

IEA Data Analysis Toolkit

Introduction

This toolkit is designed to help educators use multiple data sources to improve teaching and learning, and is divided into five steps.

Step 1: Identifying Your Data Team

Schools and districts coordinate the various efforts required to collect and analyze data through the construction of different data teams. One example is an instructional leadership team or school improvement team that includes teachers and education support professionals selected by their local association to represent their colleagues, school and district administrators, and in some cases students and parents. It is important to ensure there is representation from all relevant stakeholder groups on your data team. Data teams may also include school, grade-level, and/or content area teams. Most likely your school or district already has teams of educators working together to collaboratively solve problems.

However, it is important to ensure that these teams have a designated time to engage in their collaborative work, have a clear set of expectations and norms for working together, and have access to the data and tools needed to design meaningful data displays. It is also important to ensure that these data teams regularly communicate with the school and/or district community and engage in a fair process for decision making.

A fair process includes the following three principles: engagement, explanation, and expectation clarity. Engagement means involving individuals in the decisions that affect them by asking for their input and allowing them to refute the merits of one another's ideas and assumptions. This means that the data team must engage in a fair process internally and communicate their progress and ask for their colleagues' input on a regular basis. Engagement communicates the team's respect for individuals and their ideas.

Explanation means that everyone involved and affected by a decision should understand why final decisions are made. An explanation of the thinking that underlies decisions makes people confident that the data team has considered their opinions and have made those decisions impartially in the overall interests of the school or district.

Expectation clarity requires that once a decision is made, the data team must clearly state the new expectations for performance and ensure that they are understood by everyone involved. For example, what are the new goals? Who is responsible for what? A fair process pursues the best ideas whether they are put forth by one or many.

Step 2: Conducting a Data Inventory

Next, data teams should conduct data inventories. A data inventory provides a summary of all the types of data that are available in a school and/or district and where to find them. By conducting an inventory, data teams can begin to paint a picture of the data resources that are currently available, how the data are being used, and what additional data might better support the team's data use. Teams may also work together to develop a single regularly updated inventory that is available electronically. This ensures that information about data is easily accessible to all data teams. Use Handout 1 *Creating a Data Inventory* to develop a list of the data reporting tools and assessments currently available in your school and/or district.

Step 3: Identifying Issues to Investigate

Next, the data team will identify issues to investigate using the available data. The team will begin identifying issues at the district, school, content area, and/or grade level, and will formulate questions to focus these investigations.

What makes a good issue to investigate? First, the issue must be under the control of teachers or school and/or district administrators. Second, the issue must have an immediate and significant impact on outcomes for students. Identifying issues and asking questions about those issues help focus the investigation. An example issue that meets both criteria might be reducing the number of chronically absent students.

Use Handout 2 *Identifying and Prioritizing Significant Issues* to brainstorm ideas as a data team.

Next, what type of data should be used? Many educators believe data only pertains to numbers. However, data is a much broader term and can refer to any factual information that supports the team's investigation. All data teams have a responsibility to collect data from a wide range of sources to ensure that they thoroughly understand the issue being investigated.

Examining a variety of data sources to help answer questions further ensures that the team's inferences and conclusions are valid. The term validity means that conclusions are accurate or true. When using multiple data sources, you may find yourself comparing similar data sets (e.g., results from different types of assessments) or comparing different data sets (e.g., comparing student achievement to their grade level or climate survey results). The process of relating multiple sources of data is often referred to as triangulation. Using multiple data sources to ensure conclusions are valid helps the team accurately identify problems and possible solutions.

Next, the data team will formulate questions based on the identified priority issues. Data teams must generate questions that will guide their investigation. These are often referred to as focusing questions because they provide the team with guidance concerning the data that needs to be collected and analyzed to address the identified issues.

Handout 3 *Developing Focusing Questions* asks the data team to develop questions that will focus the collection and analysis of data related to the identified priority issue. Handout 4 helps data teams identify and locate relevant data needed to answer the identified questions.

Through the analysis of the collected data, the team will discover additional questions, known as clarifying questions, which must be answered in order to further the investigation and identify the causes of the issue that needs to be addressed. Using our previous example, one focusing question a team might ask could be, "what are the characteristics (e.g., age, gender, race, school currently enrolled, achievement, disciplinary infractions, health related issues, etc.) of students who have the highest rates of absenteeism in the district?" The data team would then conduct the appropriate data analysis and ask clarifying questions. An example clarifying question might include, "which of these characteristics are most commonly held by chronically absent students?" and "which schools do these students attend?"

Step 4: Collecting and Displaying Data

After the data team has selected a priority issue and developed focusing questions, it's time to collect the relevant data needed to address these questions. Data specific to the issues are likely to be located alongside a large amount of unrelated data. A focusing question helps to sort out the most useful data. The relevant data can then be displayed in a format that facilitates analysis.

Let's take some time to think about how data can be represented to facilitate analysis. Data may be presented in many types of displays including tables, charts, maps, and graphs. It may be useful to think about the following questions before determining the best data display:

- Is the data quantitative (i.e., numbers) or qualitative (i.e., perceptions, themes, attitudes, or beliefs)? Quantitative data are usually presented in charts and graphs such as bar, line, histogram, and pie charts; while qualitative data are usually presented in tables.
- How many data points need to be displayed? A low number of data points (three or less) can usually be understood within a table, and a greater number of data points are usually displayed using a chart or graph. A bar chart is good for displaying data that are discrete, such as annual attendance by grade level. Histograms are good for displaying continuous data, such as the grade point average of students enrolled in advanced placement courses.
- How important are the relational frequencies? Pie charts are the first choice for understanding how parts relate to a whole. For example, the percentage of student who met each performance level on a standardized test within a grade level can best be understood using a pie chart.
- How important are the trends? Data gathered across multiple years are useful for determining whether the general trend is positive or negative. Line graphs can represent a downward or upward trend. Bar charts with multiple years of data can be a bit more difficult to interpret, but can be used to show many data points, such as performance by grade level for three years on a standardized assessment.

Keep in mind that whatever display your data team has chosen should draw attention to critical comparisons, trends, or patterns. For this reason, all graphs and tables need to be clearly labeled and titled so they can be easily understood.

Step 5: Analyzing Data

Analyzing data should be a collaborative effort that involves all data team members. The data analysis process starts with a clear understanding of the issue and focusing questions. With those in mind, the team may take an objective look at the data that are directly related to the focusing questions. Thoughtful and objective observations may give rise to reasoned inferences that lead to more questions or to tentative conclusions. The data analysis process outlined in Handout 5 works equally well on quantitative data (e.g., numbers) or qualitative data (e.g., perceptions, themes, attitudes, or beliefs).

Example Data Analysis

Federal guidance from the U.S. Department of Justice Civil Rights Division and the U.S. Department of Education Office for Civil Rights recommends that schools and districts examine student disciplinary data and review their disciplinary policies to determine the extent to which exclusionary disciplinary actions are being used and whether they are being administered disproportionately to subgroups of students, such as racial or ethnic minority students or students with disabilities. Therefore, I am going to use example student disciplinary data to walk through the data analysis process.

Step 1: Identifying Your Data Team. In this example, I am going to look at student discipline data from an entire school district. Therefore, it might be beneficial to create a district-wide student discipline data team. On this team I would include teachers and education support professionals selected by their local association to represent their colleagues, the superintendent, school principals and other administrators that regularly handle student discipline issues, and I might also consider including students and parents on the team as well. Remember when we discussed the importance of a fair process? It's hard to engage in a fair process when you don't have all of the important stakeholder groups represented as part of your team.

Step 2: Conducting a Data Inventory. In this example, the team has determined that the district collects and houses student demographic and discipline data in a school-wide information system. Within this system, the team has access to the following data elements:

- Student demographics including grade level, gender, race and ethnicity, disability, and English learner status.
- Student discipline data including a description of the misconduct and disciplinary actions taken. The district uses the state incident type codes to categorize different types of student misconduct but also allows the user to enter additional qualitative data or notes about the incident. The district also uses the state disciplinary action and duration codes to categorize different actions taken and their length.
- Thankfully the district has a very detailed policy about data entry concerning student discipline and has trained all appropriate staff on the process. The district also conducts regular data audits to ensure the accuracy of the data collected. This will make the data team's job much easier since there will be no missing or inaccurate data to deal with.

Step 3: Identifying Issues to Investigate. This data team is going to begin by identifying a single priority issue using Handout 2. In this example, the team has identified the priority issue to be reducing the number of out-of-school suspensions. In addition, the team has used Handout 3 to identify the following initial focusing questions:

- How often did students receive out-of-school suspensions over the past three school years?
- What are the types of misconduct students were suspended for over the past three school years?
- Does the district use out-of-school suspensions more frequently for some subgroups of students than for others?

Step 4. Collecting and Displaying Data. The data team then retrieved the student suspension data from the school-wide information system. Often this type of data can be downloaded into an excel file if the system does not include a data dashboard that helps users visualize data using appropriate tables, charts, maps, and graphs.

To answer the question, “how often did students receive out-of-school suspensions over the past three school years?” the data team decides to display the frequency of out-of-school suspensions using a table.

Table 1. Frequency of Out-Of-School Suspensions

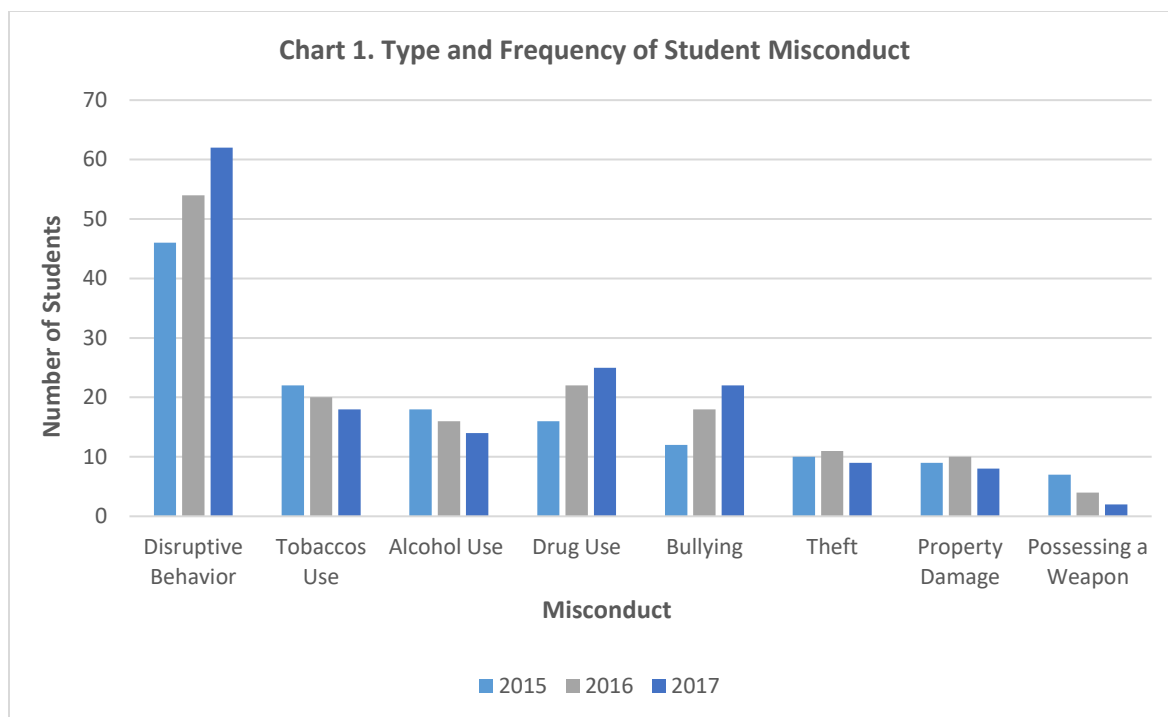
Disciplinary Action	2015	2016	2017
Out-Of-School Suspension	140	155	160

Note. *N*=1,000 enrolled students.

Next, to answer the question, “what are the types of misconduct students were suspended for over the past three school years?” the data team used the suspension data to create another table and bar chart.

Table 2. Type and Frequency of Student Misconduct

	2015		2016		2017	
Misconduct	Number	Percent	Number	Percent	Number	Percent
Disruptive Behavior	46	33	54	35	62	39
Tobaccos Use	22	16	20	13	18	11
Alcohol Use	18	13	16	10	14	9
Drug Use	16	11	22	14	25	15
Bullying	12	9	18	12	22	14
Theft	10	7	11	7	9	6
Property Damage	9	6	10	6	8	5
Possessing a Weapon	7	5	4	3	2	1



Finally, to answer the question, “does the district use out-of-school suspensions more frequently for some subgroups of students than for others?” the data team decides to create a table examining the frequency with which certain genders were suspended over the last three years.

Table 3. Frequency of Out-Of-School Suspensions by Gender

	2015		2016		2017	
Gender	Number	Percent	Number	Percent	Number	Percent
Females	46	33	53	34	53	33
Males	94	67	102	66	107	67

And then decides to create another table examining the frequency with which students with disabilities and English learners were suspended over the last three years.

Table 4. Frequency of Out-Of-School Suspensions by Disability and EL Status

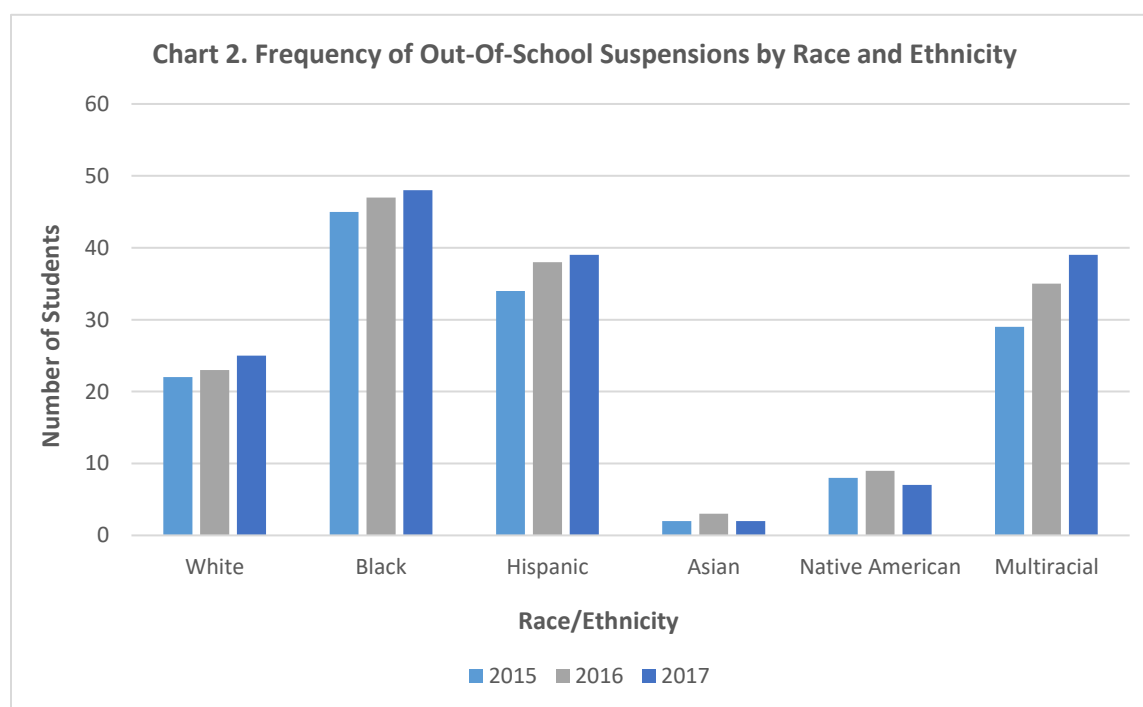
	2015		2016		2017	
Gender	Number	Percent	Number	Percent	Number	Percent
Student With Disabilities	18	13	21	14	20	13
English Learners	9	6	8	5	10	6

Note. Percent indicates the percentage of the total population of suspended students.

Finally, the data team decides to create a table and bar chart examining the frequency with which certain races and ethnicities were suspended over the last three years.

Table 5. Frequency of Out-Of-School Suspensions by Race and Ethnicity

	2015		2016		2017	
Race/Ethnicity	Number	Percent	Number	Percent	Number	Percent
White	22	16	23	15	25	16
Black	45	32	47	30	48	30
Hispanic	34	24	38	25	39	24
Asian	2	1	3	2	2	2
Native American	8	6	9	6	7	4
Multiracial	29	21	35	22	39	24



Step 5. Analyzing Data. Once the data team has finished collecting and creating appropriate data displays it's time to begin analyzing the data. Remember, data analysis should be a collaborative effort that involves all data team members. Using Handout 5, the data team first identifies a note taker who records the priority issue and focusing questions on a piece of chart paper.

Next, the data team posts the collected data displays so all the team members can see them and begins taking turns making factual observations such as "I notice that out-of-school suspensions have increased over the last three years," and "I observe that approximately twice as many males are suspended than females." The note taker will record all of the observations made on chart paper.

Next, once the team is finished taking turns making factual observations about the data, the data team will work to make meaning from the data and observations made. Coding or grouping the observations into categories such as “trends or patterns” might be helpful during this step. Once the team has coded or grouped their observations they can begin making inferences about the data. For example, “there are gender and racial disparities in our district’s disciplinary practices.” The note taker will record all of the inferences made on chart paper.

Finally, the data team will brainstorm clarifying questions that will be recorded on chart paper by the note taker. For example, “what is the relationship between the gender and race of students who were suspended out-of-school?” The team might also consider additional cross tabulation questions concerning race, gender, disability, and EL status, as well as the examination of this data by school and grade level. The data team might also consider the inclusion of additional qualitative data sources such as the district’s climate and culture survey.

The data analysis process is iterative. Therefore, the data team will continue to collect and display additional data and repeat the steps of this protocol until the team is confident that it can draw accurate conclusions from its observations and inferences.

Please contact [IEA Teaching and Learning](#) with any questions.

Additional Resources

Achieve. (2016). *Student assessment inventory for school districts*. Retrieved from <http://www.achieve.org/assessmentinventory>

Data Quality Campaign. (2016). *Using data to improve student achievement*. Retrieved from <http://www.dataqualitycampaign.org/>

Boudett, K.P., City, E.A., & Murnane, R.J. (2005). *Data wise: A step by step guide to using assessment results to improve teaching and learning*. Cambridge, Mass: Harvard Education Press.

Geier, R., Smith, S., (2012). *District and school data team toolkit*. Everett, WA: Washington Office of Superintendent of Public Instruction, Washington School Information Processing Cooperative, and Public Consulting Group.

National Center for Education Statistics. (2016). *Forum guide to building a culture of quality data: A school and district resource*. Retrieved from http://nces.ed.gov/forum/pub_2005801.asp

Sagor, R. (1992). *How to conduct collaborative action research*. Alexandria, VA: Association for Supervision and Curriculum Development (ASCD).

Teaching Channel (2016). *Success at the core leadership development modules*. Retrieved from <https://www.teachingchannel.org/success-at-the-core-sac>

The Pell Institute and Pathways to College Network. Analyze Qualitative Data. *Evaluation Toolkit*. Retrieved from <http://toolkit.pellinstitute.org/evaluation-guide/analyze/analyze-qualitative-data/>

Ronka, D, R. Geier, and M. Marciniak. (2010). *A practical framework for building a data-driven district or school: How a focus on data quality, capacity, and culture supports data-driven action to improve student outcomes*. Boston, MA: Public Consulting Group.

Handout 1. Creating a Data Inventory

Data Systems

Create a table or excel file and list the data systems used in your school and/or district. For each system identify the following:

- **System Name:** Write the name of the system or software being described.
- **Type of Data:** Describe the types of data captured by the system (e.g., attendance, discipline, grades).
- **Reporting Features:** Describe any reporting features the system has (e.g., ad hoc, one-click, predefined).
- **Users:** Describe who has access to the system (e.g., teachers, principals, secretaries).
- **Additional Notes:** Add any additional information about the system you would like to record.

Assessments

Next, create another table or excel file and list the assessments used in your school and/or district. For each system identify the following:

- **Assessment:** Enter the name of the assessment.
- **Grade Levels Administered:** Record the grade levels in which the assessment is given.
- **Content/Subject Area(s):** Record the subject areas that the assessment measures (e.g., mathematics, reading, and writing).
- **Date Test Data Are Available:** List the date (or dates) when the data are available to use.
- **Students Assessed:** List the populations of students assessed (e.g., all students, special education, English learners).
- **Current Data Use:** Describe how the data are currently used (e.g., setting school improvement goals, placing students in intervention programs). List as many uses as you are aware of.

Data Not Currently Collected

Are there any other types of data that the data team would like to see collected and used? If so, list them and their potential use in an additional table or excel file. Include the (1) type of data, (2) potential use, (3) how it might be collected, and (4) who would be responsible for the data collection.

Discussion Questions

As a team, consider the following discussion questions related to each inventory component.

Data Systems

1. Which are actively used to inform decisions made by teachers and school and/or district administrators? Which are not actively used?
2. Which produce helpful output such as attendance and demographic reports? Which do not produce helpful resources?
3. How might the systems be improved to support data use?

Assessments

1. Which assessments are used to inform decisions by teachers and school and/or district administrators? Which are not actively used?
2. Are there assessments that provide the same or similar information about students? If so, is this additional information beneficial?
3. Are there assessments in place that provide longitudinal data that can track the growth of student cohorts?
4. What assessments might be added to enhance data use or removed to increase instructional time?

Additional Data Needed (Next Steps)

1. Which of the identified additional data are currently critical to support data use?
2. Who needs to be involved in the decision to collect these data?
3. Develop a plan that involves the important stakeholders and will expedite the collection of these data.

Handout 2. Identifying and Prioritizing Significant Issues

1. Brainstorm issues that could be the focus of your investigation. Capture these issues on chart paper or in an electronic file.
2. As a team, reach consensus on the three top priority issues and circle them on the chart paper. From these three, choose the highest priority issue. This issue will guide the initial stage of your investigation. Although the team will focus on one priority issue at a time, other issues that have been identified can be investigated as the process progresses.
3. Record all of the issues that were suggested for future use.

Handout 3. Developing Focusing Questions

1. Write the issue that the team identified using Handout 2 *Identifying and Prioritizing Significant Issues* at the top of a piece of chart paper. It can be formulated either as a statement or a question.
2. Brainstorm questions that stem from the issue. Capture these questions on chart paper. All items should be phrased as questions. Circle your top three priority questions. From these three, choose the highest priority question. This question will guide the initial state of your investigation. Although the team will focus on one priority question at this time, other questions that have been identified can be investigated as the investigation progresses.
3. Record all of the questions that were suggested for future use.
4. When you're finished, record the priority focusing question on a new sheet of chart paper for use in Handout 4 *Identifying and Locating Relevant Data*.

Handout 4. Identifying and Locating Relevant Data

1. Copy the question that you identified in Handout 3 *Developing Focusing Questions* to a sheet of chart paper if you have not already done so.
2. Brainstorm the data needed to address the focusing question. Record your ideas on the chart paper below the question. Be as specific as possible about the type of data needed. For instance, rather than saying assessment results, say 2018 Grade 3 PARCC data disaggregated by subgroups.
3. Reach consensus on data needed to address the question and record them on another sheet of chart paper in a table or excel file.
4. Determine where the data is stored and who can provide access to the data. Record the information.
5. Determine and record when the data will be collected and who will be responsible for the collection.

Handout 5. Data Analysis Protocol

Part 1: Preparing for Analysis

1. Appoint a note taker and record the priority issue and focusing questions that you are investigating on a piece of chart paper.
2. Gather the collected data and data displays and make them available to all team members.

Part 2: Making Observations

1. First, concentrate on making objective observations about what is in the data. Do not attempt to make judgments about why the data may appear as they do.
2. Using the data and display(s) provided, take turns making factual observations about what the data say. The note taker will record the observations on the chart paper.
3. When expressing your observation, you might use sentence starters such as: "I see...", "I observe...", and "I notice..." Stay away from making inferences. Discuss only the facts at this stage of the process. It is okay to make observations that are based on the observations made by other team members. Think about the trends and patterns that may be evident in the data. The note taker will record the observations on the chart paper.

Part 3: Making Inferences

1. Next, the team will work to make meaning from the data and the observations made. Remember that any inferences the team makes need to be based on the data.
2. When all observations have been made, review them as a team. Code or group the observations into categories of findings. Think about the following questions while organizing the observations:
 - What trends, patterns, or themes do you see in the observations?
 - What assumptions might have motivated your observations?
 - What surprised you (both positive and negative)?
3. As a team, review the categorized findings. Make a list of what the team can now infer about the data. The note taker should record the list on chart paper. The inferences made by the team will help clearly identify the direction for further inquiry.

Step 4: Asking Clarifying Questions or Drawing Tentative Conclusions

1. Brainstorm questions that arise from the observations and inferences the team has made about the data. Record these questions on chart paper.
2. From this group of questions, identify the questions that must be answered before any tentative conclusions about the priority issue and focusing questions can be made. Record them on a new sheet of chart paper, leaving room next to each question to record more information.

3. The clarifying questions the team has identified may be answered using the data already collected or the team might need to collect additional data. For each of the clarifying questions, brainstorm the data needed next to each question on the chart paper.
4. The data analysis process is iterative. Repeat the steps of this protocol to analyze any newly collected data. Repeat the data analysis process until the team is confident that it can draw a tentative conclusion from its observations and inferences.

Once the data analysis process is completed, it is recommended that this information be shared with all staff who are encouraged to ask additional questions or suggest additional data that the team should collect. In addition, all staff should also be encouraged to brainstorm possible strategies that might address the priority issue based on the conclusions made by the data team. Remember the importance of a fair process.