas, including

- ✓ early childhood education;
- ✓ career and technical education;
- ✓ migrant education;
- ✓ special education;
- ✓ homeless services;
- ✓ school finance;
- ✓ school construction;
- ✓ teacher certification and quality;
- ✓ college and career readiness;
- ✓ federal title programs; and
- ✓ child nutrition and wellness.

Data use by state program staff is not new. State program specialists have always been asked to use data to answer a wide range of questions:

- ✓ *Compliance*: e.g., Are only students who are eligible for program participation receiving services?
- ✓ *Accountability*: e.g., Do I have evidence that program funds have been spent appropriately?
- ✓ *Program effectiveness:* e.g., Are program participants demonstrating improved academic performance and graduation rates?
- ✓ *Technical assistance*: e.g., Do I understand the characteristics of the program site and participant population well enough to provide appropriate technical assistance?

The Cycle of Data Use

How do people use data?

Wise data use can increase the effectiveness of state program staff's primary purpose: providing services to eligible populations. The cycle of data use presented in figure 3.1 has data use to inform action as its primary goal. As such, it is based on a framework consisting of five iterative phases (or activities): (1) seek information; (2) access/gather data; (3) analyze/interpret data; (4) act; and (5) evaluate. Such a framework can serve as the basis for the systematic use of education data in state education agencies.

Figure 3.1. The Cycle of Data Use. For a deeper discussion about the cycle of data, see the Introduction to the series Forum Guide to Taking Action with Education Data, available at *http://nces.ed.gov/forum/publications*.

1. Seek Information

"What data do I have versus what data do I need?"

To be effective and efficient, data use should be driven by well-defined questions that are intended to improve the operations and management of state program services. For example, rather than trying to find data to address a very broad question such as "Are our programs working?", it is likely that a more precisely worded question such as "Is the high school graduation rate increasing for students receiving program services?" will enable you to find more relevant data to inform planning and action.

When faced with such a question, ask yourself, "What information do I need (and not currently have) to answer this question?" Identifying these gaps will point you toward different types of data depending on the information gap you hope to address. For example, with the question above about program participants completing high school, in addition to current program rosters (data you already have), you might seek historical data about program rosters, graduation rates, and completion rates during the periods of interest.

2. Access/Gather Data

"What data do I have and what data can I get?"

As a state program administrator, what data do you use from national, state, regional, district, or school data systems? Are these data accessible via downloadable data files, reports, spreadsheets, a data warehouse, or a business intelligence system with portals, dashboards, analysis instruments, and graphical visualization tools? In addition to the information collected by states and districts (e.g., student demographic data, attendance data, and performance data), other entities sometimes issue reports about state- and district-level fiscal status, facility conditions, long-term planning, etc.[18] Depending on your information needs, these may be aggregate level (e.g., grade-level or building-level) or individual-level (e.g., Student First Name), snapshot or longitudinal in nature, observational or recorded, and may be in the form of raw numbers for analysis or customized reports that present data specifically for planning purposes. Other pertinent information might describe a student's participation in related programs or family participation in social services, human services, and community health programs. Accessing these data often requires engaging numerous data sources, and sometimes the challenge is not in finding the data, but understanding them—including, for example, recognizing appropriate and spurious relationships between data about program eligibility, participation, completion, family stability, and academic persistence (see Step 3: Analyze/Interpret Data). Gaining access to data may also be a challenge if you request personally identifiable data. You should always consider whether de-identified or aggregate data would meet your need.

Be thoughtful consumers of data. Realize that some data are particularly sensitive to change—e.g., class enrollment can vary simply because of the date of collection. Verify quality (accuracy, timeliness, etc.) before using data to take action.

Steps to the information seeking process include

- ✓ Recognizing when information is needed to inform a decision and direct an action.
- ✓ Defining a meaningful and achievable scope of concern/unit of analysis.
- ✓ Clearly articulating the issue at hand as a critical question.
- ✓ Assessing what relevant data are already available.
- ✓ Identifying "gaps" in currently available data.
- ✓ Identifying potential barriers to finding the information and ways to overcome them.
- ✓ Seeking additional data that are accurate, valid, reliable, timely, and relevant.

[18] The Common Core of Data (CCD) is a program of the U.S. Department of Education's National Center for Education Statistics that annually collects fiscal and non-fiscal data about all public schools, public school districts and state education agencies in the United States. CCD data can be accessed and customized using a variety of tools available at *http://nces.ed.gov/ccd/*.

3. Analyze and Interpret Data

"What do the data suggest?"

Steps to accessing/ gathering data include

- ✓ Identifying whether the needed data already exist.
- ✓ Collecting the data, which often means gaining access to relevant data that have already been collected by someone else.
- ✓ Learning about related data, such as other data sets, applicable definitions, limitations, timelines, formatting, other data sets, etc., (often referred to as metadata) to ensure that you fully understand the information.

Having access to needed, relevant data is necessary, but not sufficient, for appropriate data use. You must also be able to skillfully analyze and take appropriate action based upon the information to improve program management and operations. Program administrators who are good data users usually understand

- ✓ the meaning of the data (e.g., "completion rate" is not the same as "graduation rate" and "dropout rate" is not 100 percent minus the "graduation rate");
- ✓ commonly used measures for district, school, student, and subgroup performance reporting (e.g., a scale score is not the same as a percentile score);
- ✓ basic statistical concepts (e.g., mean, median, and mode);
- ✓ trends (e.g., multiple points of data pointing toward the same general trend or conclusion are more powerful than one or two data points that aren't supported by other data);
- ✓ common presentation formats (e.g., tabular reports as well as graphs and charts);
- ✓ assumptions that limit the appropriate use of data (e.g., data from a point in time collection date aren't necessarily representative of longer periods of time); and
- ✓ the value of collaborating with colleagues (e.g., state staff relying on data staff to improve understanding).

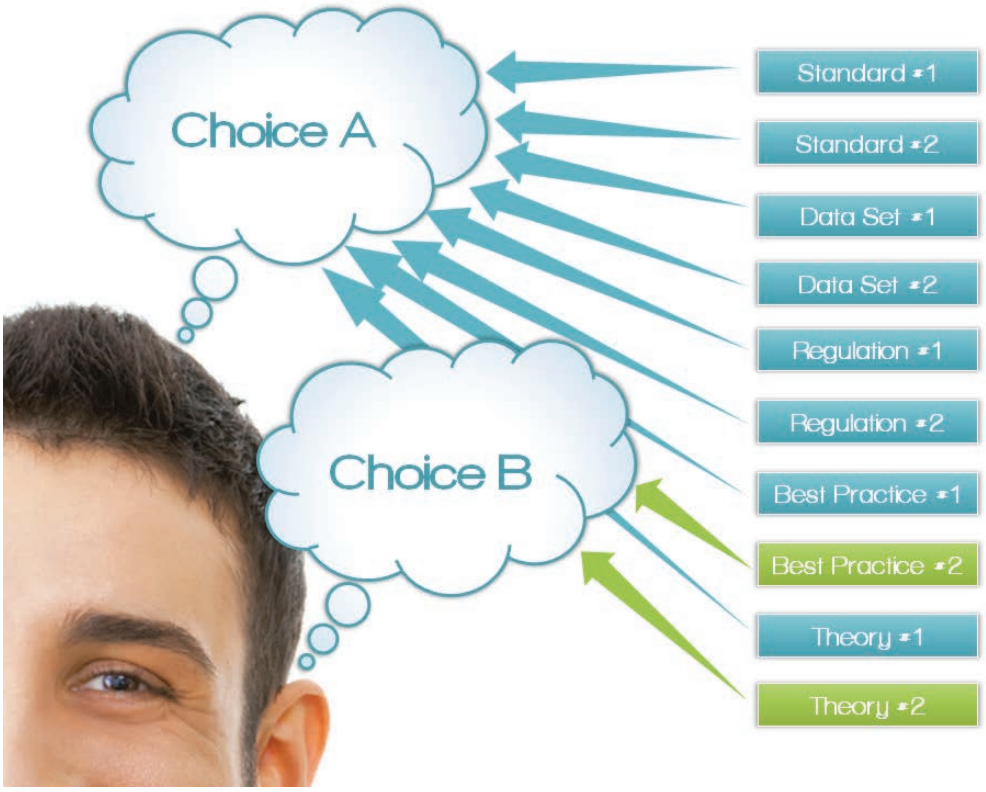

Figure 3.2. Analysis includes looking for patterns in the data. Rather than finding one piece of data and using it to make a generalization or draw other conclusions that are beyond the scope of the single data point, identify multiple data sources that inform the analysis of the questions—a process sometimes referred to as "triangulation."

4. Act

"How can data be acted upon to improve educational processes and outcomes?"

By definition, "actionable" data refer to information that allows a decision to be made and action to be taken. When you, as a state program administrator, are data literate, you are able to supplement your program expertise, management skills, and personal experience at the state agency with the right data for the right purposes: to improve the management and operations of program services.

For example, some states rely on career "pathway" programs to help allocate resources to targeted pre-professional areas based on employment opportunities and service demands in various regions of a state. Perhaps there aren't enough teacher aides in one region of the state, and not enough people with technical skills in another region. If this is the case, pathway programs aim to respond to these needs and opportunities by offering targeted secondary school coursework that helps prepare students for these occupations. By identifying employment needs and analyzing student and program data (employee capabilities), program staff are able to act by creating new pathway programs that meet the employment demands of individual regions across the state. Education resources are used to help both a state's employers and future employees (students who participate in pathway programs) because of the ability of program staff to interpret and act on data.

Steps to the analysis and interpretation process include

- ✓ Formatting the data in a manner that enables sound analysis and interpretation.
- ✓ Determining any limitations on, or constraints to, data use including consideration of the data's
  - purpose;
  - quality;
  - bias; and
  - timeliness.
- ✓ Reviewing whether conclusions are logically and statistically sound and defensible.

5. Evaluate

"Has the issue changed for the better?"

Actionable data are powerful tools that often lead to change. The question is whether this change is for the better, and whether the situation has improved sufficiently to have adequately addressed the original concern. For example, if you apply the data use cycle to evaluate the academic performance of program participants, it is critical to know whether performance measures are improving across the entire student population or only in the program participation subgroup. In addition to determining whether there is academic improvement, you may also wish to assess whether there is sufficient progress—that is, whether the student population is achieving expected growth targets rather than just improving basic skills that are still not satisfactory. As such, determining whether the original issue has been adequately addressed is an important component of the data use process. This type of evaluation often includes consideration of the following types of questions:

- ✓ How effectively has the initial issue been resolved?
- ✓ What new concerns have arisen?
- ✓ Which factors are understood sufficiently and which warrant additional investigation?
- ✓ Have new data gaps (needs) been identified?

If the issue has been effectively addressed by data-informed action, then you may wish to share your experience with colleagues and encourage them to use data to deal with similar problems. If the issue hasn't been fully resolved, the cycle of data use repeats itself (see Step 1: Seek Information).

Critical Data Use Skills

Data are becoming increasingly relevant to the core management duties of state program staff. Some fundamental knowledge, skills, and abilities needed to effectively analyze and interpret data—and thus use education data effectively—include

- ✓ Understand what the data mean. Is program participation the same as program completion? Do program participation data in a table refer to a point in time during a particular academic year or an average over several years? Data users have difficulty knowing what the data really mean unless they understand data definitions, how the data are collected and formatted, and other usage guidance and limitations. Data about data are often referred to as "metadata."[19] More broadly, it is important that you learn about the types of information contained in the data systems you are able to access, keeping in mind that it might be possible to link data points from multiple disparate systems to address your information needs.

What Do the Data Mean?

The Graduation Rate in many states includes only those students receiving regular, standard, endorsed, or advanced diplomas. In contrast, the Completion Rate is generally used to measure graduates as well as students who receive a high school equivalency certificate, certificate of completion, or attendance certificate. The meaning of these similar data terms clearly depends on how the terms "graduate" and "completer" are defined, and anyone using the information would benefit from clear and accurate definitions for the terms.

- ✓ View data in an appropriate context. Data users should avoid jumping to a conclusion based on a single piece of data without being sure they understand the context of the data. When you evaluate data, think about complementary information that paints a richer picture of program services and the education experience. For example, if you notice that assessment scores don't fully measure the effectiveness of a program, you might argue for an evaluation system that incorporates other factors such as participant dropout and persistence rates, mobility rates, and employment rates. The point is that the program participation occurs within a broader context and data that might help to inform decisions and actions should reflect that broader context.

[19] *Forum Guide to Metadata: The Meaning Behind Education Data,* available at *http://nces.ed.gov/forum/pub_2009805.asp.*

Why is context critical?

A graduation rate of 40 percent might seem low, but what if it was at a school that specialized in trying to retain students who were at-risk for dropping out? In such a case, context is critically important for interpreting a 40 percent graduation rate as tremendously successful in such a setting.

- ✓ Recognize the nature of the collection tool. Most data collection tools are designed to generate data for a specific purpose. For example, some assessments measure skill development across a broad spectrum, while others evaluate content mastery relative to a standard criteria. Still others are used to rank school or district performance relative to other schools and districts. Similarly, some collections gather Days of Attendance and Days in Membership, while other collection tools can identify whether a student is present on any given day. Both might enable calculation of an attendance rate, but since they are constructed for different purposes, they may yield different results. The purpose and nature of a data collection should inform how the data are used to measure program effectiveness.

- ✓ Identify bias in the collection source. Be wary of data sources that may have a bias. For example, as a state program administrator, would you view data about a particular service model differently if the data originated in an accountability report from a paid service provider as opposed to an independent auditor?

- ✓ Assess the quality of the data. Data quality will limit the effectiveness of actions based on data. In other words, are your data accurate, reliable, and timely? For example, data quality may suffer during the first year of collecting a new data element while respondents learn how to interpret definitions and code responses. Similarly, quality can vary depending on whether data are self-reported or generated by an audit.[20]

- ✓ Appreciate the assumptions and limitations of data. Oftentimes, information about data meaning, format, and usage are available as metadata (data about data). For example, understanding the criteria for selecting "peer programs" is critical when evaluating a comparison of one program to other programs assumed to operate in "comparable" settings. Are they similar because of size, funding, demographic characteristics, or other reasons? Good data use requires an understanding of the assumptions and limitations of each piece of data. As a state program administrator who needs to act on data, you should expect to collaborate with data managers, data stewards, or other staff charged

Timely data are useful data. Acting on ten-year-old data is not likely to improve future educational outcomes. Make sure that the data you are using are timely enough to describe current status and conditions.

[20] *Forum Curriculum for Improving Education Data: A Resource for Local Education Agencies,* available at *http://nces.ed.gov/forum/pub_2007808.asp.*

by the organization to understand the intricacies of data elements, code sets, formulae, definitions, formats, and meaning.[21]

✓ Comprehend the significance of error and/or uncertainty in data. While calculating error requires considerable statistical training, even a novice data user can improve the likelihood of sound usage by taking a few moments to consider the implications of error measures. As a state program administrator, you should understand that confidence intervals and other methods of describing uncertainty provide important information about the limits of data accuracy. For example, students "on the bubble" (that is hovering just above and just below proficiency on state assessments) may be equally at risk statistically to score below proficient on future assessments—likely warranting comparable support services even though one group is currently viewed to be proficient.

✓ Discern meaning in tabular and graphical data. Because of the widespread use of tabular and graphical data in school, district, and state reporting, you will want to become comfortable with, and skilled at, analyzing data in these formats. Interpreting tabular data requires that you pay close attention to column and row titles as well as footnotes and other appended materials that often provide a context in which to interpret meaning. Reading a graph can be fairly straightforward, but understanding the meaning between the x- and y-axis requires some training. For example, the commonly cited statistical maxim "correlation is not causation" is particularly applicable to graphical data—just because there is a visual relationship between points on a graph does not mean that one variable caused the other to occur.

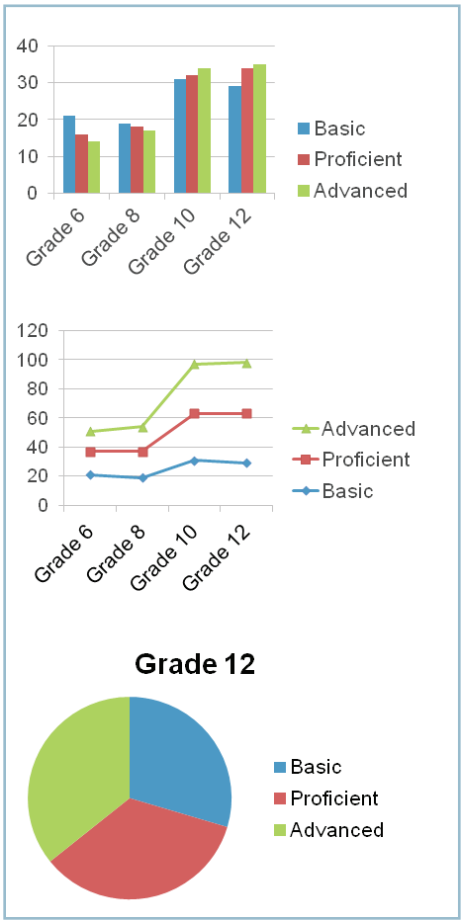

Figure 3.3. Because of the widespread use of tabular and graphical data, data users should become comfortable with, and even skilled at, analyzing data in tables and figures.

✓ Know how to effectively question data/report authors. Sometimes the fiscal data reported by a newspaper of special interest group are misleading. Other times, research reports draw conclusions that don't seem obvious from the data. How does a state program administrator deal with inaccurate, misleading, or poorly presented data? Unlike some data skills that are heavily quantitative or analytical in nature, effectively questioning a data source is mostly a function of effort and confidence. When a data report or research finding appears to be inaccurate, misleading, or unclear to you, a practicing program administrator, then it is entirely appropriate to contact the source of the data to politely and professionally request clarification or correction. In addition to addressing your immediate concerns, you may help the author make the data more accurate, understandable, and actionable for the entire education community.

[21] *Forum Guide to Building a Culture of Quality Data: A School and District Resource,* available at *http://nces.ed.gov/forum/pub_2005801.asp.*

Training and Skill Development

Current professionals might receive informal support through peer-to-peer study and professional learning communities. A great deal of information concerning the processes and techniques that support good data use can also be found online by enterprising individuals who understand the value of strong data use skills. More formally, professional development opportunities might include training that emphasize topics such as recognizing whether data are within acceptable ranges, identifying patterns or trends in the data, and applying this information to solve real-world problems. Similarly, trainers with data expertise can develop a staff's quantitative skills, such as appreciating the meaning of error measures; calculating the amount of change a variable presented in charts, tables, and graphs; and interpreting the significance of statistical summaries of large data.

A Question-Driven Approach to Data Use

Using the skills described in the previous section, state program staff can rely on a question-driven approach to data use for nearly any scenario that requires making a data-informed decision and taking data-informed action.

- ✓ What do I want to know?
- ✓ What data might be relevant?
- ✓ How will I access the relevant data?
- ✓ What skills and tools do I need to analyze the data?
- ✓ What do the data tell me?
- ✓ What are my conclusions?
- ✓ What will I do?
- ✓ What effects did my actions have?
- ✓ What are the next steps?

Table 1 and table 2 illustrate how these questions can be applied to example scenarios commonly seen by state program staff.

Table 1. An illustration of a question-driven approach to data use for various scenarios facing state program staff (example 1).

Data Use Cycle	Framework	Scenario	Comments
	Scenario	A state program administrator is evaluating program effectiveness as defined by a goal of improving the graduation rates of program completers.	Program evaluation is a common occurrence for many state program administrators.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know… Are program completers graduating from high school at a higher rate than their peers who do not complete the program?	Subsequent questions include: Are there enough data to draw conclusions about long-term trends? How are program completers succeeding in postsecondary education and the workforce?
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include… ☒ program participation data ☒ program completion data ☐ attendance data ☐ mobility data ☐ discipline data ☒ family data ☐ program cost data ☐ academic growth data ☒ graduation/completion data ☐ postsecondary education data ☐ workforce data	Although there may be a wealth of data that could be evaluated, the scenario may warrant only a small subset of data for analysis.
	How will I access the relevant data?	Based on the relevant data, I will… ☐ consult colleagues about observational and anecdotal data ☐ institute a new collection ☒ review program participation and completion data ☒ review program fiscal data ☒ access statewide longitudinal data system portal	You may already have access to these data sources; other needs may require gathering data you do not already have. The process for accessing these data may vary by organization.
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to… ☒ understand the context and how the data are presented ☒ organize the data in a way that applies to this situation ☒ decide how I will determine student peer groups ☒ relate, combine, and balance information from different sources ☒ assess the data quality and limitations	Don't be too quick to form an opinion based on one or even a few pieces of data. Use techniques such as triangulation to assimilate and evaluate the body of data in order to develop conclusions.
	What do the data tell me?	Based on this analysis, the data suggest… ☐ inconsistent or conflicting results ☒ students who complete the program graduate at a higher rate ☐ students who complete the program graduate at a lower rate ☐ students who complete the program graduate at the same rate	Is there a correlational relationship in the data? Is there a cause-effect relationship in the data?

Table 1. An illustration of a question-driven approach to data use for various scenarios facing state program staff (continued).

Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude… Students who complete the program are graduating at a higher rate than comparable student populations that did not complete the program.	If it is not a problem that requires action, then it is the end of the inquiry. If it is a problem that requires action, then more information becomes necessary.
	What will I do?	Based on this conclusion, actions I will take include… ☐ find more information (check other data sources) ☒ write a cost-benefit report ☐ recommend changes to program eligibility ☐ recommend changes to program activities ☒ recommend an increase in program funding to increase student participation ☒ communicate with: ☒ eligible students ☒ eligible students' parents ☒ state superintendent and school board	Can the program accommodate additional participation? Are more eligible students willing to participate? Will additional funding permit additional participation?
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that… ☒ the program was effective with respect to its goal to increase graduation rates ☐ the program was not effective with respect to its goal to increase graduation rates	At a later point in time, I can assess whether my action (based on data use) changed the situation.
	What are the next steps?	Based on my evaluation, I will… ☒ continue to monitor the situation ☒ observe whether program completers continue to demonstrate better performance than non-completers ☒ evaluate whether subsequent questions have arisen and, if necessary, using this question-driven approach to data use to advance the inquiry	If the situation is not completely resolved, the program administrator/staff may wish to identify what specific issues still need to be addressed and return to the beginning of the data use cycle to seek new information that will inform future action.

Table 2. An illustration of a question-driven approach to data use for various scenarios facing state program staff (example 2).

Data Use Cycle	Framework	Scenario	Comments
	Scenario	A state program administrator is applying for a grant to improve student literacy and needs to know how expensive it would be to expand the program to new service sites.	Grant writing is a common occurrence for many state program administrators.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know… What is the cost of expanding the program to ten new locations?	Subsequent questions include: How many students are eligible to participate in the program at each prospective site? What is the profile of these students] (e.g., academic, behavioral, social, family, health)? What were the costs per participant at each type of site?
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include… ☒ Site location data ☒ Program eligibility data ☐ Attendance data ☐ Mobility data ☐ Discipline data ☐ Family data ☒ Socio-economic data ☒ Program cost data ☒ Direct expenses ☒ Indirect expenses ☒ Total expenses ☒ Cost per participant	Although there may be a wealth of data that could be evaluated, the scenario may warrant only a small subset of data for analysis.
	How will I access the relevant data?	Based on the relevant data, I will… ☐ consult colleagues about observational and anecdotal data ☐ institute a new collection ☒ review grant application criteria and priorities ☒ review program fiscal data ☒ access GIS data on community/site need ☒ access statewide longitudinal data system portal	You may already have access to these data sources; other needs may require gathering data you do not already have. The process for accessing these data may vary by organization.

Table 2. An illustration of a question-driven approach to data use for various scenarios facing state program staff (continued).

Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to… ☒ understand the context and how the data are presented ☒ organize the data in a way that applies to this situation ☒ integrate parameters from grant requirements ☒ relate, combine, and balance information from different sources ☒ assess the data quality and limitations	Don't be too quick to form an opinion based on one or even a few pieces of data. Use techniques such as triangulation to assimilate and evaluate the body of data in order to develop conclusions.
	What do the data tell me?	Based on this analysis, the data suggest… ☐ inconsistent or conflicting results ☒ there is a need and corresponding opportunity for expansion ☐ there is not a need for expansion ☐ there is not an opportunity for expansion	Is there a correlational relationship in the data? Is there a cause-effect relationship in the data?
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude… Our agency should apply for the funds needed to serve additional sites that have students who are eligible to receive service but not currently enrolled.	If it is not a problem that requires action, then it is the end of the inquiry. If it is a problem that requires action, then more information becomes necessary.
	What will I do?	Based on this conclusion, actions I will take include… ☐ find more information (check other data sources) ☐ do not apply for a grant ☒ recommend writing a grant application ☐ recommend changes to program eligibility ☒ communicate with: ☐ eligible students ☐ eligible students' parents ☒ state superintendent and school board	Steps must be taken to actively apply for the grant if that is the action that is warranted by the information.
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that… ☐ the grant application was not submitted ☒ the grant application was submitted	At a later point in time, I can assess whether my action (based on data use) changed the situation.
	What are the next steps?	Based on my evaluation, I will… ☒ continue to monitor the situation ☒ observe whether the grant application was successful and funds were received to increase the number of students served ☒ if the grant was not received, evaluate whether subsequent or alternative opportunities for funding should be explored, using this question-driven approach to data use to advance the inquiry	If the situation is not completely resolved, the program administrator/staff may wish to identify what specific issues still need to be addressed and return to the beginning of the data use cycle to seek new information that will inform future action.

Conclusions

High quality and timely data are powerful tools for improving the management and operation of the entire education enterprise. Thoughtful application of the frameworks, principles, and questions recommended in this Brief will help state program staff use data to inform decisionmaking and actions related to program services and management. The Practical Exercise below provides resources for applying these recommendations when dealing with actual issues or illustrative scenarios. While these skills can be developed by individuals, skill development at a staff level will be enhanced by the delivery of professional development curricula around this area of growing importance for the entire education enterprise. Many state program staff will benefit by collaborating with colleagues when completing these data use scenarios.

Practical Exercise for State Program Staff: Using What You've Learned

State program staff face a wide range of issues that require that they make decisions each and every day. Following the question-driven approach to data use described above, work individually or brainstorm with colleagues to complete the tables below. Be as realistic as possible in your responses, using real data sources, practices, and people in your organization so as to make the scenario as useful as possible.

Data Use Cycle	Framework	Scenario	Comments
	Scenario	A state program staff person is preparing a budget for the upcoming service year.	A common occurrence for state program staff.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know…	
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include…	
	How will I access the relevant data?	Based on the relevant data, I will…	
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to…	
	What do the data tell me?	Based on this analysis, the data suggest…	
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude…	
	What will I do?	Based on this conclusion, actions I will take include…	
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that…	
	What are the next steps?	Based on my evaluation, I will…	

Scenario 2

Data Use Cycle	Framework	Scenario	Comments
	Scenario	A state program staff person is assessing the effectiveness of program staff.	A common occurrence for state program staff.
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know…	
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include…	
	How will I access the relevant data?	Based on the relevant data, I will…	
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to…	
	What do the data tell me?	Based on this analysis, the data suggest…	
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude…	
	What will I do?	Based on this conclusion, actions I will take include…	
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that…	
	What are the next steps?	Based on my evaluation, I will…	

Insert Your Own Scenario Table

Data Use Cycle	Framework	Scenario	Comments
	Scenario		
Step 1: Seek Info	**What do I want to know?**	Based on this scenario, I need to know…	
Step 2: Access/Gather Data	**What data might be relevant?**	Based on the information I need, possibilities include…	
	How will I access the relevant data?	Based on the relevant data, I will…	
Step 3: Analyze/Interpret Data	**What skills and tools do I need to analyze the data?**	Based on gaining access to these data, I will need to be able to…	
	What do the data tell me?	Based on this analysis, the data suggest…	
Step 4: Act on the Data	**What are my conclusions?**	Based on this interpretation, I conclude…	
	What will I do?	Based on this conclusion, actions I will take include…	
Step 5: Evaluate	**What effects did my actions have?**	Based on these actions, I observed that…	
	What are the next steps?	Based on my evaluation, I will…	

Appendix: Online Resources

The following resources are available online and may serve as useful tools or references for learning more about good data use.

Achieving a Wealth of Riches: Delivering on the Promise of Data to Transform Teaching and Learning

http://www.all4ed.org/files/AchievingWealthOfRiches.pdf

Author: Miller (2009)

Description: This brief addresses why using data represents a significant shift for most teachers in how they perform their jobs, explains the importance of using multiple types of data to affect learning, details the infrastructure necessary to encourage teachers' use of data, and provides federal policy recommendations.

Benefits of and Lessons Learned from Linking Teacher and Student Data

http://www.dataqualitycampaign.org/files/publications-benefits_of_and_lessons_learned_from_linking_teacher_and_student_data-120607.pdf

Author: DQC (2007)

Description: This brief looks at how several states are linking student and teacher data, the benefits of those links, and lessons learned.

Can interim assessments be used for instructional change?

http://www.cpre.org/images/stories/cpre_pdfs/rb_51_role%20policy%20brief_final%20web.pdf

Author: Goertz, et al. (2009)

Description: The purpose of this study was to explore the use of interim assessments in elementary mathematics and the district and school policies that support the use of interim assessments to modify classroom instruction. This use of interim assessments was supported by various district and school factors including the alignment of assessment content to standards and curriculum, district expectations that interim assessments should be used to inform instruction, a high-quality and accessible information management system, time allocated for re-teaching, instructional supports for students, and professional supports for teachers. The researchers conclude with a discussion of the implications for policy and research.

Continuous Improvement: It Takes More Than Test Scores
http://eff.csuchico.edu/downloads/TestScores.pdf
Author: Bernhardt (2004)
Description: This article summarizes why analyzing state assessment results is only the beginning of effective data-driven decisionmaking.

A critical review of research on formative assessments: The limited scientific evidence of the impact of formative assessments in education
http://pareonline.net/pdf/v14n7.pdf
Author: Dunn & Mulvenon (2009)
Description: The purpose of this article is to review the research on formative assessment. The authors clarify terms related to formative assessment practices and then provide a critical review of the formative assessment literature. They conclude with recommendations concerning the use of a common vocabulary when researching formative assessment practices as well as additional research on the effects of formative assessments on student performance.

Cutting through the "data-driven" mantra: Different conceptions of data-driven decision making.
http://www.rand.org/pubs/reprints/2009/RAND_RP1372.pdf
Author: Ikemoto, G.S. & Marsh, J.A. (2007)
Description: This chapter explores the increased emphasis on data-driven decisionmaking (DDDM) and the ways in which educators use data to make informed decisions about teaching and learning. The authors explain the process of DDDM from data collection to implementation and identify four broad models of DDDM strategies that range from simple to complex.

Data for School Improvement: Factors for designing effective information systems to support decision-making in schools
http://www.ifets.info/journals/9_3/18.pdf
Author: Breiter, Light (2006)
Description: This document draws on the considerable body of business and organizational research on MIS (and a recent educational case study in New York City) to introduce a theoretical framework for getting from data to decisionmaking in schools. It explores how schools use information with an emphasis on the potential of new technologies and new ways of analysis to meet the information needs of educators across different levels of the system.

Data use in the school and classroom: The challenges of implementing data-based decision making inside schools
http://www.wcer.wisc.edu/publications/workingPapers/Working_Paper_No_2002_2.pdf
Author: Thorn, C.A. (2002)
Description: This paper explores the challenges teachers and school-level administrators face when implementing research-based decisions about instructional practices in the classroom. The author presents both individual and group strategic decision making models and maintains that no one model is best. The author concludes with recommendations to improve quality decisionmaking, including greater access to data and high quality professional development opportunities, incentives for short- and long-term gains, and an expanded range of strategies to address plans for school improvement.

How to Read a Research Article
http://www.human.cornell.edu/pam/outreach/parenting/research/upload/How-20to-20Read-20a-20Research-20Article.pdf
Author: Dunifon (2005)
Description: This brief describes a step-by-step process for making reading a research article more illuminating and useful to non-researchers.

Making Sense of All Your Data
http://www.principals.org/portals/0/content/54342.pdf
Author: LaChat, et al. (2006)
Description: This article discusses the three key components of effective data use: essential questions that guide data analysis, data warehousing technology that supports extensive data disaggregation, and a data team and data coach that ensures that data are available and used. These components support a culture of inquiry, continuous improvement, accountability, and purposeful data-driven decisionmaking as cornerstones to ensure student success.

Making Sense of Data-Driven Decision Making in Education: Evidence from Recent RAND Research
http://www.rand.org/content/dam/rand/pubs/occasional_papers/2006/RAND_OP170.pdf
Author: RAND (2006)
Description: Data-driven decisionmaking applied to student achievement testing data is a central focus of many school and district reform efforts, in part because of federal and state test-based accountability policies. This paper shows how schools and districts are analyzing achievement test results and other types of data to make decisions to improve student success.

Multiple Measures
http://eff.csuchico.edu/downloads/MMeasure.pdf
Author: Bernhardt (1998)
Description: This article advocates for the use of a variety of data to measure student learning and school success. In addition to assessment data, the author argues for the use of demographics, perceptions, and school process data.

The Next Step: Using Longitudinal Data Systems to Improve Student Success
http://www.dataqualitycampaign.org/files/NextStep.pdf
Author: DQC (2009)
Description: This report looks at the "next step" of the LDS development movement: using data to improve education. It summarizes a number of key tasks that education agencies could undertake to facilitate effective data use (expand linkages; ensure access to, analysis of, and communication about data; and build skills among stakeholders to effectively use data).

A Policymaker's Guide to the Value of Student Longitudinal Data
http://www.ecs.org/clearinghouse/40/21/4021.htm
Author: Dougherty, C (2002)
Description: This report on the use of longitudinal data addresses the types of policy questions an LDS data can help to answer.

Practices That Support Data Use
http://daniellight.edublogs.org/files/2007/11/lachat-smith-2005.pdf
Author: Lachat, Smith (2005)
Description: This article presents initial findings of a case study focused on data use in five low-performing urban high schools undergoing comprehensive schoolwide reform. The findings point to several key factors that have an impact on data use in the study sites: the quality and accuracy of available data, staff access to timely data, the capacity for data disaggregation, the collaborative use of data organized around a clear set of questions, and leadership structures that support school-wide use of data.

Reporting and Analysis Tools
http://www.dataqualitycampaign.org/files/Publications-Reporting_and_Analysis_Tools_Education_Data-090107.pdf
Author: DQC (2007)
Description: This policy brief explores how to make data useful and accessible, and reviews lessons learned from states implementing reporting and analysis tools.

Tapping into the Power of Longitudinal Data: A Guide for School Leaders
http://dataqualitycampaign.org/files/publications-tapping_into_the_power_of_longitudinal_data-a_guide_for_school_leaders-010108.pdf
Author: DQC (2008)
Description: In this guide for school leaders, the DQC looks at ways teachers and principals can use longitudinal data to meet students' individual needs and improve performance.

Teachers' Use of Data to Improve Student Learning
http://www.docstoc.com/docs/43687726/Teachers-Use-of-Data-to-Improve-Student-Learning
Author: Urbanski (2004)
Description: This article focuses on the value of using data to improve teaching and learning, with descriptions of the types of resources needed to prepare teachers to use data effectively.

Teachers' Use of Student Data Systems to Improve Instruction: 2005 to 2007
http://www2.ed.gov/rschstat/eval/tech/teachers-data-use-2005-2007/teachers-data-use-2005-2007.pdf
Author: Gallagher, et al. (2008)
Description: The availability and use of electronic student data systems for instructional improvement are rapidly changing. Federal, state, and district efforts to promote the use of data to improve instruction and student achievement are being accompanied by changes in teacher access to student data systems and data use. This report summarizes survey results on teacher use of data to support their work.

Teachers' Use of Student Level Data Systems
http://www.ed.gov/rschstat/eval/tech/teachers-data-use/teachers-data-use-intro.html
Author: USED (2007)
Description: Relying on data from national surveys of teachers and school districts, this brief provides the first national estimates of the prevalence of K-12 teacher access to and use of electronic student data management systems.

What's the evidence on districts' use of evidence?
http://www-gse.berkeley.edu/faculty/CECoburn/coburnhonigsteinfinal.pdf
Author: Coburn, et al. (2009)
Description: This report documents findings from an extensive review of research on school districts' use of evidence in decisionmaking. The authors discover that the processes by which district personnel use evidence to inform their decisions are often complex and mediated by individual and communal interpretations of the research, as well as by organizational and political conditions. Based on these findings the authors provide a set of key lessons to support evidence use in districts and highlight the importance of understanding the processes at work.