USING DATA

TO GUIDE ACTION FOR SCHOOL IMPROVEMENT

NEBRASKA esu Coordinating Council

NEBRASKA DEPARTMENT OF EDUCATION

North Central Comprehensive Center at NCREL

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This project originated as a response to a need for school improvement activities within the four ESU #1 Native American Districts. However, as the project proceeded, it was clear that it would be a valuable resource for all Nebraska school districts. With the support of the ESU #1 Native American Districts, NDE, and ESUCC, the project was expanded to include all stakeholders statewide. With the expanded scope, the product has been strengthened and will support the implementation of processes to use data to improve student achievement across the state.

The development team convened to provide information and support to schools and districts regarding the effective and efficient use of data to make decisions and take action for school improvement. The team hopes that individuals at all levels of the Nebraska education system will find the guidebook and facilitator guide useful in building capacity for analyzing and interpreting data to improve schools and student achievement.

Thank you for your support!

Dr. Bob Uhing
ESU #1 Administrator

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How to Use This Guidebook

This guidebook is divided into four sections and a set of appendices:

- Background Information
- Data Team Logistics
- Data Inquiry Toolkit
- Sample Data
- Appendices

Each section builds on the information in the prior section. Users should first review the guide in its entirety to become comfortable with the content and ready to participate as a member of a data team. The Data Inquiry Toolkit and Sample Data sections will walk the user through each step of the data analysis and decision-making process.

The **Background Information** section provides an overview of the research around school improvement efforts and data processes in education. This section offers general background information that provides context prior to beginning data inquiry cycle efforts.

The **Data Team Logistics** section helps the user identify and build a data team. It provides a set of tools to assist a data facilitator or administrator organize the structures for data inquiry.

The **Data Inquiry Toolkit** provides the tools needed to analyze any set of data to solve a problem or investigate a question.

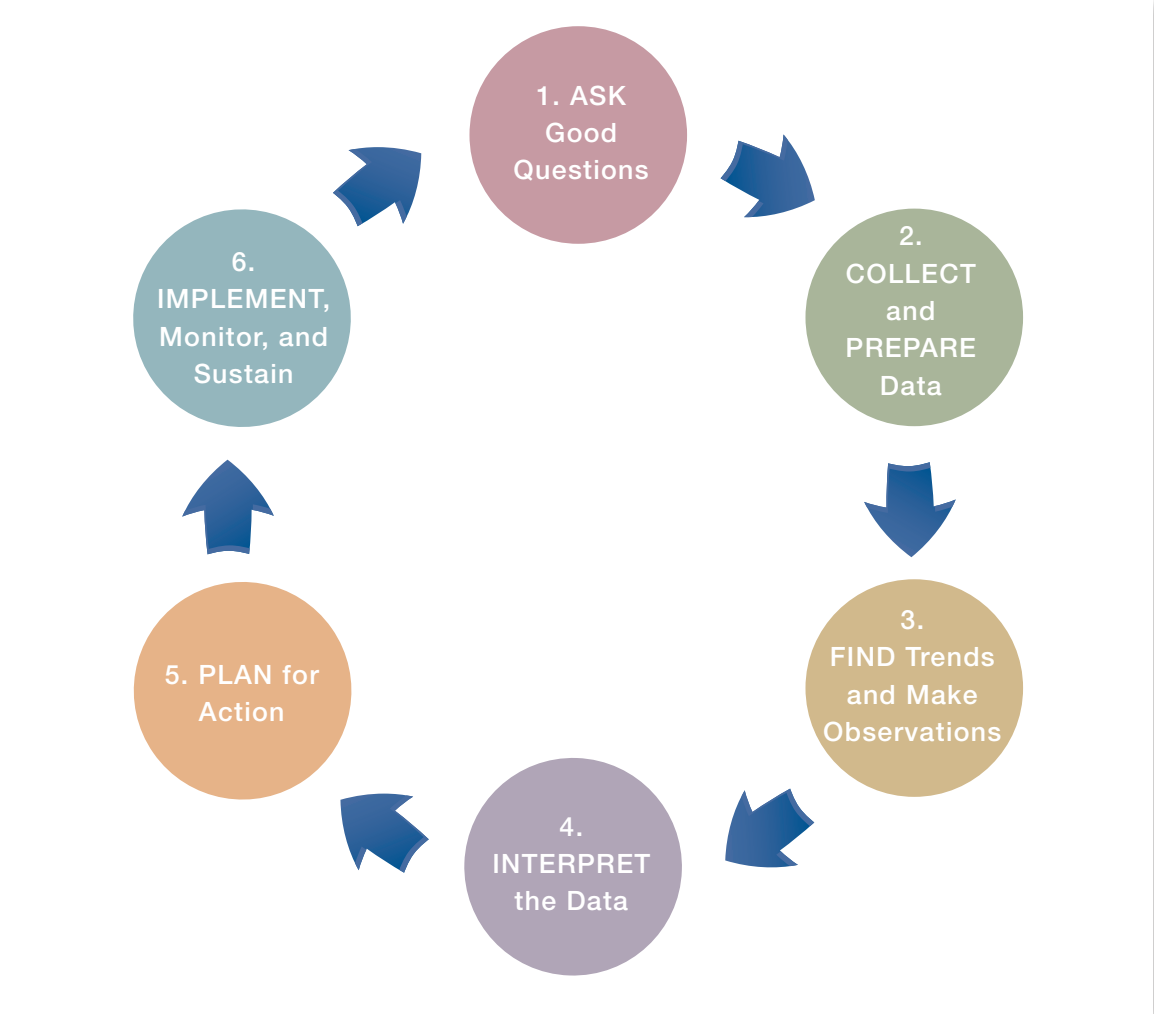
The **Sample Data** section demonstrates how to use the Toolkit by describing a full process using a common school improvement question and related data.

The guidebook also includes an **Appendix** containing a glossary, examples of visual data displays, and a bank of common questions to assist teams as they begin their data analysis efforts.

The supplementary Facilitator's Guide, available at the Nebraska Department of Education's (NDE) website, is designed to assist a data team facilitator in successfully leading a team through all of the stages of the data analysis and decision-making process.

Access the NDE website at **www.education.ne.gov/APAC/SchoolImprovement.html**.

The Six Stages of the Cycle of Data Inquiry



Background Information

Introduction

Schools and school districts are data-rich environments, with heaps of data on student demographics, achievement, outcomes, and perceptions. With so much data available, it can be easy to get caught up in the sheer enormity of the data sets. A cohesive data analysis and decision-making process can help schools, districts, and additional stakeholders to

- ask good questions,
- sort through the available data,
- identify which figures are needed to answer the questions at hand,
- analyze the data, and, ultimately,
- use the information gained from the analysis to make good decisions and carry out meaningful action for school improvement.

Data can provide policymakers with objective information needed to make decisions about their education systems, provide states with information about program effectiveness, and provide schools and districts with information about student learning to influence instruction, programming, and teacher professional development.

With recent changes in accountability expectations of educational institutions and an increased awareness of the power of data, both schools and districts are expected to be data-driven organizations, making decisions and taking action based on the facts presented to them through data. This is a considerable charge, but one that can lead to powerful improvements in student achievement.

The goal of this guidebook is to build capacity for data use at the school, district, and state levels. Ideally, data users will train their colleagues on the data inquiry process, building an entire system of educators who are comfortable with and skilled at using data to take action for school improvement.

Why Have a Data Process?

It is important to have a process for any activity, to ensure high-quality outcomes and seamless transitions. In having a clearly-described, comprehensive process, data teams are able to efficiently and effectively work through their questions for inquiry, data collection, data analysis, and action tasks.

The purpose of the data process is to use data to answer important questions in order to drive positive change to improve student achievement. Good decisions

In an elementary school in one medium-sized district, the teachers and leaders were concerned about students' scores and skills in reading. They assumed that, based on anecdotes and personal experiences, the issue lay in a lack of opportunities for reading outside of school. The staff implemented a costly program in which they provided students with books to take home and read, with associated homework assignments. The team expected that, after the program had been in place for some time, students' skills and scores would improve.

After having expended considerable resources, the scores remained flat one year later. Confused by this, the principal convened a team of reading teachers to investigate the issue. The team began a process of systematically collecting and analyzing the data on student reading skills and achievement. They found that the data indicated that the problem might lay in a lack of foundational reading skills. After implementing a targeted, data-based program of intensive skill building in the lower grades, the school experienced marked improvement in the following year's NeSA-R tests.

and meaningful actions rarely emerge from assumptions and gut reactions. The data process ensures that schools and districts use their resources wisely to take effective action for change.

The data process guides teams and practitioners toward the root causes of a challenge, allowing them to take targeted, effective action to improve the situation without wasting time or other resources on potentially ineffective solutions. It helps educators to maximize the impact of their efforts.

A cohesive data process also enables teams to hold consistent expectations of the actions that can be taken to move toward a data-based school or district culture. Over time and with repeated applications, teachers, administrators, and other education personnel will share a common language around data use.

What Makes a Data Process Effective?

An effective data process is structured and systematic, leading to informed decision making and action. To effectively use data to improve instruction, educators should make data analysis a part of an ongoing cycle of instructional improvement (Hamilton, Halverson, Jackson, Mandinach, Supovitz, & Wayman, 2009). Data use should not be relegated to a periodic event but should become a part of regular practice in schools and districts. Data use should also be prevalent across all levels of the school system, including classrooms, professional learning communities (PLCs), schools, districts, and state departments of education. Data use can be effective for many activities, including improving teaching strategies within classrooms, updating departmental priorities, and altering the educational climate within a school, district, or state (Wade, 2001).

High-performing systems utilize data to improve instruction through a number of practices, including

- reviewing data during weekly collaboration time,
- holding data discussions during daily team instructional planning times,
- dismissing students early periodically to allow teachers uninterrupted time for team data discussions,
- holding all-staff meetings during which data is discussed,
- providing teachers with a few hours of dedicated data review time each week through the use of substitute teachers or support personnel, and
- discussing data collaboratively with other schools and districts. (Datnow, Park, & Wohlstetter, 2007)

How Does a School or District Begin?

An organization seeking to use data for informed decision making in order to improve student achievement should begin by considering who will lead the efforts within the school or district. Then, the organization needs to begin to create a culture that values data and the resulting information, while also familiarizing data teams with the data inquiry process.

When beginning to implement the data inquiry process, it's a good idea to start small, with questions that can be answered relatively quickly and easily. Beginning with a small question that can be analyzed and followed with simple action, leading to a "quick win," will help to build support for data use within the community.

The data analysis process is much like a sport; with practice over time, it will become easier until, eventually, the steps in the process and associated language will become second nature to users. When the process becomes frustrating or difficult, it is the responsibility of the data team members to push and support themselves and their teammates. As the team experiences successes and student achievement climbs, it will become easier to make the connection between the team's hard work and the positive outcomes it creates.

Data Teams

The full data analysis process, when conducted effectively, is a collaborative endeavor. Through collaboration, teams can amass the resources and manpower needed to collect and organize data and numerous points of view on questions, analysis, and action.

Before a school or district begins to organize data around identified questions, it is important to identify a group of individuals within the organization who will hold primary responsibility for organizing, analyzing, and coordinating responses informed by the data. This group becomes the data team.

What Is a Data Team?

Data teams are interdisciplinary groups that field challenges, questions, and insights from the greater organizational community. They are collaborative and work together to monitor student and school performance and efforts to improve performance within the organization (White, 2005).

The way that an organization manages its data teams can vary. Sometimes, schools may choose to support numerous data teams, delineated by subject, grade level, or specialty. Alternatively, schools might choose to have a single guiding team that works with challenges and related data at all levels of the school. Some schools might combine both approaches, with a large, school-wide team that works with smaller, more specified teams. Districts often pursue a systemic approach, with an overarching data team at the district level that works with school-wide teams and school-level subject and content data teams (Love, Haley-Speca, & Reed, 2010). Sometimes, individual teachers may form single-person data teams. The way that a school or district chooses to organize and manage its data teams will depend on the context, including the school's goals and available resources (Hamilton et al., 2009).

Role & Function

The educational data team's role is to engage in data-driven dialogue in order to identify and solve student achievement problems, issues, challenges, or gaps within the school or district setting. The data team serves in an advisory capacity, as it guides selection of the questions for inquiry, collects and analyzes the data, and suggests actions that can be taken to improve on a situation within the educational environment. It is not the team's responsibility to police data use within the school or district or to ensure that policies are being followed.

The data team is responsible for encouraging and enabling a culture of data use and continuous improvement throughout the school or district. As indicators of improved achievement occur, it is likely that the data-based inquiry concept and associated behaviors will spread throughout the organization.

Successful data-based decision making and action are more likely to happen at the classroom and grade levels when the efforts are supported by a data-informed culture at the school and district levels (Hamilton et al., 2009). In a study of data-driven schools, it was found that successful schools did not appoint a single person to hold responsibility for the school's data and data analysis. In successful schools, all school-based personnel, particularly teachers and principals, were explicitly expected to understand and use data to improve instruction and achievement (Wohlstetter, Datnow, & Park, 2008).

Structures & Processes

Data teams can be comprised of endless combinations of teachers, administrators, staff, and other stakeholders. The team members should be dedicated to the process and its intended outcomes. To enable effective and efficient work,

practitioners suggest keeping membership to a maximum of 15 people (Learning Point Associates, 2004). If the team is larger, smaller groupings of pairs or trios can simplify communication patterns and allow for more efficient task completion (Wellman & Lipton, 2004).

When a data team is in the early stages of development, the group should begin by taking the time necessary to build a well-functioning team. This will include establishing group norms, clarifying the group's purpose and goals, and developing a monitoring and control process to continually revisit the quality of group interactions (Love, Haley-Speca, & Reed, 2010).

Effective teams typically commit themselves to the following conditions when working together:

- A climate of trust and openness
- Open and honest communication
- A sense of belonging
- Diversity valued as an asset
- Creativity and risk-taking
- Ongoing evaluation with ability to self-correct
- Members who are interdependent
- A consensus decision-making style
- Participatory leadership

(Learning Point Associates, 2004)

Some examples and tools for building and engaging data teams are included in the Data Team Logistics section of this guide (beginning on page 31).

In studies of data analysis processes in education, data teams at successful schools met weekly for structured data discussion meetings. Within these schools, teachers were provided with daily grade-level planning time, and school-wide data meetings occurred routinely throughout the year. These school-wide meetings were particularly effective when they were coupled with early student dismissals, to allow for a few hours of focused analysis and discussion. Meetings were well-structured and participants were held to high expectations for preparedness and engagement (Wohlstetter, Datnow, & Park, 2008).

Like the continuous improvement cycle it is meant to drive, the data team process is continuous. The data team's work is never complete. The team should endeavor to continually improve instruction and achievement in an iterative process of measurement and implementation (Datnow, Park, & Wohlstetter, 2007).

Ongoing Support Needs

Data teams may require routine and ongoing professional development or training services from experts within the school, district, and/or state department. The goal of these services is to provide training on data access and to help the data teams remain informed about changes and updates to data sources, data storage systems, and data-related processes at all levels of the organization. Ongoing support can also help the team to maintain fidelity with its goals and the goals of the system in which it operates (school, district, or state department).

The data team may also require ongoing support from the administration at the school, district, or state level, to assist with follow-through on the team's findings. For example, if a school-based data team identifies a need for updated teaching practices to improve student achievement, assistance and support from the school's administrator will be needed to get full commitment to the new practice.

The data team will also need ready access to high-quality, relevant data. Team members will need to know how to locate and acquire data sets. It should also be clear to all users that the quality of the decisions made and actions taken are heavily dependent on the quality of the data used. This means that data collection and entry must be both timely and meticulous. The data team will also need a dedicated location for data storage. Depending on the size of the data sets, this could include anything from a large data warehouse to a single spreadsheet.

A data infrastructure alone will not drive data-based decision making and action. Staff members will need to have the tools needed to conduct a process for using data to make decisions and plan action. Effective processes are structured and systematic, helping teams to stay focused on using data to inform action in specified areas. This guide outlines a systematic and comprehensive process for using data effectively to make decisions and implement actions aimed at improving student achievement.

Stage 1: Ask Good Questions

Corresponds to Toolkit Tools 1A, 1B, 1C, page 38

Organizing data around essential questions about student performance helps educators use data while maintaining a clear focus on student learning. The data team's first task is to clarify the questions that need to be answered *before* data collection begins.

It is important to have a focused target for inquiry, and teams need to spend time developing focus areas and questions. To assist teams in working through this stage effectively and efficiently, a bank of common questions is available in Appendix B (page 66).

Focus Area for Inquiry

The data inquiry cycle begins with the identification of an overarching focus area, often by an administrator prior to convening the data team. If this is not the case, the data team will need to identify a focus area.

The overarching focus area serves as an "umbrella" throughout the data inquiry cycle. A potentially infinite number of questions related to the focus area can then be asked. For example, within "improve student achievement," a common focus area, the following questions might be asked:

- Why have 4th-grade math scores declined over the last three years?
- Is there a relationship between 6th graders' behavior incidents and the success of their transition to 7th grade?
- How do this year's 11th-grade ACT scores compare to the scores from the past two years?
- Has our new focus on credit recovery programs had any impact on graduation rates?

These questions vary considerably in focus, context, and possible actions; however, they are all related to "improve student achievement."

Developing Questions for Inquiry

The goal of this stage is to ask good questions that data can answer. While philosophical or theoretical questions may be interesting and important, they cannot be answered definitively through data. Examples of both types of questions are in Table 1.

Table 1: Questions Data Can and Cannot Answer

Data Can Answer	Data Cannot Answer
What is the relationship between ACT scores and college-going rates?	What does achievement really mean?
How are our scores trending in mathematics and science over the last three years?	Is it more important for students to learn mathematics or science?
What factors might be contributing to the increase in suspensions this year?	Do standardized tests really matter?

Identifying potential questions for analysis and narrowing them down to a single question can be a time-consuming and difficult process. If the focus of an individual question becomes too broad, however, the volume of data becomes overwhelming and there is a danger of not addressing key student learning or program needs. It is important to limit the scope of the questions by considering whether or not they are clear, measurable, and align with the focus area.

Other considerations include whether the question is something that the team can investigate within the provided timeframe, whether the data needed to investigate the question is available, and whether the question represents a pressing issue for the organization as a whole.

There are three common types of questions that data teams might consider during this stage of the process (Table 2). Descriptive questions address the current state of things, relational questions focus on the relationship between sets of variables, and causal questions explore the impact that one variable may have on another (Trochim, 2006).

Table 2: Common Types of Questions for Data Inquiry

Type of Question	Description	Examples
Descriptive	Describes what is going on or what exists	• How are 5th graders performing in reading .this year? • How do School X's SAT scores compare to School Y's SAT scores in 2011?
Relational	Explores the relationship between two or more variables	• What is the relationship between end-of-course grades and scores on the state test? • What is the correlation between ethnicity and enrollment in AP courses?
Causal	Determines whether one or more variables causes or effects one or more outcome variables	• What is the impact of direct instruction on kindergarteners' phonemic awareness? • What is the impact of attendance on 4th-grade MAP scores?

Regardless of the type of question selected, the team should ensure that it is clear, straightforward, and sufficiently narrow to allow for an effective data inquiry process. Questions that are clear and straightforward use common language and are easily understood by persons outside of the team. Questions that are sufficiently narrow will allow the team to answer the question within a reasonable time frame and without requiring an excessive number of data sources and variables.

A question that is too broad can require too many pieces of data and too much preparation and analysis time. This can result in a frustrated data team that is unable to complete the cycle of data inquiry in the allotted time. A question that is too narrow will not guide the team towards change that can positively affect the whole organization. Questions that are too narrow are typically those that consider only one or a very small number of students. Examples of overly broad and sufficiently narrow questions are listed in Table 3.

Table 3: Overly Broad and Sufficiently Narrow Questions

Overly Broad	Sufficiently Narrow
Is there any relationship between AP scores and other scores?	In 2010 at Main High School, how did final scores on the 11th-grade AP History test correlate to end-of-course grades?
Is behavior related to outcomes?	Are suspension rates related to high school graduation rates in our district? If so, in what way?
What impacts MAP scores?	How does student attendance affect 4th-grade MAP scores?

While the overly broad question may be interesting to ask and may be the ultimate goal over many periods of inquiry, the sufficiently narrow question allows the team to complete the data inquiry process in a reasonable amount of time. The sufficiently narrow question provides the team with clear direction for the scope of the question and the data that needs to be collected.

One way to determine whether the question is too broad is to itemize all of the variables inherent in the question. The variables are those data sources that will need to be examined in order to answer the question. When a question is too broad, the list of variables is quite long and likely overwhelming to the group. Examples of questions and the associated data are provided in Table 4.

Table 4: Using Variables to Determine if a Question is Too Broad

Question	Variables/Types of Data Needed
Overly Broad Is behavior related to outcomes?	**Behavior Data:** suspensions, expulsions, detentions, calls home, all types of behavioral infractions **Outcomes Data:** graduation, dropout, end-of-course grades, GPA, college admittance, grade retention, remediation rates **Time Period:** pull data for an indeterminate number of years
Sufficiently Narrow Are suspension rates related to high school graduation rates in our district over the last two years?	**Behavior Data:** suspension rates at each high school in the district **Outcomes Data:** graduation rates at each high school in the district **Time Period:** pull data for just the last two years

In the first example, there are countless variables and data sources needed to answer the question. The team may become frustrated by all of the possible combinations of data as well as the time and effort necessary to collect and analyze each of them.

In the second example, the question has been narrowed to include only a handful of variables and data sources. With this smaller dataset, the team can organize, review, and analyze the data relatively quickly, answering its focus question in a reasonable amount of time and moving forward to take action.

If the team chooses at a later time to continue on this path of inquiry, they may expand the question to consider additional years, grade levels, courses, or schools.

The Question Cycle

Data teams will often develop numerous possible questions for inquiry during the initial focused brainstorming session, and additional questions are likely to emerge during the course of data analysis.

It is important to document these questions for potential use in upcoming data cycles. Keeping such a log honors the input of all team members and will accelerate the process of asking good questions during the next cycle of inquiry. A Parking Lot Tool (7A, page 47) is included in the Data Inquiry Toolkit to assist with the recording of questions and other ideas (page 64).

After identifying a good question for inquiry, the team will be ready to identify, collect, and prepare the data needed to answer the question. The question should serve as a filter that helps to identify which sources of data are relevant for the inquiry.

Stage 2: Collect and Prepare the Data

Corresponds to Toolkit Tool 2A, page 39

Data collection is simply the compiling of data that address the focus question. Data collection is an important part of the data inquiry and decision making process. It should be a planned and purposeful process, as valuable data will guide the development of improvement goals that benefit all students.

Teams may discover that the data needed to answer the focus question is not readily available. This is powerful information to provide to the school-, district-, and state-level technology and data teams as they continue to build and refine longitudinal student data systems. When the required data is not readily available, the team can either select another question from the initial set or begin brainstorming new questions for which data is more available.

Data Levels

Data is available at various levels of the organization. From the broadest, most aggregated, sources to the most specific sources, data can typically be collected as identified in Figure 1. There may be additional levels available in regional or national systems, as well.

A data team may convene at any level of an educational organization to conduct a cycle of data inquiry. For example, a state-level team might analyze data on all schools, districts, or intermediate agencies within the state; an intermediate agency might consider data only on those schools with which it partners; and district and school teams might consider more specific school or classroom data.

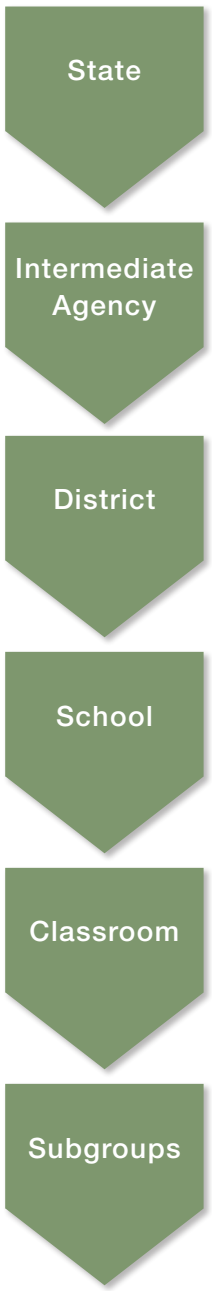


Figure 1: Common Levels of Education Data

Types of Data

Common types of data available in an educational environment include demographic, perceptual, performance, and program data, as illustrated in Figure 2.

Demographic Data

- This type of data includes descriptors of students, including gender, ethnicity, socioeconomic status, and descriptors of the organization, including enrollment and attendance.
- Typically, it is used as a way to disaggregate, or pull apart, the other focus data. Demographic information can allow the team to look at a question for different subgroups of students. This data may also be useful if the team has convened to solve an issue of equity, such as differing math performance between boys and girls. If, for example, a team is exploring a relationship between an instructional practice and reading outcomes, the team could consider whether the instructional practice leads to increased reading skills for all students or for different genders, ages, ethnicities, socioeconomic status levels, or other groupings of students. This data can give nuance to the question and perhaps focus later action.

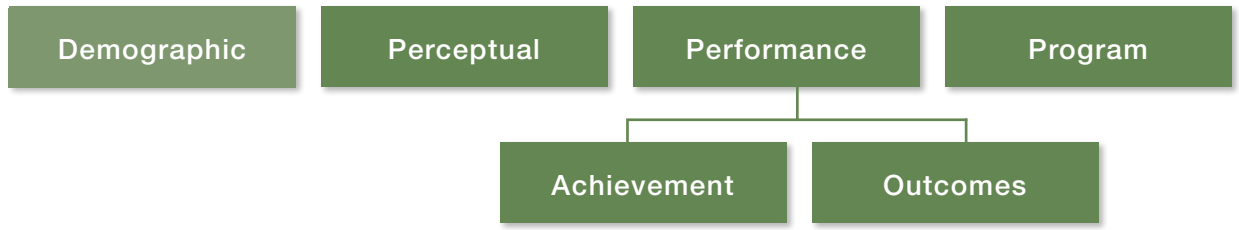


Figure 2: Common Types of Educational Data

- It might also be collected through the use of surveys or questionnaires (which are often associated with perception data), to better understand the descriptors of students' out-of-school lives. For example, teams may want to consider relationships between achievement and students' bedtimes, how many people live in the home, or how far students have to travel to get to school.

Perceptual Data

- This type of data includes stakeholder surveys or questionnaires (student, parent, staff, community member, graduate) and observations.
- Provides information on how stakeholders feel or what they observe about the organization or its activities. A team might use this data to identify correlations between stakeholder perceptions and the question for inquiry. For example, a team might consider whether there is a correlation between a student's ACT scores and his parent's or guardian's perception of school quality. Key stakeholders in a school or district include students, parents, staff, alumni, and community members.
- This data is often collected through surveys or questionnaires and may require collection after the team has identified a goal and a question for inquiry, to ensure a clear connection between the data and the inquiry.

Performance Data includes both **Achievement Data** and **Outcomes Data.**

Achievement Data

- This type of data includes state assessments, district and school assessments, curriculum-based assessments, interim and benchmark assessments, end-of-course grades, and grade point averages (GPA).
- It is useful whenever the team wants to improve and measure student achievement. For example, it would be used if the team wants to understand more fully the relationship between MAP scores and NeSA scores.
- When considering education data, unless the focus question calls for a specific type of achievement data (for example, MAP scores), the team should be careful to avoid overreliance on any single source of achievement data. When considering test scores within the context of answering the focus question, the team should try to use at least two types of achievement data, to ensure that the question is answered with appropriate accuracy and to avoid skewing the response. For example, if the data team wants to know if a certain instructional strategy is correlated with increases in student reading skills, they may want to consider reading scores on multiple assessments, including classroom-based and state standardized tests.

Outcomes Data

- This type of data includes anything that measures final results or conclusions for students. Examples are graduation rates, dropout rates, mobility rates, suspensions and expulsions, behavior rates, remediation rates, college acceptance and attendance, and career readiness. This data can also include long-term outcomes, such as career achievement, personal milestones (such as marriage or childbearing), or mortality rates.
- It is most useful to a team that wants to consider the effects of a variable on what happens to students within a specific time period or at an end-point in their education. For example, a team may want to consider whether there is a correlation between 6th-grade math achievement and college acceptance rates, to determine how the K−12 school environment can improve student outcomes.

Program Data

- This type of data includes descriptive data about how education and related activities are conducted within the organization, including, for example, the textbooks used, the levels of staffing or professional development at the school, the schedule of classes, curricular sequences, instructional strategies, the nature and frequency of assessments, extracurricular activities, and even the school setting.
- It can be useful to teams considering the effects of systemic factors on student outcomes or achievement. For example, a team might investigate whether a correlation exists between a teacher's years of service and students' achievement on the NeSA.

Having the right data is very important. The data team will frame its work when it chooses which data to collect and analyze. The data must directly link to the question under inquiry; the data team cannot answer a question and develop actionable steps with unrelated data.

This is not an exhaustive or comprehensive list of the types, sources, or potential uses of data and should be used only as a guide. Educational organizations have an abundance of data available, and it is the data team or data user who will determine which sources are most useful to answer the question at hand. Data become informative and meaningful as they are used and analyzed.

Collecting the Data

Once the team identifies the data needed to answer the focus question, the next step is to determine where the data are located and how to acquire the data. In some cases, the data will be stored at the classroom level (for example, in-class formative assessments or interim course grades).

In most cases, data are available at the school, district, or state levels. Some organizations store student data consistently in a single school-, district-, or state-wide longitudinal data system or student management system. Other organizations store data in building-specific systems. The organization's data storage systems and their associated permissions structures will vary widely and will determine the complexity of the data gathering process.

One or more team members should be given the task of collecting the necessary data prior to the next meeting. Data access, like data storage, will vary depending on the nature of the data required. If it is not publicly available, the data may need to be acquired through multiple avenues, including from classroom teachers, building, district, or state administrators, or data managers.

Grouping relevant data sources together ensures that the team is comparing data sources appropriately. When analyzing the data for correlations, causal relationships, or other interactions, it is important to keep data sources

grouped according to relevant year, location or other important variables. For example, if the team aims to consider the correlation between NeSA scores and attendance, it cannot use data from two different years. The team will need to compare 2010 NeSA scores to 2010 attendance rates in order to accurately answer the question.

If the team discovers at this stage that the data are unavailable or inaccessible, they will need to consider whether they can answer the focus question based on what is available. If not, the team should reconvene to identify a new question for inquiry. The team should also provide feedback to data managers to ensure that the need for this data is built into the system for future cycles of inquiry.

Data Preparation

Next, the team should organize the data into charts, graphs, and tables, in order for productive analysis to occur. Preparing the data is an important step, as it helps the team to visualize the facts and patterns in the data in an efficient manner. In order to maintain effective meeting outcomes, the data should be prepared ahead of the next team meeting. The team should not wait until Stage 3 to complete data preparation activities.

Depending on the types of data collected, teams might choose to use graphs, tables, color-coding, or other methods of displaying the data. Unless student names and identifying information need to be included for an accurate analysis, all student-level data should be presented using identification numbers in place of names.

Graphs provide a way to easily identify trends or differences between groups. Some graphs will also help the team to visualize changes over time or correlations between two variables. Common types of graphs are described in Table 5. Further information on common graphs is in Appendix D (page 69).

Table 5: Different Types of Graphs and When to Use Them

Graph Type	Best Uses
Line Graph	• Tracking changes or trends over a period of time • Comparing two groups over the same period of time **Example:** Scores earned by 5th graders on the last 10 math tests
Bar Graph	• Comparing a variable across different groups • Comparing two groups on a single variable **Example:** Average attendance rates by grade level
Pie Chart	• Comparing parts of a whole • Comparing percentages **Example:** Breakdown of the school's teachers' years of service
Scatterplot	• Identifying relationships or correlations between two variables • Identifying relationships in large data sets **Example:** Correlation between classroom grades and ACT scores

Color-coding is a method of quickly identifying trends and patterns in a spreadsheet through the use of color. Teams often will code "bad" data in red and "good" data in green. For example, when considering the proficiency levels of a group of students, those who scored as non-proficient might be colored red, so that the team can quickly make an estimate of the percentage of students in this category. An example of color-coding is available in Appendix C (page 68).

Stage 3: Find Trends and Make Observations

Corresponds to Toolkit Tool 3A, page 40

Once the data has been collected and organized, the team should be ready to consider what the data says. It is important to first focus on the factual evidence before considering context. This will help the team to avoid making preemptive conclusions, excuses, and assumptions about the challenge or issue in question.

Making excuses is a common approach to explain why students are not achieving at higher levels, which is often something that is completely outside of the school's control (e.g. environmental factors). A purpose of the data analysis process is to move beyond those assumptions and to identify areas the team *can* control and actions the team can take to make positive changes in student achievement.

During this stage, it is helpful for team members to use computers to sort and reorganize the data to enable efficient disaggregation. All visual displays of data, including spreadsheets, graphs, and color-coded tables, should be completed before beginning this stage. Though the data may need to be resorted, recalculated, or presented in a different format, it is not recommended that the group wait until the Stage 3 meeting to complete the bulk of the data preparation.

Find Meaningful Trends and Patterns In the Data

Data team members should keep the focus question in mind as they review the data and search for patterns. To identify the trends and patterns, the team can make calculations, disaggregate the data, and review visual displays of the data.

Make Calculations. A quick method for finding meaning in the data is counting, adding, dividing, or averaging the data.

> **Counting:** In counting, a team can determine how many members of a group were included in a particular variable. For example, counting will inform a team that 37 6th graders had grades of B or higher in mathematics.
>
> **Adding:** In adding, a team can determine how many members of multiple groups were included in a particular variable. For example, adding will inform a team that a total of 64 middle school students had grades of B or higher in mathematics.
>
> **Dividing:** Dividing will provide percentages, allowing a team to compare across groups. This method can be particularly helpful when groups are of different sizes. For example, by dividing the number of students with a grade of B or higher by the total number of students in the group, the team can determine that 46% of 6th graders and 58% of 7th graders had grades of B or higher in mathematics.
>
> **Averaging:** Determining the average for a group will help the team identify whether the mean is where it needs to be and will allow the team to compare means across groups. For example, averaging will tell a team that the mean math grades were B- in 6th grade, A- in 7th grade, and B in 8th grade.

Disaggregation. By breaking the data into subgroups, the team can consider more distinct patterns related to the focus question. The team can use the same calculations described above, but apply them to more specified groupings. The team can also sort a full data set according to the disaggregation variables. For example, the team might determine that, in mathematics, the average male 6th grader receives a B but the average female 6th grader receives a C+. This gives them more nuanced information about math performance. This pattern may help the team to formulate actions in the later stages of the process.

ID	Grade	Gender	Math Grade
66667	6	F	73
409272	6	F	76
251753	6	F	87
485833	6	F	76
868004	6	F	81
530154	6	M	90
115447	6	M	89
222288	6	M	73
750996	6	M	79
660644	6	M	90
927193	7	F	87
896362	7	F	74
191763	7	M	92
945834	7	M	87
150628	8	F	77
395946	8	F	80
571100	8	F	87
496242	8	M	88
721724	8	M	72

Figure 3: Example of Sorting for Disaggregation

By sorting the data table by grade, then by gender, the team is able to quickly calculate the average scores for 6th-grade boys and girls.

Once the team knows that boys average 84 while girls average 79, they may be able to provide a more targeted action approach to improving the school's mathematics scores.

Some common school-level indicators upon which teams can disaggregate data include:

- Grade level
- Ethnicity
- Gender
- Special Education status
- Socioeconomic status
- English Language Learner status
- Teacher's years of service
- Student's percentile rank

Visual Displays. Visual displays can be very powerful in helping the team identify patterns in the data. These should be prepared ahead of time and will often take the form of graphs, tables, or color-coded figures. These displays can help patterns appear more readily to team members. Examples of visual displays are available in Appendices C and D (pages 68–72).

If the team identifies trends or patterns that are unrelated to the focus question but may merit review at a later time, they should note this in the team's Parking Lot (page 66) and plan to return to them at the close of the current project.

Make Factual Observations About the Data

Once the team has begun to notice trends and patterns, it is important to record clear, factual observations about the strengths and the challenges evident in the data. The team should avoid explaining the patterns in the data at this stage.

When analyzing the data, the team should first consider the stories that are told by each type of data alone, then by the disaggregated and combined data sources. For example, if the team has school-wide data for NeSA-M scores and attendance rates for 2011, they should consider the NeSA-M data, then the attendance data, followed by the two data sets combined. Then the data sets can be considered in disaggregated ways, such as looking at the data by grade level, by gender, or by free-reduced lunch (FRL) status. Quickly, even a small number of data sets can become very rich in information.

Team members should avoid introducing bias and interpretation in their observations. Bias is evident in statements that indicate assumptions or prejudice about something, someone, or a group of people. Interpretation is evident in statements that attempt to explain something or the meaning of something. While interpretive statements might actually turn out to be true, they are not fully based on what the data shows. Examples of each are provided in Table 6.

Table 6: Examples of Bias and Interpretation

Type	Example Statements
Bias	• Boys are better than girls at mathematics. • Students living in poverty will achieve at lower levels. • Foreign-born teachers are not as good as American teachers at teaching English Language Arts.
Interpretation	• Fourth graders are having behavior issues because they play too many video games. • The ACT scores have been dropping because we moved mathematics to the morning. • Gym class helps students do better in afternoon classes.

One way the team can ensure factual observations about data is to make SURF statements (Figure 4). Examples of statements that adhere to SURF appear in Table 7.

Specific	Statements comment on only one item in the data. These statements are straightforward and clear because they involve single sources.
Understandable	Statements are easy to comprehend even without having intimate knowledge of the data.
Related	Statements are those that are relevant to the question the team is seeking to answer.
Factual	Statements only incorporate the data; they do not involve assumptions, inferences, or biases.

Figure 4: Descriptions of SURF Statements

Table 7: SURF Data Statements

Example Focus Question: How are 4th-grade attendance rates related to 4th-grade MAP scores?		
	Not SURF	SURF
Specific	Fourth graders have an overall attendance rate of 76%; they aren't doing well on the MAP; the boys have better attendance than the girls.	The overall attendance rate for 4th-grade students at ABC School in 2011 was 76%.
Not SURF because the statement considers numerous ideas and data sources. It is not specific to a single fact.		
Understandable	Based on the MAP data set's trend lines, we can see that the kids weren't doing that well.	In 2011, 24% of 4th graders at ABC School scored in the 50th percentile or higher on the MAP test.
Not SURF because the statement references data and graphs that are not known to individuals outside of the group and does not make a specific statement of fact.		
Related	Fourth graders at ABC School had the highest number of behavior incidences of any group of students in 2011.	In the 2011 4th grade at ABC School, boys had an average attendance rate of 73% while girls had an average attendance rate of 81%.
Not SURF because the statement does not provide a fact with relevance to the focus question.		
Factual	Fourth graders' attendance rate of 76% in 2011 was due to the fact that the local factory laid off 100 workers, so most kids couldn't get reliable transportation to school.	In 2011, the 3% of students who scored in the 75th percentile or above on the MAP test also had attendance rates of 98% or better.
Not SURF because the statement introduces interpretation and attempts to provide reasons for the fact presented in the data.		

The team should record all of the SURF statements and hold each other accountable to the requirements of SURF. Statements that are data-based but include interpretation or context should be held over until the next stage.

This can be one of the most exciting stages of the data process, but it can also be one of the most time-intensive. If the team has time constraints, it might be best to set time limits for each data source.

After the team has thoroughly examined the various data sources, uncovering meaningful patterns, relationships, and facts that are related to the focus question, they are ready to move on to Stage 4, during which they will interpret the data.

Stage 4: Interpret the Data

Corresponds to Toolkit Tools 4A, 4B, 4C, 4D, and 4E, pages 41–43

During Stage 3, the data team considered only factual observations that were readily observed in the data patterns and trends. During Stage 4, the team begins to interpret those patterns in both the context of the organization and the focus question. Then, the team can answer the focus question and develop hypotheses to drive subsequent action.

Identify Strengths and Challenges

The team will begin by reviewing the factual statements about the data. At this stage, the group can introduce interpretation of the facts and statements, placing the statements into the appropriate context. Though data-based interpretive statements are allowed at this stage, statements grounded in bias are rarely helpful and should not be included.

During this activity, the team will begin to identify areas of strength and challenge that have emerged from the data. It's important for the team to take time to recognize and celebrate strengths. Not only does this provide a positive counterpoint to the challenges, but the exercise of identifying strengths can help to ensure that they are sustained over time and, when possible, applied to future improvement efforts.

It may be that one or more of the observed strengths can be applied to the current focus area. For example, while investigating a focus question dealing with middle school math achievement, the team may discover that, over the last three years, students have shown growth in achievement between the 6th and 7th grades. If the team can identify why that growth is occurring, it may inform action for other grade levels.

Once strengths have been identified and celebrated, team members will begin identifying challenges. Challenges represent factors that may be impeding improvement or positive outcomes in student achievement and performance. They are not barriers that were experienced during the cycle of data inquiry, such as a lack of data access or difficulty scheduling meeting times.

It is likely that multiple challenges will be identified through the data. Some challenges, however, will have a higher priority for action than others. To identify these, the team will identify all of the observed challenges, ensuring that they are related to the overarching focus area and focus question. Unrelated challenges should not be forgotten but should be reserved for a later cycle of data inquiry.

Sometimes, the team may find that the data indicates that there are no challenges in the particular area being reviewed. This is valuable information and something to celebrate. If this happens, the team should share its findings with the greater community and move on to a new focus question or additional data sets.

Prioritize the Challenges and Choose a Key Challenge

Once the challenges are listed, the team should prioritize and rank them to identify the challenge that will be the focus of action in later stages of the cycle of inquiry. The ranking process can occur in a number of ways. Team members can be asked to identify their top three challenges, their top challenge, or to rank all challenges. It may be important to remind the team that lower-rank challenges can be pursued later.

When ranking the challenges, team members should consider whether the challenge exists within the team's area of control—and, therefore, is something that the group can directly change. Other challenges may exist within the area of concern, where the group has no ability to alter any factors related to the challenge, or the area of influence, where the group can change factors around the challenge but not the challenge itself (Covey, 1989). Instead of focusing on conditions over which they have little or no control, proactive educators will focus their time and energy on things they *can* control.

Table 8: Examples of Areas of Concern, Influence, and Control

Example Focus Question: What is causing ABC School's low 4th-grade MAP scores?		
Area	**Example**	**Reason**
Concern	Parents aren't enforcing early bedtimes, so students are tired when they take their MAP tests.	There is nothing the team can do to force students to go to bed earlier.
Influence	Parents aren't encouraging students to do well on the tests.	The team can send flyers home and hold information nights to inform parents of the importance of the MAP tests, in an attempt to influence the parents to encourage their children. But the team cannot force parents to encourage their students to do well.
Control	Most of the 4th-grade students are arriving at school not having eaten breakfast, so they are hungry when they take their MAP tests.	The team can take action to provide a healthy breakfast for students on testing days.

The ranking process may result in selection of challenges that are only within the area of influence—and none within the area of control. If the team believes that it has sufficient influence to warrant action in that area, it is acceptable to choose challenges within the area of influence.

Regardless of the method used to rank challenges, the team's leader should ensure that there is consensus among the group and that all members feel comfortable pursuing the identified top- priority challenge. While it may not be possible for the team to agree completely, it is important that all members understand and are committed to the chosen challenge.

At this point, it is important for the team's facilitator to ensure that everyone has a shared understanding of and agree with the process and decisions to date.

Identify Driving Factors for the Challenge

Once a key challenge has been identified for further inquiry and action, team members transition to hypothesizing reasons for the challenge's existence. These reasons, known as driving factors, will become the targets for action in later cycle stages.

One way to identify driving factors for the key challenge is to ask a series of "Why…?" questions followed by "Because…" responses, as illustrated in Table 9. In this activity, the team considers reasons for the challenge by making interpretations and educated guesses and determining whether the driving factor is within the team's area of concern, influence, or control. Finally, the team tests its hypotheses to ensure that the inherent assumptions are correct and supported by data.

Table 9: Why/Because Driving Factor Identification Process

Key Challenge: 10th-grade students have the highest suspension rates of all of the students in the school		
Why?	**Because… (Driving Factors)**	**Which Area?**
Why do they have high suspension rates?	They have a large number of behavior incidences.	(Concern) Influence Control
Why do they have so many behavior incidences?	They have more free time in which to misbehave.	Concern (Influence) Control
Why do they have more time to misbehave?	They have lunch periods free.	Concern Influence (Control)

Another method of identifying driving factors is the Cause and Effect or Fishbone Diagram (Figure 5). This diagramming method encourages the team to consider numerous potential driving factors and to think broadly (George, Rowlands, Price, & Maxey, 2005). The team will place the key challenge in the diagram's "head" and provide numerous boxes for categories of driving factors. The team begins by brainstorming what the categories should be, and then begins to drill down into specific causes, or driving factors, of the key challenge (George et al., 2005).

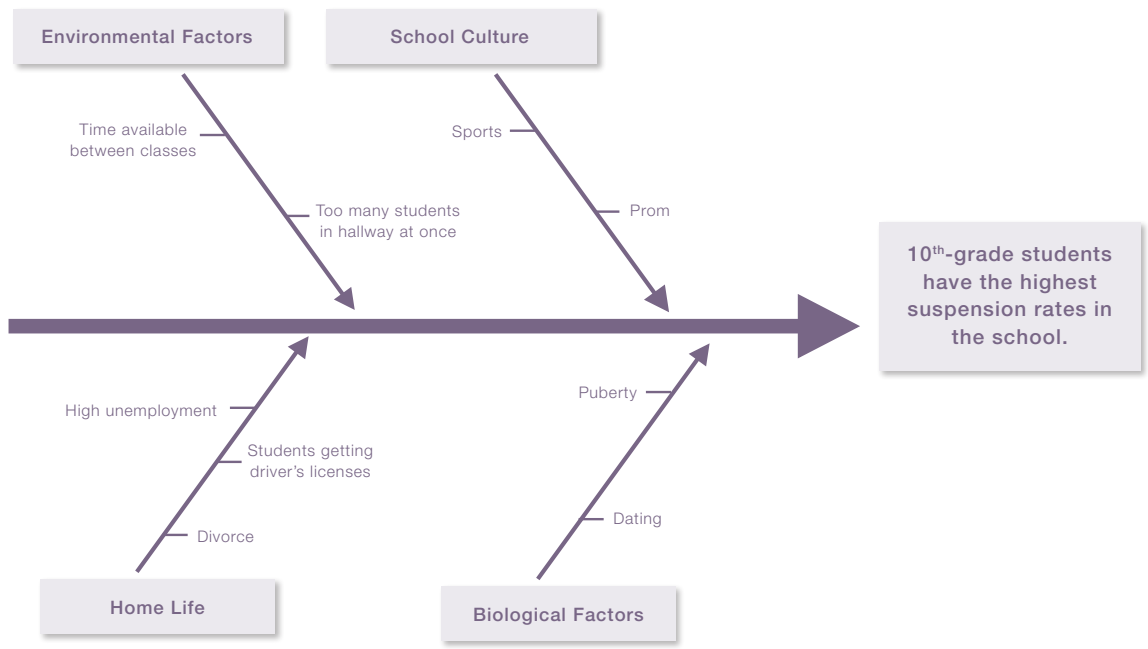


Figure 5: Fishbone Diagram of Driving Factors

The fishbone diagram can lead to more specific ideas and might be best used for more complex issues, to help the team organize the various driving factors that might be present.

Once potential driving factors have been identified, it's important to check that the assumptions inherent in the hypotheses are correct. In the example from Table 9, the team will want to consider whether the assumptions "10th graders have a large number of behavior incidents" and "10th graders have more free time" are correct. A quick look at the relevant data will reveal whether these assumptions are supported by data. If they are, the hypotheses can remain. If they are not, the hypotheses should be rejected and other potential driving factors should be considered.

Choose a Top Driving Factor for the Key Challenge

Ultimately, the team will attempt to have measurable impact on the key challenge and the focus area by taking action to improve or eradicate the driving factors. In order to focus efforts, the team will choose a single driving factor upon which to act. This factor should be within the team's area of control or, if that is not possible, the area of influence.

The team should rank order the controllable driving factors according to the impact each factor has on the key challenge. Factor 1 will have the largest impact.

Once the team has chosen a top driving factor for action, it is ready to move on to Stage 5.

Stage 5: Plan for Action

Corresponds to Toolkit Tools 5A, 5B, page 44

A data-driven decision-making continuum begins with raw data and ends with meaningful knowledge that is used to make decisions (Breiter & Light, 2006). Educators should be aware that data-driven decision making does not guarantee *effective* decision making (Marsh, Pane, & Hamilton, 2006). Simply collecting, organizing, analyzing, and interpreting data does not ensure that the data will be used to drive decisions and action or lead to school improvement.

Attention must be given to planning actions based on data, which is typically more challenging than the act of reviewing data (Marsh, Pane, & Hamilton, 2006). The data inquiry process ensures that the data team and school or district community at large bases its actions and strategies on facts, as opposed to uninformed guesses, when determining causal factors.

After the members of the data team have collected, organized, and analyzed the data to identify patterns, challenges, and driving factors, they are ready to move to action planning. The goal of the full cycle of inquiry is to take action on the driving factors to positively affect the key challenge and ultimately improve the overarching focus area.

To review, the four stages of the Cycle of Data Inquiry identify the focus area, focus question, key challenge, and top driving factor. Actions that improve or eliminate the top driving factor can be expected to improve or eliminate the key challenge, allowing the group to move toward improvement in the focus area.

During this process, it is important for data team members to commit to using data-based facts for the purpose of driving inquiry and action. Assumptions are often made about *how* or *why* things are, which can lead to excuse-making or becoming convinced that the problem cannot be solved. It's also tempting to analyze data or rationalize solutions before good questions have been asked. Following a prescribed process will ensure that, by the time the team reaches Stage 5, the decisions and resulting actions will be based on facts.

Once the team has reached Stage 5, it is time to review the progress that has been made, to ensure that all members understand the decisions and observations made thus far. Keeping a running log of the cycle on easel paper or on a computer file allows the team to easily access and review it (a blank log is available as Organizational Tool 7B, page 47).

Set a Strategy

Once the data team has assembled actionable information from the data, it will need to design a specific strategy to improve the top driving factor, key challenge, and overarching focus area (Boudett, City, & Murname, 2007; Datnow et al. 2007; Halverson, Grigg, Prichett, & Thomas, 2007; Learning Point Associates, 2004; Marsh, Pane, & Hamilton, 2006; Mid-continent Research for Education and Learning, 2010).

The strategy will provide the team with a clear outline of the following:

- The baseline measurement of the key challenge
- The improvement the team would like to see in the key challenge
- A deadline for improvement to have occurred
- The specific action the team will implement to create this improvement

The first step is to consider what the data indicated about the key challenge and what change the team wants to see. The baseline of the strategic statement is formed by the baseline measurement, or the information that the data provided about the key challenge. The strategic goal statement for action will elucidate the improvement the team would like to see in the key challenge. Examples of this are in Table 10.

Table 10: Developing the Strategic Goal Statement

Key Challenge	Baseline	Strategic Goal Statement
7th graders have the highest rate of suspensions.	The 7th grade had 47 suspensions last school year.	Reduce 7th-grade suspensions by 20%.
Elementary math scores have been trending downward over the last three years.	In 2010–2011, 47% of 4th graders were proficient in mathematics.	Increase 4th-grade proficiency to at least 60%.
The graduation rate is trending below that of neighboring districts.	The 2010 and 2011 graduation rates were 67% and 65%.	Improve the high school graduation rate to at least 76%.

Next, the team should set an end point or deadline for measuring whether the desired improvement has been reached or is progressing. If the strategy does not appear to be having a measurable effect on the top driving factor or key challenge by this date, the team will have the tools it needs to reassess whether the strategy should be continued, amended, or set aside for another plan of action.

After the team has set its end point, it should consider actions that might improve the driving factor, key challenge, and focus area. For example, if the strategic goal is to reduce 7th-grade suspensions by 20 percent and the top driving factor has been identified as the passing periods that are introduced in the 7th grade, the team might decide to eliminate passing periods or assign teachers to monitor the hallways during these time periods.

Once the team has completed its brainstorming, team members should review each potential strategic action and consider the following:

- **Relevance:** Will it impact the top driving factor?
- **Time:** Is it possible given the team's time limit?
- **Resources:** Is it possible given the team's resources?

The team should then prioritize the potential strategies. Those strategies that received "no" answers to any of the three considerations of relevance, time, and resources should not be ranked. The top priority strategy should be the one that the team agrees could most affect the key challenge and can be implemented within the given timeframe and resources. An example of this process is in Table 11.

Table 11: Example of Strategy Setting

Focus Area: Improve ABC School's academic achievement, as measured by state tests and end-of-course grades.			
Focus Question: What is the relationship between suspensions and achievement at ABC School?			
Key Challenge: At ABC School, 7th-grade students have the highest rate of suspensions, with 47 total suspensions.			
Top Driving Factor: Students begin changing classrooms between periods at this grade level.			
Strategic Target: Reduce the number of suspensions by 20%.			
Potential Strategies	**Priority Ranking**	**Is It Possible Given:**	
		Time?	**Resources?**
Change the schedule so that 7th-grade students remain in the same classrooms and teachers rotate.	3	Yes	Maybe
Identify 8th-grade peer leaders to keep watch in the hallways and to encourage the 7th graders to behave better.	1	Yes	Yes
Hire hall monitors to keep watch and stop behavior incidents immediately, before they can escalate to suspensions.	~~	Maybe	No
Require students to walk in single-file lines, silently, during class changes.	2	Yes	Yes
Strategy for Action: Identify 8th-grade peer leaders to keep watch in the hallways and to encourage the 7th graders to behave.			

In the example from Table 11, the team brainstormed four potential strategies, all of which could impact the number of suspensions the school would experience the following year. Based on the team's assessment of relevance, time, and resources, however, it decided to implement the second strategy.

The chosen top priority strategy may not be the only strategy the team implements to improve the key challenge. The team should pursue one strategy at a time, however, to ensure strong implementation before moving on to a new strategy. Other potential strategies should be tracked in the Parking Lot (Tool 7A, page 47) for implementation at a later date.

Strategies must be clearly expressed to ensure consistent and faithful implementation. This will help the team to get its members and the community at large to commit to the plan of action and the changes that may be needed to realize the ultimate goal.

Clearly written strategic statements often take this form:

By _____ , improve _____ from _____
(date) (key challenge) (current data point)

to _____ by _____ .
(future data point) (strategy)

In the example from Table 11, the strategic statement might be:

By the end of the next school year, improve the 7th-grade suspension rate from a total of 47 in a school year to a total of 37 or fewer in a school year by identifying 8th-grade peer leaders to keep watch in the hallways and to encourage the 7th graders to behave better.

This statement conveys important information: the timeframe, the deadline, the strategic goal, and the process by which the team expects to accomplish the goal. Everyone on the team should agree with the strategic statement, because it will drive the action steps in Stage 6.

Stage 6: Implement, Monitor, and Sustain

Corresponds to Toolkit Tools 6A, 6B, pages 45–46

The final stage of the cycle of data inquiry involves developing and implementing a plan for action, evaluating the effectiveness of that action, and either working to sustain the positive outcomes of the action or planning for new action.

The duration of this stage can vary from a few weeks to months or even years. The amount of effort involved in initiating, monitoring, and sustaining the actions should be proportional to the scope of the strategy. In an organization that pursues frequent and regular cycles of data inquiry that produce new strategies and plans of action every few weeks, large amounts of time cannot be spent in monitoring the implementation of each strategy. But in an organization that pursues a single strategy for large-scale change over an extended period of time, it will be essential to invest more time and effort into ensuring that the single strategy is working and is implemented with fidelity over the long term.

Prepare to Act

As the team considers the actions it will take to implement the strategy, it is important to remember that the action plan should be manageable for all persons involved in the process. Ideally, the data team will involve all affected stakeholders (e.g., teachers, counselors, administrators) in the action planning, to ensure that they all agree with the plan and are committed to it.

In preparing to act, the team will identify all of the activities needed to implement the designated strategy, which will result in an action plan, or a project plan (Tool 6A, page 45). The action plan ensures that all necessary steps are included and consists of the following pieces of information:

Action Steps: The activities that need to be completed to implement the strategy

Responsibilities: Identification of the team members and/or other stakeholders responsible for each of the action steps

Deadline: The date by which each action step should be completed

Resources: Identification of any specific materials or resources that will be needed to complete the action steps

Some action plans will be very detailed and several pages long while other action plans will be very short. What is important is that the action plan includes all of the steps needed to successfully implement the strategy.

When identifying responsible parties and timelines, it is important to be specific. Identifiers such as "team" or "staff" and vague deadlines such as "ASAP" or "ongoing" eliminate accountability and reduce the chances that the action steps will be completed on time. As much as possible, the team should assign responsibilities to specific people with specific deadlines.

Communication is a key component of a successful action plan. If the team chooses to assign responsibilities to people who are absent or who are not members of the data team, it is important to secure their consent prior to finalizing the assignment and to designate a team member to follow-up to ensure that responsibilities are clearly communicated and understood.

To streamline monitoring of the action plan, the team may want to appoint a single person to lead it. This person would hold responsibility for checking in with responsible parties to learn what progress has been made, ensure that deadlines are met, and make certain that the necessary resources are secured. This individual would also be responsible for reminding the group about upcoming milestones and deadlines, as well as reporting to the group on progress made.

Implement the Action Plan

During implementation, the data team will serve as troubleshooter, monitoring the implementation activities and intervening as needed (Tool 6B, page 46). Once the plan is implemented, it is important to continually build trust by carefully designing conversations among colleagues (Boudett et al., 2007). Building structures and processes for the team to routinely talk about the implementation with colleagues allows team members to build collegiality, trust, and buy-in among members of the school or district community.

During implementation, the team should check in regularly, celebrate successes, identify challenges, and make changes as needed. If the action plan gets off track, perhaps through dropped responsibilities or unforeseen challenges, the team should troubleshoot and determine actions to bring it back on track.

Evaluate Effectiveness of the Strategy

Assessing progress is essential in the data inquiry cycle and to assure improvement. Without measuring effectiveness of actions, the data team will not know whether any progress has been made or what progress looks like in the context of the cycle of inquiry (Boudett et al., 2007). Likewise, once the strategy has been implemented in full, it is important for the team to measure whether it has achieved the intended outcome.

The intended outcome and deadline have already been outlined in the strategic statement. The team identified a baseline and strategic goal when it wrote and adopted the strategic statement. For example:

> By May, 2013, improve the 3rd-grade attendance rate from 78 percent to 90 percent by moving math classes to the afternoon.

In this statement, the baseline is a 78 percent attendance rate, and the goal is a 90 percent attendance rate. This notifies the team that they will need to measure 3rd-grade attendance rates, seeking a change of at least +12 percent. The deadline is May 2013, which communicates information on when to measure the effectiveness of the strategy.

The team may want to determine whether the strategy has been carried out in its entirety or is still underway. In the above example, the team can simply ask whether math classes had been successfully moved to the afternoon. But ongoing strategies may be less straightforward. For example, if a strategy statement says that math teachers will provide 10 extra minutes of independent practice time each week for the duration of the school year, the team must check in periodically to determine whether the strategy has been fully implemented and is continuing to be implemented.

In assessing the effectiveness of the strategy, the team should collect data from the same source used to establish the baseline. For example, if the team measured the baseline of 3rd-grade attendance rates from the school's internal database at the end of the prior year, the new attendance rates should also be measured using that same database when it comes time to determine progress.

It is important to note that the team cannot evaluate the effectiveness of the strategy until the deadline has passed. For example, in the previous strategic statement, the team states it cannot know until after May 2013 whether the attendance rate improved to 90 percent. Some strategies will be short-term and lend themselves to quick evaluations of effectiveness; other strategies will be more long-term and may require a considerable waiting period (such as strategies relying on annual standardized test outcomes). The team can simply move on to another cycle of data inquiry while it waits to measure the effectiveness of the first strategy.

Evaluate Progress and Improvement Within Focus Area

Improvement within the overarching focus area is the ultimate goal of the cycle of data inquiry. For this reason, it's important for the team to check in on the initiative once it has been implemented to see if progress has been made. This can be done in the same way the team evaluated the effectiveness of the strategy, but it does not need to be completed at the end of every strategy, particularly if the team is pursuing an ongoing cycle of numerous short-term action strategies.

The team should consider how it can measure or assess improvement. For example, a common focus area will be "student achievement." The team might check on common measures of achievement, such as state standardized test scores or retention rates, annually, to measure whether the implemented strategies are having a positive impact.

This evaluation will provide opportunities for team members and their colleagues to observe the results of their efforts. When people see positive impacts on student achievement, their motivation and continued effort increases.

In addition, evaluating the effectiveness of the strategies and actions allows the team to learn what is and is not working. When actions or strategies are not working well, the team can make adjustments as needed.

What if Improvement Isn't Made?

Sometimes, evaluating the effectiveness of the strategic actions might indicate they had little or no effect. Sometimes, it might even indicate that a seemingly negative result occurred. While this is understandably frustrating, it's important for the team to recognize that such an outcome provides valuable information by eliminating one or more possibilities for driving factors, key challenges, or effective actions. The cycle may have generated increased knowledge or deeper questions to drive a future cycle of inquiry. It has also provided the team members with an opportunity to practice their data inquiry skills.

Other times, the measurements may show that some progress has been made but not the desired change. For example, in the previous example about 3rd-grade attendance rates, the team might discover that the rate in May 2013 was 86 percent, which is an improvement but falls short of the strategic goal of 90 percent. The team may want to re-measure the data again at the close of each upcoming semester, to determine whether progress is continuing and appears to be on track.

It's possible that many strategies will require more time to achieve the desired change than what was specified in the initial strategic statement. This is acceptable, and the team can simply move on to a new cycle of data inquiry while continuing to monitor the effectiveness of the ongoing strategy.

Keep Working!

Having completed a cycle of data inquiry, the data team is now ready to move on to another one. The new cycle might consider the same overarching focus area, the same focus question, or even the same key challenge. What is important is that the team follows all six stages in implementing new, data-based strategies and actions.

School improvement is a continuous process. Once the team has completed its first cycle of inquiry, it should celebrate its successes, revisit its initial goals and assumptions, and plan to move forward into the next cycle with innovative ideas and excitement (Boudett et al., 2007). The improvement cycle returns to the data-driven decision making process, but at a higher level focused on a potentially more complex challenges in order to elevate student achievement even higher.

Eventually, inquiry and data-based decision making will become embedded in the culture of the organization. All members of the school or district community should begin to ask probing questions about student achievement using various kinds of data to check assumptions, generate dialogue, identify plans for action, and gauge progress.

Data Team Logistics

Building the Data Team

A data team may go by several names, including Professional Learning Community (PLC), but it is always a group of people dedicated to improving student achievement through data inquiry.

The data team does not hold sole responsibility for all of the work involved in pursuing improvement. It is a group of people who have agreed to dedicate time and effort to organize change efforts around data, and who will help build and maintain a culture of data use.

Who is on the Data Team?

The data team's composition may depend in large part on the identity, goals, and focus of its organization. Regardless of who chooses to take part, practitioners suggest keeping membership to a maximum of 15 people, to enable effectiveness and efficiency (Learning Point Associates, 2004).

Data teams may be small grade-level or department groups, made up largely of teachers, with the goal of improving student achievement within their grade level or department. They may be school-wide teams, composed of teachers, support personnel, and administrators, with a goal of improving student achievement across the entire school or at the grade or department level. They may be individual teachers seeking to make improvements within their classrooms. They may be district-wide teams, consisting of representatives from schools, grade levels, and different professional roles, with the goal of improving student achievement district-wide. Or they may be an entirely different grouping altogether.

Potential data team members should be asked if they are willing and able to make the commitments in time and effort that are required to effectively work toward making data-based decisions for change within the organization. Some data teams ask members to sign a statement indicating their dedication to the effort and agreement with the team's expectations and norms.

Confidentiality

Because the data team is likely to use identifiable student data, it is important to have the team members discuss and understand the parameters of confidentiality. Every member should become familiar with the Nebraska Department of Education's *Data Access and Use Policy and Procedures* document (available at http://www.education.ne.gov/nssrs/docs/Nebraska_Data_Policy_December_2010.pdf) and should complete a confidentiality agreement. A sample agreement appears on page 32. All agreements should be approved by an administrator prior to use.

Sample Confidentiality Agreement

I acknowledge that as a member of _____'s data team, I may have access to confidential, personally-identifiable information for the purposes of pursuing student achievement and school improvement efforts.

As a member of this data team, I acknowledge that I have received a copy and understand the content of the Nebraska Department of Education's Data Access and Use Policy and Procedures document.

I understand that, under the Family Educational Rights and Privacy Act (FERPA) and the State of Nebraska's data access and use policy and procedures, it is my professional responsibility to maintain the confidentiality of all student data and information. I understand that this means that I:

- Cannot use, reveal, or in any other manner disclose any personally-identifiable information furnished, acquired, retrieved, derived, or assembled by me or others for any purpose other than the projects undertaken by the data team
- Must comply with the Family Educational Rights and Privacy Act (FERPA) [20 U.S.C. 1232g; 34 CFR Part 99]

I pledge to adhere to all data confidentiality guidelines applicable to my work as a member of the data team.

Signature: _____

Printed Name: _____

School or District:_____

Date: _____ /_____ /_____

Rosters and Attendance

The team should track members on a roster (below), to ensure that everyone on the data team knows who is on the team and how to reach them. A blank copy of the roster can be repurposed as a simple sign-in sheet for each data team meeting, to facilitate tracking of membership and attendance.

Data Team Roster

Team Member Name	Role in Organization	E-mail/Phone	Role on Team

Data Team Roles and Responsibilities

Members of the data team should be assigned roles to ensure full commitment and equal participation among members. These roles can rotate, so that every member holds every role at some point, or they can be static. Members can hold more than one role at a time. Important and common roles include:

- **Facilitator:** Guides the team through the stages of data inquiry. When decisions need to be made, this person will lead the team through decision making and consensus building. If the team does not appoint referee or planner roles, the facilitator will also maintain responsibility for the tasks associated with those roles.
- **Time-keeper:** Responsible for keeping the meeting moving according to the schedule by beginning and ending on time.
- **Recorder:** Responsible for taking notes during the meeting and reporting and disseminating to all team members following the meeting.
- **Referee:** Responsible for keeping the team on task during the meeting.
- **Planner:** Responsible for communicating with members about upcoming meetings and responsibilities.
- **Active Participant:** All team members will be engaged participants in the team meetings, actively listening and contributing to discussions.

Each data team should decide which roles are needed to accomplish the work. Other roles may be necessary in addition to those outlined above.

Establishing Norms and Purpose

High-functioning data teams appreciate the challenges inherent in the work they undertake and the investments required of all members, in terms of time and effort. These teams work hard to build a strong foundation and to identify shared norms and statements of purpose (Love, Haley-Speca, & Reed, 2010).

In early meetings, the team should come to consensus on the group's shared values and expectations for behavior. They should develop a clear and shared understanding of the team's purpose, specific roles to be filled, responsibilities of each member, and how the team will conduct its meetings (Love, Haley-Speca, & Reed, 2010).

One method of creating this shared understanding is group brainstorming at an early meeting. This can be conducted on paper (see Identify Values and Behavioral Norms on page 34) or by giving participants sticky notes on which they can write their ideas and post them to a large piece of paper.

Norms

Ask the group members to consider their previous team-based experiences. What did they like about those teams? What frustrated them about those teams? The answers can help shape expectations about behavior.

- **Positive Behaviors:** What behaviors do we want our group members to exhibit?

  Examples: Active listening, respect for each member's contributions, following through on promises made

- **Negative Behaviors:** What behaviors are unacceptable within the group?

  Examples: Arriving to meetings late, texting or e-mailing during the meeting, making excuses for low student achievement

From these inputs, the group can create a list of group norms. This list should be compiled from everyone's contributions and reviewed and approved by all members before it is finalized. The group should review the norms at the beginning of every meeting. Some teams like to include them on each meeting's agenda to ensure ongoing understanding and awareness.

Values and Purpose

Group members should also consider the purpose of the team. If the team was convened by an administrator, it is important for team members to understand the reasons for the team's creation and what the administrator hopes the team will accomplish.

Team members might ask themselves why they have joined the data team and what they hope to accomplish. From these thoughts, consider:

- What do we believe?
- What are we here to do?

From this brainstorming, the group can create a belief statement and a statement of purpose. These should be created from the contributions of the team and reviewed and approved by all members before they are finalized. The group should include the statements of belief and purpose in all agendas, to ensure ongoing shared understanding.

Identify Values and Behavioral Norms

Values & Purpose	Behavioral Norms
What do we believe? What are we here to do?	**Positive:** What behaviors do we want to exhibit? **Negative:** What behaviors are unacceptable?

Meeting Organization

To keep the team on task and moving forward, every meeting should have an agenda to guide the discussion. Important items to include on the agenda are:

- Affirmation of team norms and values
- A review of the status of the last meeting's action items
- Objective and expected outcomes for the meeting
- Action items to pursue for the next meeting (including identifying who is responsible)
- Time allotments for each agenda item

The purpose of the agenda is to ensure that all necessary items are covered and that the team members' time is used efficiently and effectively. All agendas and notes should be maintained in a central repository, such as a computer file, for later review.

Sample Agenda

ABC School Data Team Meeting

Meeting Date and Time	February 29, 2012, 3:00– 4:00 pm
Meeting Objective	Complete Stage 3 of the Data Guide: SURFing the Data
Expected Outcome(s)	• Completed SURF statements related to our focus question • Action items for next meeting
Team Norms	1. We will arrive to our meetings on time, end on time, and remain engaged and focused throughout each meeting. 2. We will not presuppose reasons for anything but will base all decisions on what the data tell us. 3. We will listen to one another respectfully and will thoughtfully consider one another's opinions.
Statement of Belief and Purpose	We believe that all students can achieve at a high level and that there are no excuses for low achievement. We exist to identify solutions for even the toughest challenges to ensure that all students can achieve at a high level at ABC School.

3:00–3:05	Review Norms & Beliefs	
3:05–3:15	Review Action Items from 1/25 meeting	
3:15–3:30	SURF Statements	Divide into three small groups. Each group reviews one of the three data sources. Write out SURF statements on easels.
3:30–3:45	Readout	Readout each team's SURF statements.
3:45–3:55	Action Items	Identify action items for next meeting.
3:55–4:00	Appreciations & Closing	Recognize team members for successes.

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Data Inquiry Toolkit

Overview

Once the infrastructure is settled, the data team members will begin its work by following the stages of the data inquiry process. Each stage is discussed in detail in the Background Information section and has associated tools to assist the team members in completing the stages. The stages and their corresponding Background Information sections are listed below.

Stage 1: Ask Good Questions
Corresponds to Background Information pages 8–10

Stage 2: Collect and Prepare the Data
Corresponds to Background Information pages 11–14

Stage 3: Find Trends and Make Observations
Corresponds to Background Information pages 15–19

Stage 4: Interpret the Data
Corresponds to Background Information pages 19–22

Stage 5: Plan for Action
Corresponds to Background Information pages 23–26

Stage 6: Implement, Monitor, and Sustain
Corresponds to Background Information pages 27–30

Stage 1: Ask Good Questions

1A. Identify the Focus Area

FOCUS AREA FOR THE CYCLE OF DATA INQUIRY:

1B. Generate Possible Questions

Question	
1	
2	
3	
4	
5	
6	
7	
8	

1C. Narrow the Question to Focus Inquiry

Top Priority Question:		
1. Does the question address an issue that is significant to the individual, group, or the school?	☐ Yes ☐ No	If no, refine the question or choose a different question that will result in more significant new insight.
2. Is it a question with a dichotomous answer (e.g., yes/no or improving/not improving)?	☐ Yes ☐ No	If yes, refine the question to be one with a more informative answer or choose a different question.
3. Is the question amenable to action? Can you act on the outcomes in order to make things better?	☐ Yes ☐ No	If no, refine the question or choose a different question that will result in more actionable information.
4. Is it possible to address the question in the available time?	☐ Yes ☐ No	If no, narrow the scope of the question to be more manageable in the time allotted for this cycle.
5. Is the question narrow, clear, and straightforward?	☐ Yes ☐ No	If no, narrow the scope or refine the question to clarify.
6. Are the data necessary for answering the question accessible prior to the time of inquiry?	☐ Yes ☐ No	If no, either modify the question to one that can be answered with available data or set the date of study when necessary data can be collected.
Final Focus Question:		

Stage 2: Collect and Prepare the Data

2A. Data Collection Plan

Focus Question:				
What data are currently available that will help answer the focus question?	**What factors will be used for disaggregation?**	**How will the data be prepared and organized?**	**Who is responsible for collecting and organizing each data source for the team?**	**Deadline for data to be collected and prepared**
EXAMPLE • 3rd-grade NeSA scores for 2010 and 2011	• Gender, race/ ethnicity, and classroom teacher	• One table for each year. The columns will be NeSA score, gender, ethnicity, and teacher. The rows will be student IDs.	• Ralph and Sheri	• Next meeting: 3/14/12

Stage 3: Find Trends and Make Observations

3A. Data Review

Focus Question:
Data Source:
Check to ensure the statements are: ✓ Specific ✓ Understandable ✓ Related to the focus question ✓ Factual
Statements about the data source

Stage 4: Interpret the Data

4A. Celebrate Strengths and Identify Challenges

Observed Strengths	Observed Challenges

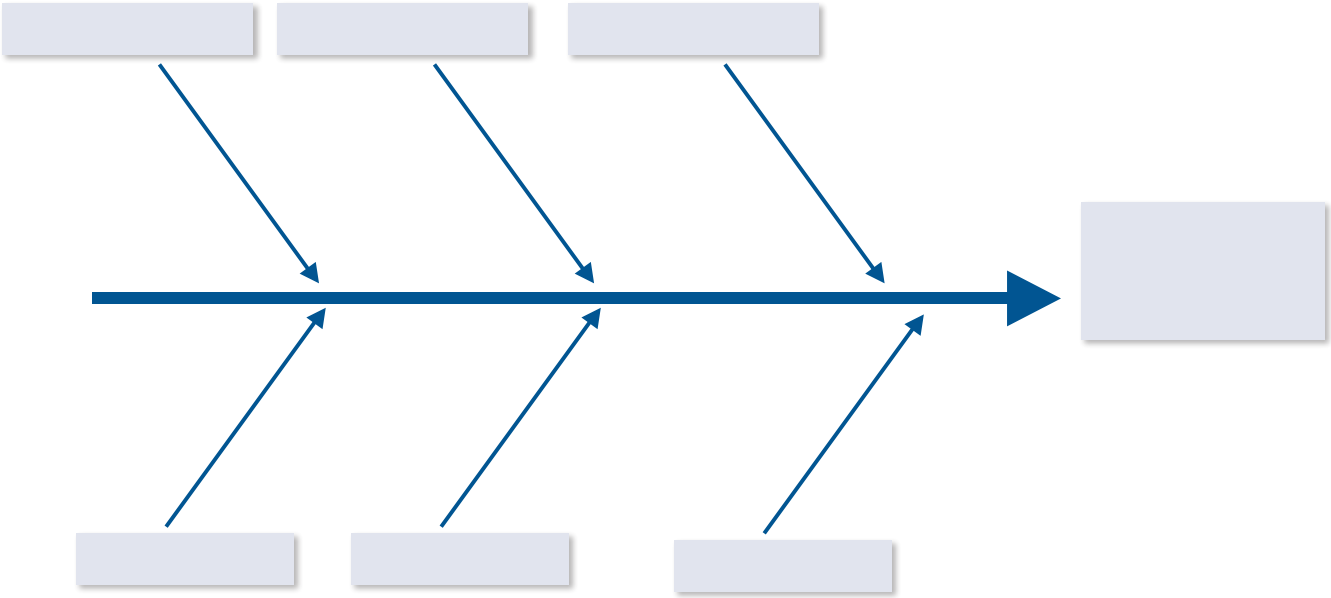
4B. Prioritize Challenges

Priority	Challenge
1	
2	
3	
4	
5	

4C. Determine Driving Factors

Key Challenge:		
Why?	**Because... (Driving Factors)**	**Which Area?**
		Concern Influence Control
		Concern Influence Control
		Concern Influence Control
		Concern Influence Control
		Concern Influence Control
		Concern Influence Control
	Driving Factor	Concern Influence Control

4D. Cause and Effect/Fishbone Diagram



4Di. Fishbone Diagram: Why/Because Table

Key Challenge:		
Why?	**Because... (Driving Factors)**	**Which Area?**
		Concern Influence Control
		Concern Influence Control
		Concern Influence Control

4E. Isolate Controllable Driving Factors

Controllable or High-Influence Driving Factors	Impact Ranking
Top Driving Factor:	

Impact Rankings:
1 = No impact on the key challenge
3 = Some impact on the key challenge
5 = High impact on the key challenge

Stage 5: Plan for Action

5A. Identify Strategy for Action

Focus Area:			
Focus Question:			
Key Challenge:			
Top Driving Factor:			
Strategic Target:			
Potential Strategies	**Priority Ranking**	**Is It Possible Given:**	
		Time?	**Resources?**
Strategy for Action:			

5B. Strategy Setting Tool

Strategic Statement:

By _____ , improve _____ from _____
(date) (key challenge) (current data point)

to _____ by _____ .
(future data point) (strategy)

Stage 6: Implement, Monitor, and Sustain

6A. Action Plan - Organizing the Team for Action

Strategic Statement:			
Action Steps *What will be done?*	**Resources** *What is needed to do this step?*	**Deadline** *By when?*	**Responsibilities** *Who will do it?*

6B. Evaluating Progress and Improvement

Focus Area:						
Key Challenge:						
Strategic Statement:						
Date	Baseline Measurement	New Measurement	Difference	Has Desired Change Been Achieved?		Next Steps
				Key Challenge	Focus Area	
				Y N	Y N	
				Y N	Y N	
				Y N	Y N	
				Y N	Y N	
				Y N	Y N	
Has the team achieved improvement in the focus area? If yes, describe:						

Organizational Tools

7A. Parking Lot Tool

Questions to Return to Later	Data Findings to Return to Later

7B. Data Cycle Overview

Focus Area	
Focus Question	
Key Challenge	
Top Driving Factor	
Strategy	
Strategic Statement (including Target)	

Background

Mr. Russell, the principal at Triumph Middle School in Nebraska, has been concerned about his students' attendance rates and NeSA scores. He isn't sure, but he thinks that his school's scores are trending downward. The principal wants to convene a group to investigate ways to improve students' achievement, particularly on the NeSA assessment.

He begins by announcing at a staff meeting that this issue is at the top of his school improvement agenda and that he plans to assemble a group of teachers to consider how Triumph can improve scores over the 2012–2013 school year. He asks for volunteers, and four teachers and a guidance counselor sign up and become the data team for this project.

The team begins to meet regularly to conduct a cycle of data inquiry around Mr. Russell's charge of improving student achievement school-wide. The following is an outline of their cycle and the results they achieved.

Stage 1: Ask Good Questions

1A. Identify the Focus Area

The focus area for inquiry was identified by Mr. Russell and served as the impetus for forming the data team. The team restates this focus area to ensure full group understanding. The facilitator hangs a piece of chart paper on the wall with the full data cycle overview copied on it (tool 7B). She adds the focus area to the top row.

FOCUS AREA FOR THE CYCLE OF DATA INQUIRY
Improve student achievement, particularly as measured by the NESA test.

The Triumph data team now knows that its work will be focused on improving student achievement on the NeSA assessments. This will help them to narrow their questions for inquiry.

The data team's facilitator begins the questioning process by reminding team members to concentrate on the focus area. She also reminds the team that, though only one question will be used for this cycle of data inquiry, any other questions will remain available for subsequent or concurrent cycles of inquiry. She sets 20 minutes for brainstorming, after which the team must choose a question for further refinement and inquiry.

As the team suggests questions for inquiry, the data team's recorder documents them in the focused brainstorming spreadsheet tool (1B, page 38). The facilitator redirects team members when necessary and ensures that all of the questions are reasonably focused and within the realm of reading achievement.

1B. Generate Possible Questions

Question		Prefer?
1	Which grades show the most improvement on NeSA and why?	Yes, No
2	Is there a correlation between math scores and reading scores?	No
3	Do attendance rates have any effect on NeSA test outcomes?	Yes
4	Why don't students understand that NeSA is important?	No
5	Which teachers are producing the best outcomes and what are they doing differently in their classrooms?	No

At the end of the 20 minutes, the recorder reads out the five questions that the group has identified. Next, he uses the forced-choice method to help the group choose its top priority question. Instead of prioritization rankings, he enters Yes/No markers in the far right column of the tool. The recorder then leads the group through the forced choices by asking them to consider which questions will have the greatest impact on the focus area.

Recorder: "Which do you prefer, Question 1 or Question 2?"

The team votes by holding up one finger for Question 1 and two fingers for Question 2. Question 1 is chosen.

Recorder: "Which do you prefer, Question 1 or Question 3?"

Question 3 is chosen. This continues until the team has settled on Question 3 as its focus question.

1C. Narrow the Question to Focus Inquiry

The team now considers whether or not the question they chose is sufficiently narrow, clear, and focused for effective inquiry. The chosen question is dichotomous–it can be answered as "Yes, attendance rates have an effect," or "No, they do not." The team works to refine this question to something more informative: *What effects, if any, do attendance rates have on NeSA test outcomes?* They go through the questions again and determine that this is a stronger question.

Top Priority Question:		
1. Does the question address an issue that is significant to the individual, group, or the school?	✓ Yes ☐ No	If no, refine the question or choose a different question that will result in more significant new insight.
2. Is it a question with a dichotomous answer (e.g., yes/no or improving/not improving)?	✓ Yes ☐ No	If yes, refine the question to be one with a more informative answer or choose a different question.
3. Is the question amenable to action? Can you act on the outcomes in order to make things better?	✓ Yes ☐ No	If no, refine the question or choose a different question that will result in more actionable information.
4. Is it possible to address the question in the available time?	✓ Yes ☐ No	If no, narrow the scope of the question to be more manageable in the time allotted for this cycle.
5. Is the question narrow, clear, and straightforward?	✓ Yes ☐ No	If no, narrow the scope or refine the question to clarify.
6. Are the data necessary for answering the question accessible prior to the time of inquiry?	✓ Yes ☐ No	If no, either modify the question to one that can be answered with available data or set the date of study when necessary data can be collected.
FINAL FOCUS QUESTION: What effects, if any, do attendance rates have on NeSA test outcomes?		

The facilitator copies the final focus question to the data cycle overview chart paper. The team briefly celebrates the completion of Stage 1 before moving on to Stage 2.

Stage 2: Collect and Prepare the Data

While discussing their data collection plan, the team becomes concerned with the number of data points they will be collecting if they choose to analyze this question for all students in grades 6–8. To make their cycle more manageable, the team decides to focus this first cycle of data inquiry on 7th-grade students only.

2A. Data Collection Plan

Focus Question: What effects, if any, do attendance rates have on NESA test outcomes for 7th-grade students?				
What data are currently available that will help answer the focus question?	**What factors will be used for disaggregation?**	**How will the data be prepared and organized?**	**Who is responsible for collecting and organizing each data source for the team?**	**Deadline for data to be collected and prepared**
The scores from the most recent NESA-M test for 7th graders (Spring 2011)	Gender Classroom teacher	In a single table, with students in rows and their scores and demographics in columns	Meredith and Jeremy	Next meeting: 9/12/11
The scores from the most recent NESA-R test for 7th graders (Spring 2011)				
Average attendance rates for the first three quarters of 2011 for 7th graders				

Meredith and Jeremy volunteer to work together to collect and prepare the data because they both have access to the databases where this information is kept.

2B. Prepare the Data

In preparing the data, Meredith and Jeremy color code all of the scores and levels and sort the data by student ID. They make sure to provide a legend outlining what the different color codes represent so that it will be easy for the team to read. In general, red indicates low scores or levels and green indicates high scores or levels.

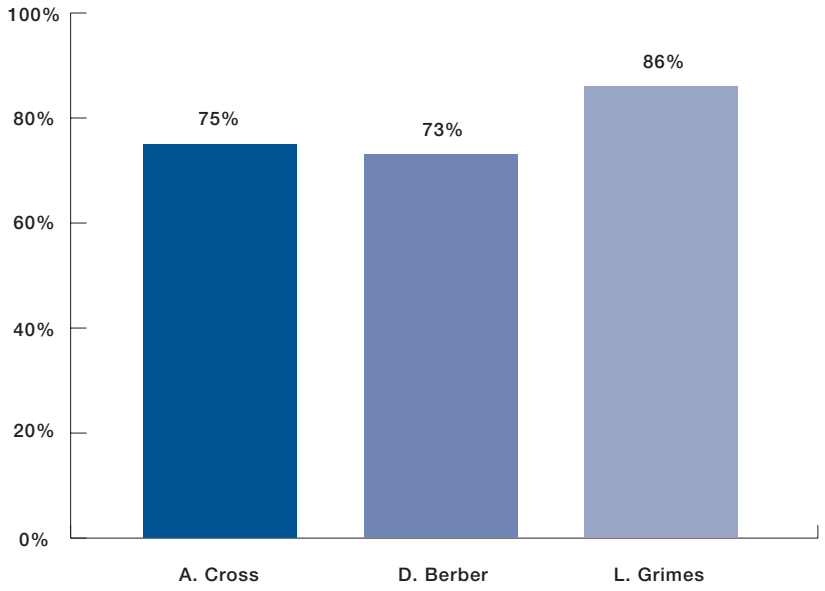
Student ID	Gender	Teacher	Attendance Rate	NeSA-M	NeSA-R
101617	F	A. Cross	65%	Below	Below
121224	M	L. Grimes	95%	Exceeds	Meets
144084	F	L. Grimes	100%	Exceeds	Exceeds
230769	M	A. Cross	82%	Meets	Meets
257661	F	L. Grimes	82%	Meets	Meets
353042	F	D. Berber	90%	Below	Meets
385537	M	L. Grimes	95%	Below	Exceeds
527890	M	D. Berber	49%	Below	Below
623058	F	L. Grimes	100%	Exceeds	Exceeds
714597	M	L. Grimes	48%	Meets	Below
720508	F	D. Berber	92%	Meets	Exceeds
747337	M	D. Berber	69%	Below	Below
762871	F	A. Cross	90%	Meets	Meets
829757	M	A. Cross	96%	Meets	Exceeds
864729	F	D. Berber	89%	Exceeds	Meets
905777	M	A. Cross	84%	Meets	Meets
910519	F	L. Grimes	85%	Below	Exceeds
926985	M	A. Cross	50%	Below	Meets
979696	F	D. Berber	70%	Below	Below
980957	F	D. Berber	50%	Below	Below
993067	M	A. Cross	58%	Below	Meets

Attendance Rates			NESA Scores		
0%–50%	Poor		Below	Red	
51%–85%	Fair		Meets	Yellow	
86%–100%	Good		Exceeds	Green	

Noticing that there appears to be a difference in attendance and scores across classrooms, Meredith and Jeremy also do some quick calculations to determine the average attendance rates for each teacher. They create a graph to display the attendance rates by classroom.

Meredith and Jeremy send the table and the graph out to the team a day ahead of the next meeting to give everyone a chance to review it to ensure an efficient and effective meeting. They also save all of the data tables to the computer they will use during the meeting.

Average Attendance Rates, by Teacher



Stage 3: Find Trends and Make Observations

At the next meeting, the team arrives with excitement, having reviewed the data set before the meeting. The facilitator has brought chart paper and markers, and the recorder has prepared a SURFing table to document all of the ideas that are raised. Meredith has volunteered to re-sort and conduct calculations on the data as requested by the team during the meeting, projecting it onto a screen so everyone can see. To ensure that their meeting ends on time, the facilitator sets a five-minute time limit for making observations on each data set and 15 minutes for the combined data sets.

The team begins by reviewing the principles of SURFing (especially the part requiring the statements to be unbiased) and then takes turns providing observations, which are recorded. When additional questions or ideas for further inquiry are raised during the SURFing process, the facilitator notes them on the chart paper, which serves as the team's parking lot of ideas for this cycle of inquiry.

The team reviews the NeSA results, followed by the attendance rates. While working through the data sets, team members often ask Meredith to make some calculations. For example, they determine that the average attendance rate was 78 percent, and they count 10 students who scored "Below" in the NeSA-M.

3A. SURFing the Data

Focus Question: What effects, if any, do attendance rates have on NeSA test outcomes for 7th-grade students?
Data Source: Spring 2011 NeSA-R scores for 7th graders
Check to ensure the statements are: ✓ Specific ✓ Understandable ✓ Related to the focus question ✓ Factual
Statements about the data source • 6 students scored below • 6 students exceeded • 9 students met
Data Source: Spring 2011 NeSA-M scores for 7th graders
Statements about the data source • 10 students scored below • 4 students exceeded • 7 students met
Data Source: 2010–2011 Attendance rates up to NeSA tests, 7th graders
• 4 students have poor attendance rates • 6 students have fair attendance rates • 11 students have good attendance rates • 2 students have perfect attendance

After the time limit is reached for each data set, they move on to the next. After reviewing all three data sets separately, they consider the full table, with all of the data sets combined. They ask Meredith to re-sort the data on each disaggregation variable in order to better determine how the data look when analyzing across subgroups.

For example, when they ask Meredith to re-sort the data according to gender, they see the following table, where all of the girls are grouped together at the top and all of the boys are grouped together at the bottom. This re-sort allows them to quickly see that most of the poor attenders were boys. They can also see that there did not appear to be a large difference across genders in the number of students who scored "Below" on the NeSA-M.

Student ID	Gender	Teacher	Attendance Rate	NeSA-M	NeSA-R
101617	F	A. Cross	65%	Below	Below
762871	F	A. Cross	90%	Meets	Meets
353042	F	D. Berber	90%	Below	Meets
720508	F	D. Berber	92%	Meets	Exceeds
864729	F	D. Berber	89%	Exceeds	Meets
979696	F	D. Berber	70%	Below	Below
980957	F	D. Berber	50%	Below	Below
144084	F	L. Grimes	100%	Exceeds	Exceeds
257661	F	L. Grimes	82%	Meets	Meets
623058	F	L. Grimes	100%	Exceeds	Exceeds
910519	F	L. Grimes	85%	Below	Exceeds
230769	M	A. Cross	82%	Meets	Meets
829757	M	A. Cross	96%	Meets	Exceeds
905777	M	A. Cross	84%	Meets	Meets
926985	M	A. Cross	50%	Below	Meets
993067	M	A. Cross	58%	Below	Meets
527890	M	D. Berber	49%	Below	Below
747337	M	D. Berber	69%	Below	Below
121224	M	L. Grimes	95%	Exceeds	Meets
385537	M	L. Grimes	95%	Below	Exceeds
714597	M	L. Grimes	48%	Meets	Below

Continuing with the sorting and calculations, the team spends 15 minutes identifying factual relationships between the data sources while the recorder notes them on the SURF tool.

Focus Question: What effects, if any, do attendance rates have on NeSA test outcomes for 7th-grade students?

Data Source: All 3 of the data sources (NeSA-R, NeSA-M, attendance rates) plus demographics

Check to ensure the statements are:

✓ Specific ✓ Understandable ✓ Related to the focus question ✓ Factual

Statements about the data source

- 3 of the 4 students with poor attendance scored below in NeSA-M
- The student with the lowest attendance rate (48%) met standards in NeSA-M
- 4 of the students with the lowest rates in the fair attendance category scored below in NeSA-M
- 2 of the 9 students with good attendance scored below in NeSA-M
- 4 of the 9 students with good attendance exceeded in NeSA-M, 3 met in NeSA-M
- The 3 students with the lowest attendance rates scored below in NeSA-R
- Only 1 student with poor or fair attendance (n=12) exceeded in NeSA-R
- None of the students with good attendance scored below in NeSA-R\
- 5 of the 9 students with good attendance exceeded in NeSA-R

Demographics

- 1 female and 3 male students had poor attendance
- The 2 students with perfect attendance were both female and both in Grimes' class
- 5 students of each gender scored below on NeSA-M
- 3 girls and 1 boy exceeded in NeSA-M
- 3 students of each gender scored below on NeSA-R
- 4 girls and 2 boys exceeded on NeSA-R
- Grimes had the best attendance and Berber the worst with a difference of 13%:

  Grimes 86%
  Cross 75%
  Berber 73%
- Berber's class had the lowest performance on NeSA-M: 5 out of 7 below, 1 exceeds, 1 meets
- Berber's class also had the lowest performance on NeSA-R: 4 out of 7 below, 1 exceeds, 2 meets
- Grimes' class had the highest performance on each test:

  NeSA-M 3 exceeds, 2 meets (out of 7)
  NeSA-R 4 exceeds, 2 meets (out of 7)

Stage 4: Interpret the Data

Now that the team has identified factual statements evident in the data, they are excited to begin interpreting those statements, as they move forward in identifying potential answers to their initial question. First, they consider what the data demonstrate about success in achievement and attendance. Next, they consider what the data demonstrate about challenges in achievement and attendance.

4A. Celebrate Strengths and Identify Challenges

Observed Strengths	Observed Challenges
• Two students had perfect attendance. • The majority of students were at or above expectations in both NeSA-R and NeSA-M. • Grimes' students had high scores, with 5/7 meeting or exceeding in NeSA-M and 6/7 meeting or exceeding in NeSA-R.	• The 7th grade had an average attendance rate of 78%. • Students with poor attendance seem to be achieving at a lower rate than students with good attendance. • Cross and Berber have average classroom attendance rates below the grade average (75% and 73%, respectively). • Girls appear to be achieving at a slightly higher rate and have attendance rates 10 percentage points higher than boys' attendance rates.

The team decides to share the successes with the greater school community at the next all-school meeting. As a group, they rank order the challenges, with number 1 being the top priority challenge. This is the challenge that the team thinks will have the most impact in answering the focus question.

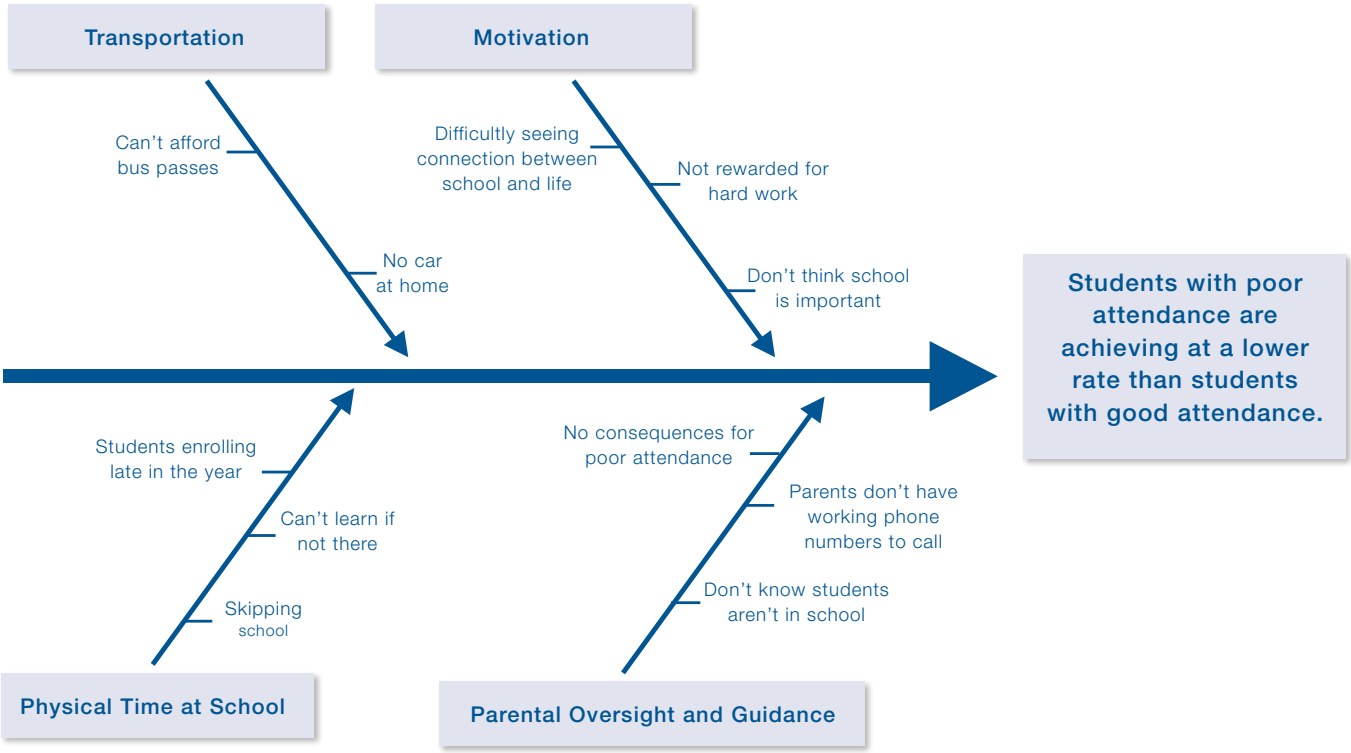
4B. Prioritize Challenges

Priority	Challege
1	Students with poor attendance seem to be achieving at a lower rate than students with good attendance.
2	The 7th grade had an average attendance rate of 78%.
3	Cross and Berber have average classroom attendance rate below the grade average (75% and 73%, respectively).
4	Girls seem to be achieving at a slightly higher rate and have attendance rates 10 percentage points higher than boys' attendance rates.

The team decides that the apparent connection between attendance and NeSA scores is the top challenge that also relates to their focus question. At this point, they can choose to use either the Determine Driving Factors tool (4C, page 42) or the Fishbone Diagram (4D, page 42). Because they want to delve deeply into the potential root causes of this correlation, they decide to use the Fishbone Diagram method of identifying driving factors. The facilitator draws a large blank diagram on the chalkboard in the meeting room.

They start by placing the key challenge into the "head" of the diagram. Next, they take five minutes to work as a team to identify major categories of causes for the key challenge ("Transportation," "Motivation," "Physical Time at School," and "Parental Oversight and Guidance"). The facilitator distributes sticky notes and pens and asks the team members to take five minutes to generate possible causes within each category. The team members write each cause on a separate sticky note and affix them to the diagram below the appropriate category. After the five minutes has concluded, the team has identified eleven potential causes related to the key challenge.

4D. Fishbone Diagram



Next, the team works through the potential causes to arrive at driving factors of those causes. Because they have only twenty minutes left in their meeting, they isolate two of the causes that they agree are most actionable and have the most impact on the key challenge—"Transportation: Can't afford bus passes" and "Physical Time at School: Skipping school." They complete two Fishbone Diagrams: Why/Because Tables, one for each cause, to arrive at driving factors.

4Di. Fishbone Diagram: Why/Because Table

Key Challenge: Students with poor attendance seem to be achieving at a lower rate than students with good attendance		
Why?	**Because... (Driving Factors)**	**Which Area?**
Why can't they afford bus passes?	They don't have any money.	(Concern) Influence Control
Why don't they have any money?	They can't get jobs.	(Concern) Influence Control
Why can't they get jobs?	They aren't old enough yet to work.	(Concern) Influence Control

The team realizes it can't directly control the students' access to income at this time. While the team could consider projects that would directly affect students' access to bus passes, perhaps by acquiring grant money to pay for them, it does not have enough time or resources to work on this driving factor at this time. Team members decide to move on to a Why/Because Table for the second potential cause.

Key Challenge: Students with poor attendance seem to be achieving at a lower rate than students with good attendance		
Why?	**Because... (Driving Factors)**	**Which Area?**
Why are they skipping school?	They are able to.	(Concern) Influence Control
Why are they able to skip school?	Their parents don't know about it.	Concern (Influence) Control
Why don't their parents know about it?	We don't alert them in a timely manner.	Concern Influence (Control)

The team has identified a driving factor for their key challenge where they can create positive change. They are concerned that students aren't in school often enough to really learn the content. They can *influence* their skipping behaviors by hosting information sessions for parents. They can directly *control* the parents' knowledge about the students' attendance patterns by providing them with timely information.

The team completes this process a few more times until it has a set of potential driving factors. All of the factors that are within the area of control are copied to the Isolate Controllable Driving Factors tool (4E, page 43).

4E. Isolate Controllable Driving Factors

Controllable or High-Influence Driving Factors	Impact Ranking
Students don't know about the transportation options available to help them get to school.	3
The students' parents don't know they're skipping school.	1
The schedule provides the students with too much free time.	2
Top Driving factor:	

The team ranks the potential driving factors by the influence the team members believe the factor has on the key challenge. Using the forced-choice method, they identify the second driving factor as their top driving factor.

They write the key challenge and the top driving factor on the data cycle overview chart to ensure full group understanding. The overview is on chart paper in the room so the group members can always see the organizational factors of their data cycle process.

7B. Data Cycle Overview

Focus Area	Improve student achievement, particularly as measured by the NeSA assessment.
Focus Question	What effects, if any, do attendance rates have on NeSA test outcomes for 7th-grade students?
Key Challenge	Students with poor attendance seem to be achieving at a lower rate than students with good attendance.
Top Driving Factor	Parents are not aware that their children are skipping school.

Stage 5: Plan for Action

Now that the team has identified the top driving factor, it is ready to prepare for action. This is an exciting part of the process because team members know they will be able to take steps to create positive change for their students.

In the first step of planning to take action, the team identifies strategies that might positively change the key challenge. The facilitator sets a 10-minute time limit for the team to brainstorm possible strategies for action. Unlike a traditional brainstorming session, the facilitator asks the team to be very mindful of the relevance of each strategy and allows the team to veto irrelevant or truly impractical ideas. As the team collects relevant, feasible ideas for strategies, the recorder notes them on a large piece of chart paper.

In the time allotted, the team identifies numerous potential strategies. While brainstorming, team members veto ideas such as "Pass a stronger state law that penalizes parents for students' non-attendance" and "Provide healthier food in the cafeteria" because they are unfeasible and irrelevant, respectively.

The team settles on six potential strategies for action and considers whether each is possible given time and resources. For example, while the school has the resources, there is no time to update school policies even though team members would like to see progress in this area within the next school year; and, while there is enough time, there are no resources for hiring school monitors. In addition, though the team likes the idea of a reward system, there is no money to fund one. Hoping instead to raise the funds over the coming school year, the team decides to mark the "Resources" box as "Not Yet" and to return to this strategy at a later date.

This leaves three strategies to rank. After some discussion, the team decides that weekly notices to parents will have the most impact on the challenge and the least impact on teachers' time. For the first semester, notices will go out only when students have unexcused absences. This will reduce the burden on front office staff and teachers who will need to create and track the notices. The recorder adds this strategy to the team's cycle tracking sheet.

5A. Identify Strategy for Action

Focus Area:			
Focus Question:			
Key Challenge:			
Top Driving Factor:			
Strategic Target: Increase 7th-grade average attendance to 90%.			
Potential Strategies	**Priority Ranking**	**Is It Possible Given:**	
		Time?	**Resources?**
Hold a parent information night to tell parents about the importance of school attendance.	3	Yes	Yes
Update school policies to make penalties for skipping school more severe.	--	No	Yes
Hire school monitors to patrol the school and grounds to stop students from skipping school.	--	Yes	No
Have teachers call parents when the student is not in class.	2	Yes	yes
Send home weekly attendance reports that require a parent's signature.	1	yes	Yes
Create a relevant quarterly reward system, like a pizza party, for students who are good attenders.	--	Yes	Not Yet
Strategy for Action: Send home weekly attendance reports that require a parent's signature whenever a student has an unexcused absence.			

The team knows it will need to have a way to communicate the strategy and its goal to other members of the school community. It will also need to know what to measure later to determine if the strategy has been successful. To accomplish this, team members write a clear and succinct strategic statement.

5B. Strategy Setting Tool

Strategic Statement:
By the end of this school year, improve 7th-graders' overall average attendance from 78% to 90% by sending home weekly attendance reports that require a parent's signature whenever a student has an unexcused absence.

With this strategic statement, the team knows its target (90% attendance rate in the 7th grade by the end of the school year) and the plan to reach that target (by sending home attendance reports). This also tells team members what they will need to measure at the end of the school year to determine if their strategy has been successful (7th-grade average attendance).

Stage 6: Implement, Monitor, and Sustain

The strategic statement written and agreed upon in Stage 5 drives the action steps in Stage 6. Now, the team outlines the specific steps it will take as well as the resources needed, the people responsible, and the deadline for each step. As the team puts the plan into action, they track progress closely in order to determine if they've met their goals and to inform the next cycle of inquiry.

6A. Action Plan - Organizing the Team for Action

Strategic Statement: By the end of this school year, improve 7th graders' overall average attendance from 78% to 90% by sending home weekly attendance reports that require a parent's signature whenever a student has an unexcused absence.			
Action Steps *What will be done?*	**Resources** *What is needed to do this step?*	**Deadline** *By when?*	**Responsibilities** *Who will do it?*
Send letters home with students to inform parents about the new process.	Assistance with printing and mailing (team will help)	10/25/11	Mr. Russell
Develop unexcused absence reports that can be quickly pulled each week.	None	11/15/11	Mrs. Bennett (district tech team)
Develop an automated system for the reports to feed into form letters.	None	12/1/11	Ms. Bratton (district tech team) Mr. Tressel
Mid-day every Friday, pull the form letters, print them, stuff them in envelopes, and mail them.	Envelopes & postage. Team will help with process in the early months.	Beginning 1/13/12 and every week thereafter	Mrs. Jefferson & Mrs. Moon (front office)
Track the returned, signed letters every Monday. Call home if they are not returned by Tuesday.	None	Beginning 1/16/12 and every week thereafter	All teachers & front office staff

Because the team assigned responsibilities to so many colleagues who are not part of the data team, it assigns follow-up responsibilities to ensure that all individuals with assigned responsibilities are aware of and agree to them, and believe they have the resources to complete their tasks. During this follow-up communication, Jeremy learns from Mr. Tressel that he has just been assigned a high-priority district task but that a member of his team has agreed to develop the automated system to feed the absence reports into form letters. With this information, the team updates the action plan. Meredith agrees to track the action plan over the first six months (October through March) to ensure ongoing completion and compliance. The team agrees to check in on the action plan's progress monthly while completing a new cycle of data inquiry. For this cycle, team members decide to pursue an amended version of one of the other questions they had developed during Stage 1, asking what the relationship might be between students' perceptions of the importance of the NeSA tests and their ultimate scores on those tests.

Student ID	Attendance Rate
714597	65%
527890	79%
980957	66%
926985	75%
993067	70%
101617	59%
747337	92%
979696	65%
257661	88%
230769	92%
905777	83%
910519	91%
864729	95%
353042	89%
762871	100%
720508	93%
385537	95%
121224	100%
829757	95%
144084	96%
623058	100%

The data team continues to meet every other week throughout the school year. During this time, it completes two more cycles of data inquiry, implementing strategies to improve student achievement.

When June arrives and the school year ends, the data team revisits its strategies and begins the process of measuring outcomes. For the first cycle of data inquiry, the team pursued a strategy to increase 7th-graders' average attendance from 78 percent to 90 percent. To measure outcomes, the team collected data on the 2011–2012 attendance rates for 7th graders. The data indicated that the 7th graders had an average attendance rate of 85 percent during the 2011–2012 school year. This is a seven percent improvement over the prior year, but it does not quite reach the team's strategic target.

The team records the findings on the Evaluating Progress and Improvement tool (6B, page 46) and decides to continue the strategy for another year, to try to make further progress. When they are available in the fall, team members will revisit the 2011–2012 NeSA scores to determine whether there has been any progress in improving student achievement.

6B. Evaluating Progress and Improvement

Focus Area: Improve students' achievement, particularly as measured by the NeSA test.

Key Challenge: Students with poor attendance seem to be achieving at a lower rate than students with good attendance.

Strategic Statement: By the end of this school year, improve 7th-graders' overall average attendance from 78% to 90% by sending home weekly attendance reports that require a parent's signature whenever a student has an unexcused absence.

Date	Baseline Measurement	New Measurement	Difference	Has Desired Change Been Achieved?		Next Steps
				Key Challenge	Focus Area	
6/5/12	78%	78%	+7%	No	Unknown	• Continue strategy during 2012–2013 school year. • Evaluate progress in attendance rates again in December, 2012 and at the end of the school year. • Collect NeSA scores in the fall and evaluate whether progress was made in the focus area.
December 2012				Y N	Y N	
June 2013				Y N	Y N	

Organizational Tools

At the end of their cycle of inquiry, the data team reviewed the items that had been recorded on the Parking Lot Tool (7A, page 47). These questions and data findings would form the basis of their next cycle of data inquiry.

7A. Parking Lot Tool

Questions to Return to Later	Data Findings to Return to Later
Is there a correlation between math scores and reading scores? Which teachers are producing the best outcomes and what are they doing differently in their classrooms? Which grades show the most improvement in NeSA and why? Look at the correlation between attendance rates and NeSA outcomes for grade levels besides 7th grade.	Cross has a majority male population in her classroom. Overall, almost half of the 7th-grade scored below proficiency on the NeSA-M. There are two students with 100% attendance who exceeded expectations in both NeSA-M and NeSA-R. • Both were in Grimes' class. • What are they, or Grimes, doing differently?

The team also reviewed the Data Cycle Overview (7B, page 47) to clarify and celebrate the completed work. With the overview available, the team can return to the data cycle at any time in the future to review its decisions.

7B. Data Cycle Overview

Focus Area	Improve student achievement, particularly as measured by the NeSA assessment.
Focus Question	What effects, if any, do attendance rates have on NeSA test outcomes for 7th-grade students?
Key Challenge	Students with poor attendance seem to be achieving at a lower rate than students with good attendance.
Top Driving Factor	Parents are not aware that their children are skipping school.
Strategy	Send home weekly attendance reports that require a parent's signature.
Strategic Statement (including Target)	By the end of this school year, improve 7th-graders' overall average attendance from 78% to 90% by sending home weekly attendance reports that require a parent's signature whenever a student has an unexcused absence.

Appendices

Appendix A: Glossary

Term	Definition
Achievement Data	Data that indicate how students are performing on tests of academic knowledge or skill.
Area of Concern	Factors that may impact the challenge but that the team cannot directly influence or change.
Area of Control	Factors that the team can directly change.
Area of Influence	Factors that the team cannot directly change but that the team can possibly manipulate to move toward change.
Causal Questions	Questions that aim to determine whether one or more variables causes or effects one or more other variables.
Cycle of Data Inquiry	The specific project during which the Data Team completes all of the Stages of the Data Inquiry process. Each question for inquiry leads to a new cycle of data inquiry.
Data Inquiry	A process of identifying questions, collecting and examining data, interpreting data, and proposing actions based on data.
Data Source	The data that are under study or analysis.
Demographic Data	Data that provide information on characteristics of a population or sample. Common demographic variables include gender, race/ethnicity, socioeconomic status, and geographic location.
Descriptive Questions	Questions that aim to describe or summarize what is going on or what currently exists. These questions do not lead to predictions, associations between variables, or causal statements.
Dichotomous Questions	Questions that have only two possible answers. Common examples are those questions that lead to answers of “yes or no,” “up or down,” or “male or female.”
Disaggregated Data	Data that have been broken down according to subgroup identifiers to enable analysis of the data set according to subgroups.
Interim Assessments	Assessments that are administered during instruction to evaluate students’ knowledge and skills relative to a specific set of academic goals.
MAP	Northwest Evaluation Association's Measures of Academic Progress (MAP) assessment, a computer adaptive assessment used by several Nebraska schools to meet the Nebraska Department of Education's norm-reference requirements.
NeSA	The Nebraska State Accountability test is a system of criterion-referenced tests in reading, mathematics, science, and writing. Reading (NeSA-R) and mathematics (NeSA-M) are administered to students in grades 3–8 and 11; science is administered to students in grades 5, 8, and 11; and writing is administered to students in grades 8 and 11.
Outcomes Data	Data that indicate how students fare in all areas but academic achievement at the end of a period of time, such as a semester, year, or K–12 education.
Perception Data	Data that provide information about respondents’ values, opinions, views, and beliefs, often collected through surveys or questionnaires.
Program Data	Data that describe the structures and processes in place within the system or program under inquiry.
Relational Questions	Questions that analyze the relationship(s) between two or more variables.
Variable	A characteristic or observation that differs among members of a sample or population.

Appendix B: Question Bank

This question bank includes some common question formats and example questions. As data teams begin working, they may find it useful to pull from this bank in order to save time as they learn the data inquiry process. For all data sources, demographic and other sources may also be required to disaggregate the data.

This is not an exhaustive list of possible questions and should only be used as inspiration or for use by a new data team struggling with question development.

Most questions should have associated timeframes which designate the period(s) (e.g., in semesters or years) across which data will be collected. In general, if a static measure of performance is desired, data from the most recent time period should be acquired. If a trending measure is desired, data from a series of consecutive time periods should be acquired.

Question Format	
Example	Data Sources Required for the Example

1. What is the correlation between (variable) and (variable) [in subgroup]?	
What is the correlation between benchmark math tests and NeSA-M scores?	Benchmark scores that directly precede the NeSA-M scores
How are attendance rates related to NeSA scores for 5th graders?	NeSA scores, for 5th grade only Attendance rates, for 5th grade only

2. How are (sub group) performing in (content area) as measured by (test) over (time period)?	
How are 4th-grade girls performing in reading as measured by DIBELS over the last three years?	DIBELS scores from the last three years for 4th-grade girls only
How have Title I students performed in reading over the course of this school year, as measured by interim course grades?	Course grades from this school year for Title I students only

3. How has (program or intervention) affected (data source)?	
How has our intensive reading program affected NeSA-R scores?	NeSA-R scores from years during which program was implemented and at least one year prior
How has the introduction of the Boys Town Education Model™ affected behavior rates at the high-school level?	Behavior rates from the high school from years during which the program was implemented and at least one year prior

4. What are the trends in (data source) over (time period)?	
What are the trends in graduation rates over the last 10 years?	Graduation rates for the last 10 years
What are the trends in parent perception of the importance of education since we began parent nights four years ago?	Parent perception data from the last four years

Question Format	
Example	Data Sources Required for the Example

5. What is (sub group)'s perception of (variable)? How does that correlate with (variable)?	
What are 5th-grade students' perceptions of their reading skills? How does that correlate with NeSA scores?	Reading skills perception survey data from the 5th-grade NeSA-R scores for the 5th grade
What are the middle school students' perceptions of school culture? How does that correlate with classroom grades?	Middle school perception survey data related to school culture Middle school classroom grades

6. How does (data source) compare across (subgroups)?	
How do MAP math scores compare across classrooms?	MAP math scores Disaggregated by classroom
How do NeSA-M scores compare across student ethnic groups?	NeSA-M scores Disaggregated by ethnicity

7. What was the impact of (program) on (outcome)?	
What was the impact of additional reading on student NeSA-R achievement?	NeSA-R scores from both before and after the program implementation
What was the impact of using study guides on unit test scores?	Unit test scores from both before and after the program implementation

8. What is the relationship between (test) scores and (variable)?	
What is the relationship between ACT scores and graduation rates?	ACT scores Graduation rates
What is the relationship between MAP reading scores and retention rates?	MAP reading scores Retention rates

Appendix C: Color-Coding the Data

One possible approach to identifying patterns in the data is color-coding. Bright colors can be used to highlight all of the places where the data show students scoring below a certain threshold. The stoplight method suggests using the three colors of the stoplight to highlight the lowest third (red), the middle third (yellow), and the highest third (green) in a data set. For example, students below proficiency may be red, at proficiency may be yellow, and above proficiency may be green (Learning Point Associates, 2004).

Below is an example of this method. The table consists of classroom data that show the raw score and proficiency level of 15 students on a single assessment. This is a comprehensive data set–a user can consider proficiency levels or raw scores at the classroom level and disaggregated by student, free or reduced-lunch status, and gender. The example has been color-coded according to proficiency and sorted by gender.

Student ID	Gender	FRL	Score	Proficiency Level
23456	F	NA	14	Exceeds
67890	F	NA	4	Below
13451	F	Free	15	Exceeds
24562	F	Reduced	10	Exceeds
46784	F	NA	11	Exceeds
57895	F	Free	4	Below
70987	F	NA	3	Below
12345	M	Free	15	Exceeds
34567	M	Reduced	8	Meets
45678	M	NA	13	Exceeds
56789	M	Reduced	2	Below
35673	M	Free	9	Meets
68906	M	Free	9	Meets
80987	M	Reduced	9	Meets
98765	M	Reduced	8	Meets

Appendix D: Creating Visual Displays of the Data

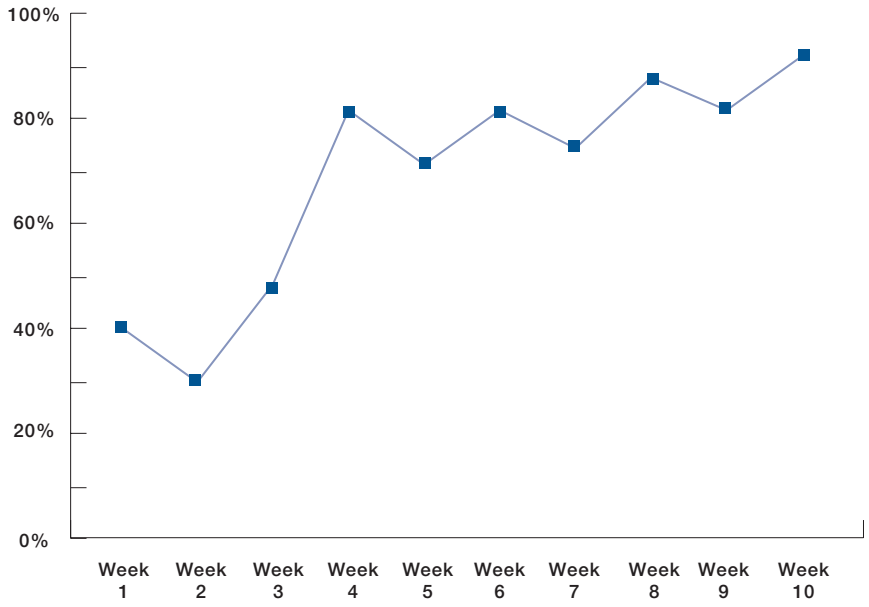
There are many common types of graphs that can be easily created in Word or Excel. The type of graph that is chosen will depend largely on the data being shared.

Line Graphs

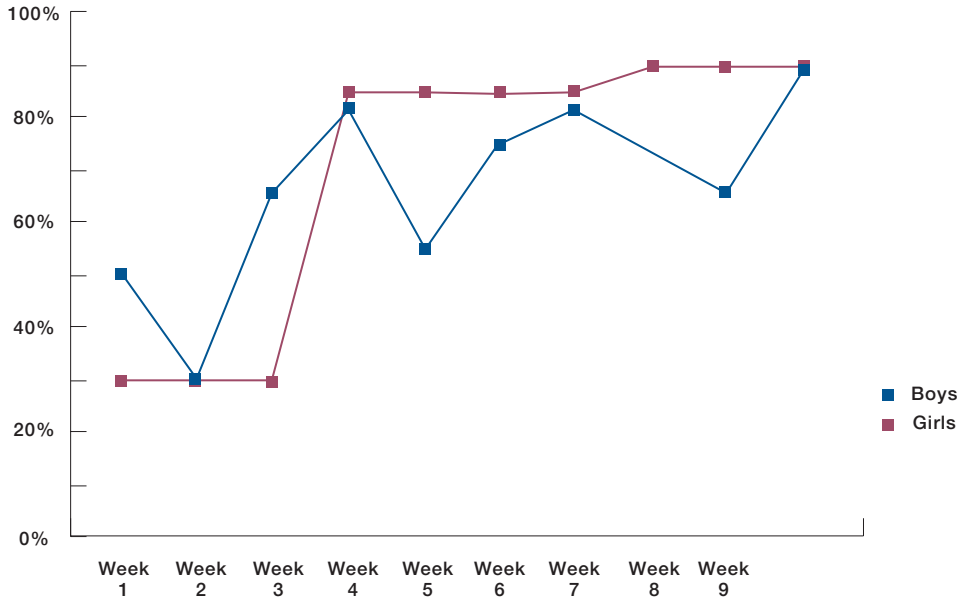
These graphs are best used to track data changes over a period of time. The following graph displays the 4th-graders' average math test scores over the first 10 weeks of school.

Line graphs can also be used to compare two groups over the same period of time. In the second example, the data have been disaggregated by gender in order to show the average math scores for girls and boys in the 4th grade. Having both lines on the same graph allows for comparison of these two subgroups over the first 10 weeks of school.

4th-Grade Students' Average Math Test Scores



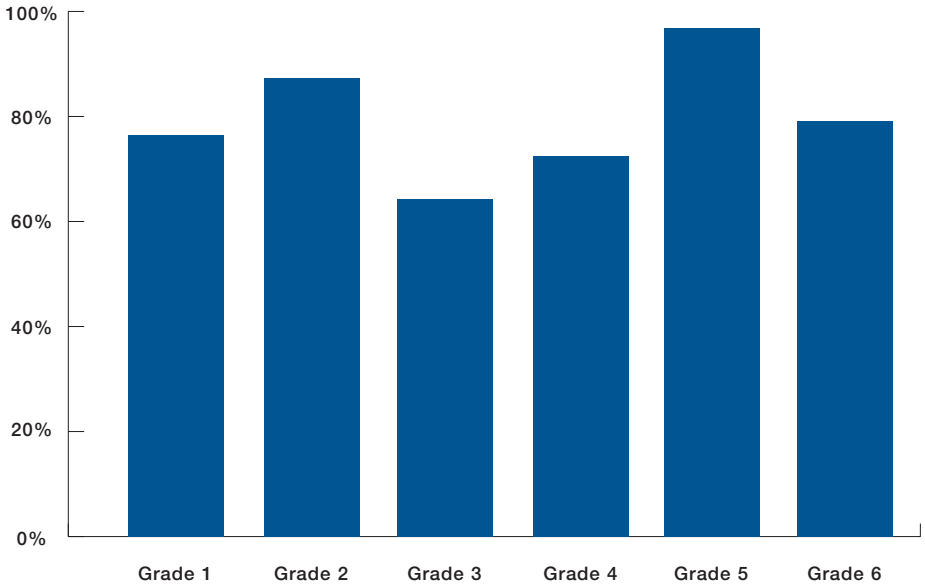
4th-Grade Students' Average Math Test Scores by Gender



Bar Graphs

These graphs are best used to compare variables across different groups. The following example displays the average math scores across the grade levels in ABC School.

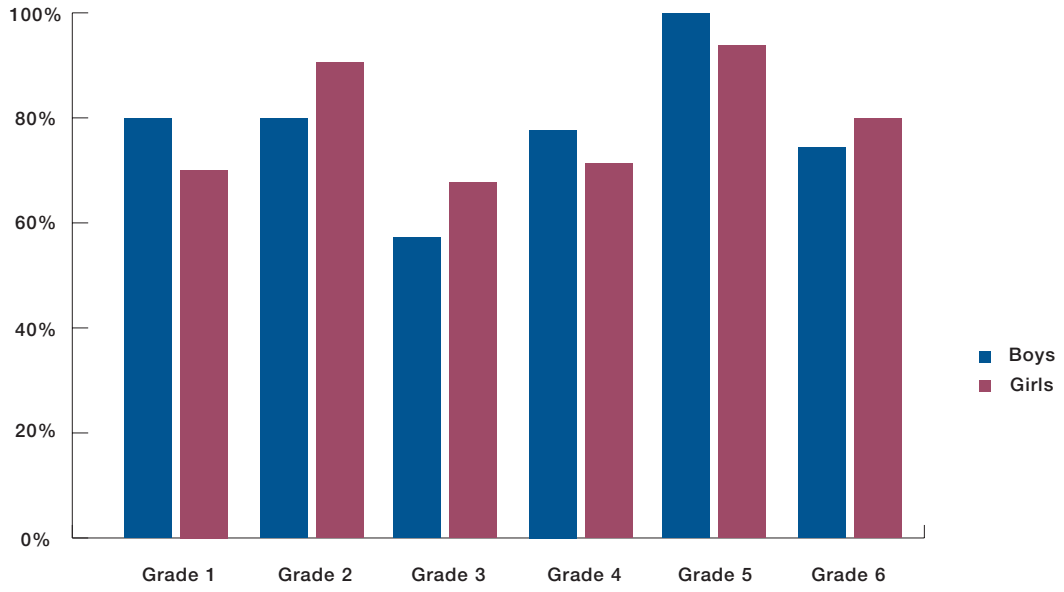
Average Math Scores in ABC School: Fall 2011



Bar graphs can also be used to compare two groups on a single measure. In the next example, the data from the previous example have been disaggregated by gender in order to show the average math scores for girls and boys in

the school. Having both sets of data on the same graph is helpful in seeing how certain grade levels or genders are performing as compared to others.

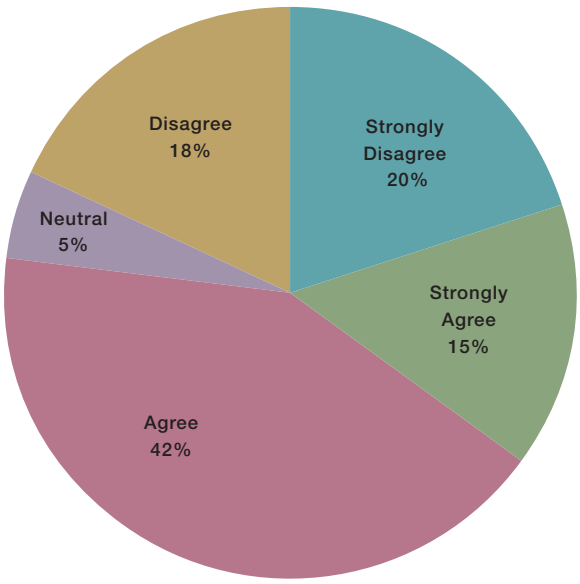
Average Math Scores in ABC School: Fall 2011, By Gender



Pie Charts

These graphs are best used to compare parts of a whole. They are most often used to show and quickly compare percentages and do not show changes over time. The example below displays responses to a school climate survey.

ABC School is a Good Place to Go to School



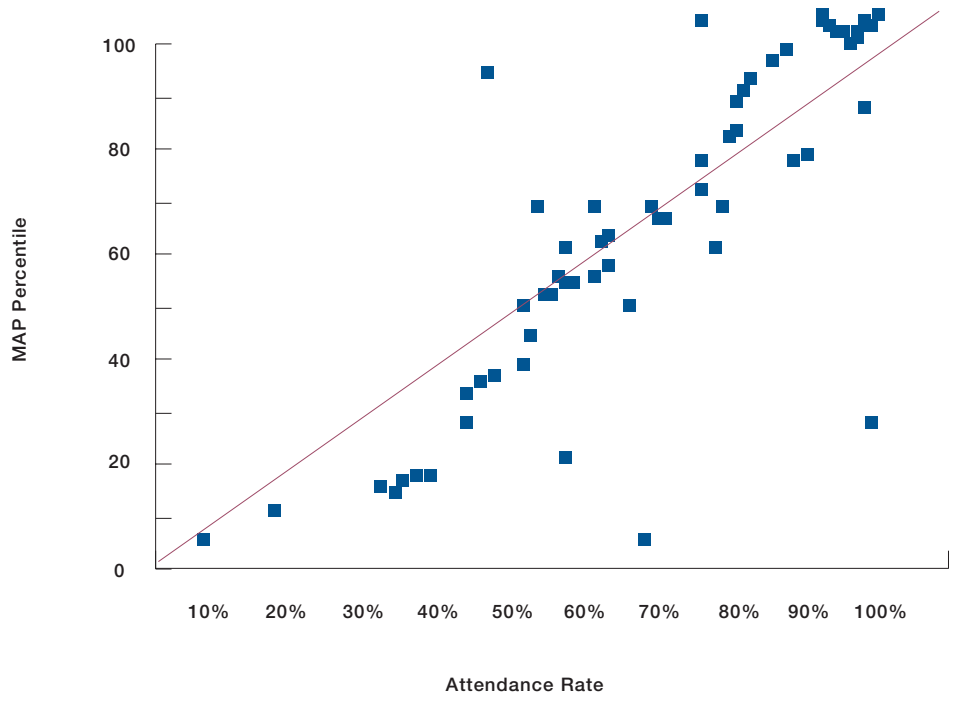
The pie chart shows that more than half of the respondents stated they "Agree" or "Strongly Agree" with the statement that "ABC School is a good place to go to school."

Scatterplots

These graphs are best used to identify relationships between two variables. The variable that is considered explanatory typically is placed on the horizontal axis and the response variable is placed on the y axis. They are most useful when there are a large number of data points. Scatterplots are not recommended for use with very few data points.

In the example below, the MAP percentiles for 62 4th-grade students at ABC School are plotted on a scatterplot.

4th-Grade Attendance Rates and MAP Test Percentiles at ABC School



The attendance rate is considered explanatory, because the hypothesis is that attendance rates are affecting MAP percentile scores.

The dots on the graph indicate a positive correlation between attendance and MAP percentiles (as attendance rates increase, MAP percentiles increase). A line can be drawn on the graph to emphasize this trend. The dots that fall well outside the trend line are outliers–they may have other factors causing them to fall outside the general trend seen with the majority of the population.

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