Chapter 8

USING DATA

TOOLS

Where are we?

In our school, data drive decisions at the school and classroom level.

STRONGLY AGREE   AGREE   NOT SURE   DISAGREE   STRONGLY DISAGREE

Data management systems make data easily accessible to teachers.

STRONGLY AGREE   AGREE   NOT SURE   DISAGREE   STRONGLY DISAGREE

The culture of our school does not support open discussion about student academic performance.

STRONGLY AGREE   AGREE   NOT SURE   DISAGREE   STRONGLY DISAGREE

B efore teams begin their work, it is important that they determine what their work is. Examining data about their students' learning is the initial step in identifying the focus of the team's work. In *Using Data/Getting Results: A Practical Guide for School Improvement in Mathematics and Science,* Nancy Love identifies 10 reasons for engaging in data analysis. Data, she says, can:

- Uncover problems that might otherwise remain invisible;
- Convince people of the need for change;
- Confirm or discredit assumptions about students and school practices;
- Get to the root cause of problems, pinpoint areas where change is most needed, and guide resource allocation;
- Help schools evaluate program effectiveness and keep the focus on student learning results;
- Provide the feedback teachers and administrators need to keep going and stay on course;
- Prevent over-reliance on standardized tests;
- Prevent one-size-fits-all, quick-fix solutions;
- Give schools the ability to respond to accountability questions; and

> We in education have a history of adopting one innovation after another as they are introduced. Very few of us take the time to understand the needs of the children we serve, the impact that our current processes have on children, the root cause of recurring problems, the solutions to alleviate the problems in the long run, and how to measure and analyze impacts after implementing new approaches.
> — Victoria Bernhardt,
> *Data Analysis for Comprehensive Schoolwide Improvement,* 1998, p. 2.

- Help build a culture of inquiry and continuous improvement (2002, pp. 28-30).

Various types of data

Because teams work collaboratively to improve teaching and learning, they identify the specific area of student learning they want to work on. Letting data drive the decision about the focus of the team's efforts allows that work to be more focused on the specific needs of their students.

Teachers have access to a variety of data to use as they identify the main focus for their collaborative work. Victoria Bernhardt identifies four categories of data that provide a unique and valuable piece of information that helps school teams develop a complete and full understanding of student learners and the school context:

• **Perception data** help develop an understanding of "what students, parents, teachers, and others think about the learning environment;"

• **Demographic data** "provide descriptive information about the school community — enrollment, attendance, grade level, ethnicity, gender, native language;"

Tool 8.1

Tool 8.2

Tool 8.3

• **Student learning data** "describes the results of our educational system in terms of standardized test results, grade point averages, standards assessments, and authentic assessments;" and

• **School processes data** "define what teachers are doing to get the results they are getting" (pp. 16-17).

Tool 8.1 asks teams to identify what types of data are available in each school using Bernhardt's categories of data.

When teachers invest time in analyzing data about their students, they identify the deficit areas in student learning. For example, a team of 4th-grade teachers, after analyzing data from their district writing samples and state language arts assessments, determine that their students' organizational skills are weak. They consider a variety of ways to help develop students' organization. World History teachers, after analyzing a set of student essays, are disappointed that their students' work fails to reflect application of critical thinking skills. They decide that students would benefit from more explicit instruction in critical thinking. When the Algebra teachers meet to review semester exam results, they discover that over half of the students missed the same series of questions. After discussing the possible causes of this pattern, teachers decide that the method they used to assess the skill was different from the way it was presented in the textbook.

Conducting data analysis as a team helps teachers gain understanding of the problem areas to target; it also helps them identify multiple possible reasons for the problem.

It has been said that educators are data rich and information poor. Since the advent of the No Child Left Behind Act, this is increasingly true. Data abound. Slowly educators are beginning to turn data into useful information to help them make informed decisions.

Data analysis process

The eight steps below outline the data analysis process. While some analysis might not include every step, most does.

• Gather data
• Analyze the data
• Summarize data analysis
• Brainstorm causes
• Collect more data
• Analyze and summarize data
• Identify a goal
• Repeat the process

Gather data

Teachers typically have access to multiple types of data. When they are ready to gather data, it is helpful to determine in advance what kind(s) of data are most appropriate to examine. Continuously throughout the year, teachers examine data from informal and/or common assessments, the kind they design and administer in their own classrooms. These assessments, when designed in common, help teachers calibrate their expectations for students. Once a year teachers may also examine results from state assessments, norm-referenced tests, or other forms of formal assessments.

Tool 8.4

Tool 8.5

Tool 8.6

Teachers decide what data to analyze. The results of Tool 8.1 can guide their decisions about what data they want to examine. Tool 8.2 is a student data checklist that might be helpful to teams as they consider what types of data to examine. After they decide what data to examine, they determine who will take responsibility to gather and bring what data to their meeting. By planning in advance what data to examine, team members can prepare for the next meeting at which they will use one of the protocols to conduct their analysis. The more data a team has access to, the easier the data analysis process will be. To prepare for analysis of the data, it might be helpful if a team has more than three members to duplicate copies of the data so that each team member can easily see the data.

• **Analyze data**

Modern and sophisticated data management systems have made data more easily available within schools. However, data have little meaning without analysis. When the data are analyzed, they become valuable information that can be used to improve practice and results. Data analysis can take many forms. Tools 8.3 and 8.4 are protocols to use for data analysis. When teachers use these tools, they turn data into information that leads to results for their students.

Data analysis is a process of reviewing, studying, examining, and probing the data in order to find patterns, anomalies, and trends. This occurs by using a process or protocol that offers some structure for looking at the data. The end result of data analysis is the discovery of both strengths and areas for improvement. When analysis is done in a collaborative team, teachers bring multiple perspectives into the conversations that enrich the discoveries.

Using the protocols offered in Tools 8.3 and 8.4 guides teachers through the process of examining their data. Each offers a set of questions that become a vehicle for this work. When done with structure, the analysis is more likely to be thorough and complete. The data analysis process results in knowing or identifying:
• Specific areas of deficit;
• Specific knowledge and skills students need in order to overcome the deficit;
• Specific students or groups of students for whom the deficit is most prevalent or pronounced; and
• Possible root causes of identified problems.

After the data are analyzed, it is helpful to display the data in a way that will make it easy to explain to others and so that progress can be monitored. For example, teachers may want to create charts, tables, or other forms of data displays that can provide quick and easy overviews of the data. These data displays can be posted and used as reference for ongoing decision making.

• **Summarize data analysis**

Once teams complete their data analysis, they often want to present their discoveries to other teams. Summarizing data analysis into clear, concise statements is one way to communicate the findings across teams. Tool 8.5 will help teams summarize and share their findings.

• **Brainstorm for causes**

Finding the patterns, anomalies, and trends within

the data is only one part of the process of turning data into action. Simply knowing the patterns, anomalies, or trends is insufficient to determine what actions to take to address the target issue. It is through consideration of causes of the data that teams begin to generate possible actions. Therefore, teams will next search for possible causes of the findings and eventually select from all of the possibilities the one finding that will be the target of selected interventions.

Causes can fall into several areas. These areas include curriculum, instruction, resources, assessment, or external factors. Since the team cannot control most external factors, it is not appropriate to address them in the goal-setting process. It is very important at this point in the process to categorize the causes and concentrate only on the possible causes that teachers and schools can change or address. This is where teachers can make a difference. If they focus on the decisions they routinely make, teachers will be empowered to act rather than victimized by circumstances beyond their sphere of control (e.g. parental involvement).

• Collect additional data

The process of determining root cause is a hypothesis forming and testing process. If teachers think excessive absence is a reason for student failure, they will want to gather any additional data they need to prove or disprove their hypothesis. If there are students with excessive absences who are performing well, then the hypothesis about absenteeism is false. Teachers continue this process until they believe they understand what the possible root causes are that fall within their sphere of actions and design a plan to address those.

Maintaining a log of their hypotheses, the data they use to verify the hypotheses, and the conclusion they draw can be helpful to teams if they are doing extensive data analysis. Tool 8.7 offers one version of a recordkeeping template to help teams with this work.

• Analyze and summarize data

When teams determine that additional data are necessary before confirming or disproving their hypotheses, they will repeat the analysis and summary

Tool 8.7

of these new data. They may find it useful to use Tools 8.3, 8.4, and 8.5 to accomplish these processes before determining with certainty what they believe is the likely root cause. Tool 8.6 is one guide for making decisions about possible causes. This common quality management tool is useful for brainstorming, categorizing, and deciding about possible causes. With confidence that they have discovered the root cause, they can move to the next step.

• Identify a goal

Once possible causes are identified, the team sets a measurable goal for improvement. Goals that are measurable, set within a specific timeframe, and focused on the results desired are helpful to focus action planning. Many educators are familiar with a tool called SMART goals. Another quality management tool, SMART goals, help team members set precise targets for their work.

S = Specific
M = Measurable
A = Attainable
R = Results-driven
T = Timebound

Sample SMART goals for teams are below:

- Reading scores of 11th grade males will improve a minimum of two grade levels on the Gates-McGinitie test as a result of participating in the reading lab program during the 2006-07 school year.
- Students scoring below basic on the 2006 math problem-solving items of the state assessment will move to proficient by 2007.
- The number of students enrolled in advanced level core academic courses in 11th and 12th grades will increase by 15% each year for the next three years. The percentage of female, underrepresented, and high-poverty students will increase by 20% each year for the next three years.

• Repeat the process

The eight-step data analysis process will be repeated several times during a single school year. It will be done once as a schoolwide process when data from state, norm-referenced, or other forms of high stakes

assessment are returned to each school. Yet this is not the only time data are analyzed. Teachers will use this process when they administer common benchmark assessments. They can adapt the process for use when they give any assessment of student learning. For example, if teachers give end-of-unit or chapter assessments to measure student progress between other more formal assessments, they will analyze data, summarize it, and identify root causes — what students did not know or do correctly that prevented them from being successful on the assessment — before they plan their next unit of instruction so they know exactly what to include.

From data to action

After the data are analyzed, the controllable root cause(s) is (are) identified, and the goal is identified, teams move to the next phase of their work — determining a course of action. Their plan of action outlines how they will learn and work together to accomplish their SMART goal. Action planning includes knowing how best to use available time in teams to accomplish the goal and using appropriate planning templates to guide the decision making. Chapter 9 helps teams iden-

tify possible learning designs for accomplishing their goal, and Chapter 10 includes planning tools to help them record their action plans.

References

Bernhardt, V. (1998). *Data analysis for comprehensive schoolwide improvement.* Larchmont, NY: Eye on Education.

Bernhardt, V. (2003). *Using data to improve student learning in elementary schools.* Larchmont, NY: Eye on Education.

Bernhardt, V. (2003). *Using data to improve student learning in high schools.* Larchmont, NY: Eye on Education.

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Bernhardt, V. (2003). *Using data to improve student learning in districts.* Larchmont, NY: Eye on Education.

Love, N. (2002). *Using data/getting results: A practical guide for school improvement in mathematics and science.* Norwood, MA: Christopher-Gordon.

Types of data available

Use the framework below to identify the types of data available in your school.

STUDENT LEARNING DATA	DEMOGRAPHIC DATA
PERCEPTION DATA	**SCHOOL PROCESS DATA**

Tools For Schools

Student data checklist

STUDENT DATA CHECKLIST	GRADE LEVEL				
ENROLLMENT					
Total number of registered students.					
Number of students in special programs (e.g., Title I, LEP, gifted and talented) broken down by category.					
Number of students broken down by ethnicity, language group or other meaningful categories.					
DAILY ATTENDANCE					
Average daily attendance of students by grade, grade span, whole school, or other enrollment category.					
Percent of students tardy for classes.					
Number of students who have been absent from school 21 days or more.					
MOBILITY/STABILITY					
Mobility rate: percent of children who move in and out of a school during a year.					
Stability rate: the percent of students who remain in the same building for the entire year.					
SOCIOECONOMIC STATUS (SES)					
Percent of students receiving free or reduced-price lunch.					
Average level of parents' education and/or household income.					
Unemployment rates in the attendance area.					
STUDENT BEHAVIOR					
Number or percentage of discipline referrals or incidents.					
Number or percentage of student suspensions and expulsions.					
Frequency of gang-related, substance abuse, or other at-risk behavior.					
LIMITED ENGLISH PROFICIENCY					
Percent of students with limited English proficiency.					
Percent of families who speak English as a second language.					

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TOOL 8.3

Data analysis protocol (informal)

What is being measured in these data?

_____

_____

_____

Who is represented in the data pool?

_____

_____

_____

What jumps out in the data on first glance?

_____

_____

Surprises
_____

Expected
_____

What conclusions can we draw at this point?

_____

_____

_____

What other data have we looked at recently that have suggested similar findings?

_____

_____

_____

What other data might we consider to confirm or disprove these conclusions?

_____

_____

_____

TOOL 8.4

Data analysis protocol (formal)

What are we looking at here?

_____

_____

What is being measured in each assessment?

_____

_____

Which students are assessed?

_____

_____

What areas of student performance are meeting or exceeding expectations?

_____

_____

What areas of student performance are below expectations?

_____

_____

Do patterns exist in the data?

_____

_____

How did various populations of students perform? (Consider factors such as gender, race, and socioeconomic status.)

_____

_____

What are other data telling us about student performance?

_____

_____

How are the data similar or different in various grade levels, content areas, and individual classes?

_____

_____

What surprises us?

_____

_____

What confirms what we already know?

_____

_____

Tools For Schools

EXAMPLE

Data summary statement:
Fourth-grade Vietnamese immigrant boys are underachieving in science.

Evidence:
Achievement scores, teacher observation, and chapter (textbook) tests.

Why questions:

Q: Why do 4th grade Vietnamese immigrant boys underachieve in science?

A: They have difficulty with English language. (Supporting data or facts: language assessment.)

Q: Why does the fact that Vietnamese boys have difficulty with English contribute to low performance in science?

A: They have difficulty understanding the concepts and applying them in practice. (Supporting data or facts: observation and student input.)

Q: Why do 4th grade Vietnamese immigrant boys underachieve in science?

A: Curriculum does not match assessment. (Supporting data or facts: Curriculum is based on 1985 framework, assessment is based on 1995 framework.)

Q: Why does the mismatch between curriculum and assessment contribute to the low performance in boys?

A: There is mis-alignment between what is taught and what is being assessed. (Supporting data or facts: comparison of 1985 and 1995 frameworks.) Upon further examination, all students are having some difficulty in science.

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Crafting data summary statements

Comments to facilitator: This activity will assist the team in focusing on what it has learned from the data it has collected about the school. As the team compares this data to its vision for the school, it should be able to identify the steps the school needs to take to reach identified goals.

Materials: Several copies of the data summary sheet, various data sources, chart paper, markers, pens.

Directions

1. Complete the Data Summary Sheet (see Page 5) for each of your data sources. Be as complete as possible. Think about other possible summary tables that might also be created. For example, after completing the sample data summary sheet, you may notice that girls in 4th through 6th grades are underachieving in mathematics. You could create another data summary table in which you break out the girls by ethnicity to see if a pattern emerges.

2. Summarize the data by writing a statement based on the data. As you review the data, consider:
   - Which student sub-groups appear to need priority assistance, as determined by test scores, grades, or other assessments? Consider sub-groups by grade level, ethnicity, gender, language background (proficiency and/or home language), categorical programs (e.g., migrant, special education), economic status, classroom assignment, years at our school, attendance.
   - In which subject areas do students appear to need the most improvement? Also, consider English language development.
   - In which subject areas do the "below proficient" student sub-groups need the most assistance?
   - What evidence supports your findings?

3. For each data summary statement, brainstorm all the possible reasons why the data show what they do. For each reason, identify data or facts that support that assertion. If no data exist, determine how to locate data that would support the assertion. Continue asking "why" until the root cause of the problem or need has been identified.

Source: *Comprehensive School Reform Research-Based Strategies to Achieve High Standards* by Sylvie Hale (San Francisco: WestEd, 2000). See Page 7 for ordering information.

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Data summaries

Data type: _____

(e.g., enrollment, student achievement, total, attendance, student achievement reading)

Data source/measure: _____

(e.g., SAT9, school records, staff survey)

What the numbers represent: _____

(e.g., percentage of students below grade-level; number of students higher than 4 on district math assessment; percentage of students who say they like to read)

STUDENT CHARACTERISTIC	Grade Level												Total
ETHNICITY													
African-American													
Asian/Pacific Islander													
Caucasian													
Hispanic													
Native American													
Other													
GENDER													
Male													
Female													
INCOME													
Low-income													
Not low-income													
LANGUAGE ABILITY													
Fully proficient													
Limited proficient													
Non-proficient													
English only													
SPECIAL POPULATIONS													
Migrant													
Title I Target Assist													
Special education													
Preschool													
After-school													
Other													
Other													

Write a statement summarizing the data collected above. A data summary statement or need statement does not offer a solution nor does it describe a cause or lay blame.

_____

_____

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Fishbone diagram

This quality management tool was developed by Kaoru Ishikawa and is sometimes called the Ishikawa Diagram or the Cause-Effect Diagram. It is designed to help take results from data analysis and to identify possible root causes for identified problems. Data identify the problems. They do not identify the cause of the findings until further analysis is conducted. It is through analyzing the probable root causes that teams will find their leverage point.

To use the Fishbone Diagram to identify possible causes of an identified problem, write the problem or current state, in specific terms, in the head of the fish. On the big bones of the fish list major factors that might contribute to the current situation. For example, 65% of the male students are reading two or more grades below level. Some of the major factors related to this problem might be instruction, availability of reading materials, learning styles, and curriculum. It is possible to consider other areas such as demographics, parent involvement, etc.; however, spending time working in these areas may not yield actions that school staff can take to address the identified problem. It is important to note that there are external areas of concern, such as the number of male students who live in households headed by females. Yet, this area is not one teachers can change. While it is possible to influence it in some way, identifying this as the root cause leaves teachers little room to act. It is helpful, therefore, to focus the bulk of the root cause analysis on areas of influence, those areas school staff can directly impact through their actions and interactions with students each day at school.

On the small bones of the fish, the team identifies specific areas related to the major factors. For example, availability of reading materials, teachers might write classroom and library reading materials of interest to male students. After identifying as many specific factors as possible, team members circle or mark those factors they believe have the greatest impact on the current state. In essence, they are formulating hypotheses about what might be causing the current state. For example, a hypothesis might sound like this: In classrooms where there are reading materials on topics of interest to males and where students have easy access to these materials, male students' reading scores are higher than in classrooms where this type of resource is not readily available.

Teams then examine additional data to confirm or disprove their hypotheses until they find one or two that hold up. It is from these hypotheses that they begin their action planning. If in fact the above hypothesis was confirmed, their actions would center on how to make more high-interest reading materials easily accessible to male students.

The next page has a blank fishbone diagram template for teams to use with their own problems.

Problem/current state
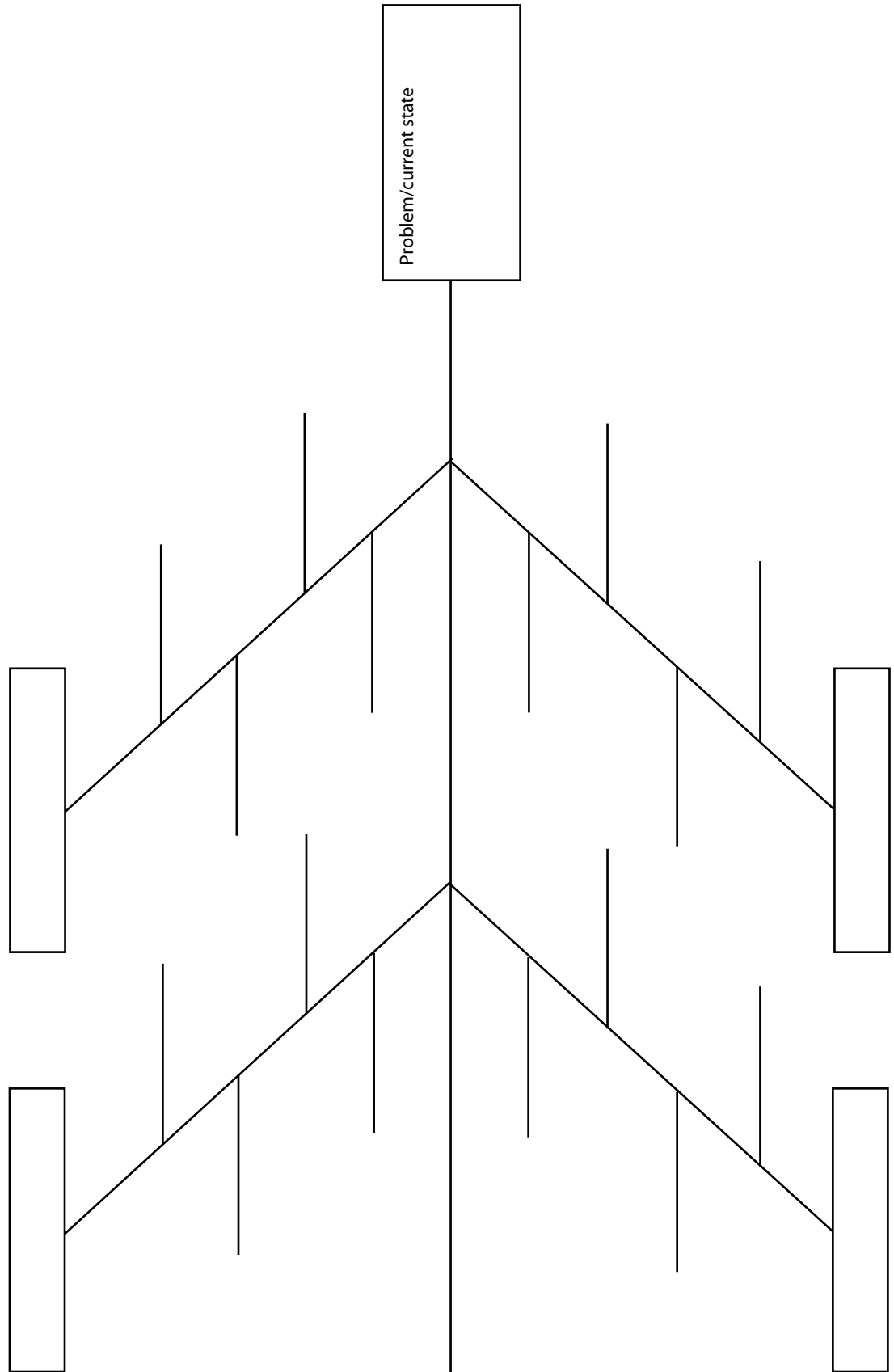
TOOL 8.7

Hypothesis-testing record keeping sheet

Use this form to record hypotheses about root causes, other data sources to check to confirm or disprove each hypothesis, and to indicate if this hypothesis is confirmed or disproved.

Hypotheses about root causes	Other data sources to check	Confirm	Disprove