District Data Team Toolkit

MODULE 4: Knowledge

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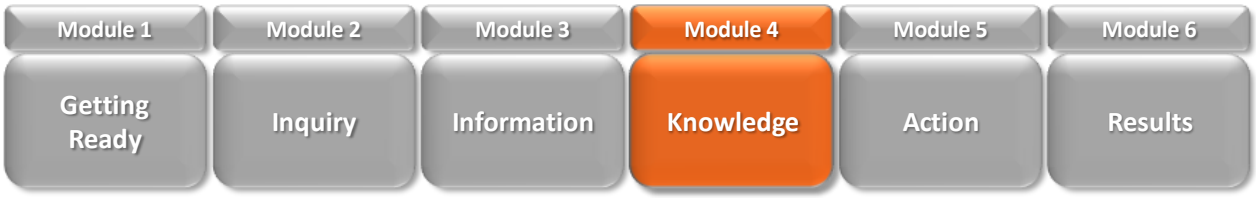
INTRODUCTION

WHERE ARE WE NOW?

The District Data Team Toolkit is based on the Data-Driven Inquiry and Action Cycle. The Cycle provides the structure that takes data use within the district from asking the right questions to getting results. It is an iterative process in which the district acts on data to support continuous improvement. The Toolkit uses the steps of the Cycle to structure a progression through the model—you are now in ***Module 4: Knowledge***.



In the *Knowledge* step of the Data-Driven Inquiry and Action Cycle, a group engages in deeper analysis of the data and collaborates to begin using this new perspective to inform strategic action. The tools in this module can help a Team collaboratively refine questions that emerge from data analysis, articulate a problem statement, connect possible solutions with research, and lay groundwork for results-oriented action.

The most important parts about this transition from analysis to action is taking time to make sure all members of a group are clearly in agreement on the problem being addressed, and that an effort is made to connect the problem to research and to other district efforts to solve the same problem. Being purposeful during this step helps a Team avoid repeating past mistakes and strengthens its ability to take effective action.

MODULE OBJECTIVES

The **Knowledge** module will help a District Data Team:

- Clearly articulate a problem statement
- Identify and explore root causes of the problem
- Cross-reference solutions with research and local knowledge
- Begin to capture information on the district's improvement efforts

CLARIFYING THE PROBLEM

In the *Inquiry* module, the District Data Team formulates a number of questions for study and refines them through discussion and data analysis. During the *Information* module, the Team delves more deeply into the data and triangulates multiple data sources to get the best understanding possible of the issues at the heart of the focusing and clarifying questions. The Team may emerge from this analysis with a clear set of conclusions that address the initial focusing and clarifying questions. It may also generate a number of new questions raised by their investigation of the data.

A problem statement can help the Team focus its work prior to validating potential solutions with research and then moving on to action.

Teams that want to explore the questions that emerge from the data analysis may want to engage with the root cause activities outlined later in this module to gain new perspectives on the factors that may explain the patterns, trends, or aberrations evident in the data. If this process does not help the Team gain agreement on the problem to be addressed, then it will likely reveal a need for more data or different questions, which would cycle the Team back to the *Inquiry* stage of the process.

Teams that emerge from the data analysis in the *Inquiry* module with strong conclusions may be ready to move toward planning action by first crafting a problem statement.

WRITING A PROBLEM STATEMENT

A problem statement can help the Team focus its work prior to validating potential solutions with research and then moving on to action. A problem statement can also help the Team communicate with stakeholders that will need to be engaged in this work, including students, families, teachers, and other school and district personnel.

A problem statement can help the Team articulate:

- The original undesirable situation (the problem)
- The desired outcome (the goal)
- The underlying problem causing the original problem
- The solution to that underlying cause

Writing a problem statement can serve as a self-check to see if the Team is ready to move on. If the Team is all in agreement about the nature of the problem being addressed and how to best approach resolving it, writing a problem statement may be a fairly straightforward activity. However, the Team may find that while working through the process of writing a problem statement, Team members are not in alignment or agreement. In fact, frequently a number of ideas about how to address those issues are raised during the discussions. If that is the case, the Team will want to use one of the *Root Cause Analysis* activities in the next section to calibrate the Team and then return to *4.1.1T: Writing a Problem Statement*.

One element of a problem statement involves describing the nature of the problem identified in the data analysis. Articulating the type of problem can help the Team think wisely about the best strategies to put in place to resolve it. Problems can be broadly categorized as relating to skills, attitudes, knowledge, and/or resources.

However, ultimately, regardless of the specific nature of the problem, it is the adults in a district who create and maintain the learning opportunities for the students they serve. This includes not only teachers and principals, but *all* district employees, such as secretaries, facilities staff, central office staff, district leadership, and school committee members. Resolving problems with teaching, curriculum implementation, or resource allocation all involve shifting how adults throughout the district approach and conduct their work. Therefore, in articulating a problem statement, it is important that the proposal for addressing the problem paint a clear picture of how this will change–what the work needs to look like and how the district will help personnel make the needed changes.

From this angle, when identifying the solution to address the underlying problem, a district would be wise to first consider how it can reallocate existing resources and improve existing initiatives. The inclination is often to identify new strategies or initiatives, but the Team should first evaluate the efficacy and impact of current initiatives before adding new ones. A new initiative should be added only if it is unarguable that the need exists.

Resolving problems with teaching, curriculum implementation, or resource allocation all involve shifting how adults throughout the district approach and conduct their work.

Activity 4.1 Writing a Problem Statement

This is a collaborative process meant to help the Team discuss a problem in depth and write an agreed upon statement about how it will be addressed.

(4.1.1T: Writing a Problem Statement)

ROOT CAUSE ANALYSIS

UNDERSTANDING ROOT CAUSES

Engaging in a root cause analysis can help the Team gain agreement on the exact nature of a problem it has identified, and/or on the best steps to take in addressing it. Before taking action, the Team needs to agree on the problem that needs to be fixed. This is rarely an easy task.

In simplest terms, a root cause is an underlying factor or condition that creates a problem and that, if addressed, would eliminate or dramatically alleviate the problem. A root cause analysis can help a group with widely varying opinions narrow the field of contributing factors until it agrees on what one(s) will yield the biggest bang for the buck if it acts on it.

In mechanical systems, diagnosing a root cause is an essential part of the troubleshooting process before beginning work. For example, if a person's car won't start in the morning, s/he having a problem. There are a number of potential root causes of that problem until some further investigation is done. Among many other things, it could be possible that:

- The battery cable isn't connected
- The battery is dead
- The starter motor isn't working
- The car is out of gas

Investigating each of these potential root causes helps to determine what is or is not the root of your trouble. Going through this effort is important, because replacing a starter motor after getting a tow to a repair shop would be an unnecessary expense if the real problem was simply that the individual spouse or teenager brought the car home with an empty tank of gas.

Naturally, discerning root causes for problems in education is not nearly as straightforward as this example suggests, and root causes are not always known. For example, a student's low academic achievement could be the result of:

- Something the student is or is not doing
- Something the teacher is or is not doing

- Something the teacher's support network, e.g., principal, coach, district central office, district processes, is or is not doing
- Something the student's support network, e.g., family, friends, community, is or is not doing
- Something the physical learning environment is or is not providing
- A combination of the above

Researchers engage in rigorous discourse to discern the most significant factors behind student achievement and learning. Practitioners must do their best to tap the best available knowledge when trying to determine the root causes of problems in their own district.

In order to change student outcomes, a district needs to change the actions of its personnel in concrete ways that lead to the desired outcome.

Discerning the root cause of educational problems is a difficult task for another reason. People tend to have strong beliefs about problems in schools and how they should be solved. These beliefs are influenced by personal values, political issues, opinions about strategies tried in the past, and many other factors. Therefore, it is important for any group attempting to solve a problem to take the time to collaboratively get all issues surrounding it out on the table for discussion.

Something to keep in mind is that in education, a problem with student achievement likely has a cause that lies in someone's practice. A district cannot change the outcome (such as low test scores) without changing someone's behavior. Like in the example about the car, the Team will be following a chain of cause/effect relationships to find where the work needs to be done. But unlike replacing a part in a car, computer, or other inanimate machine, the Team will likely end up determining that the root cause lies in processes or techniques that people in the system are using, but that, despite everyone's best efforts, just aren't getting the job done the way it needs to be done. While in some cases it may be that a process isn't being implemented correctly, in other cases it may be that the right strategy hasn't been applied in the first place. In order to change student outcomes, a district needs to change the actions of its personnel in concrete ways that lead to the desired outcome.

The collaborative tools shared here are meant to help the Data Team understand and agree on the issues that are most responsible for the problems it has have identified, in order to begin planning well-considered and researched strategies and engage people in the process of changing practice. These activities are not intended to be used to place blame on anyone in the system, but rather to understand where the most energy and attention should be placed in order to get different results.

It should be noted that root cause activities are useful for analyzing the factors that contribute to success, as well as those that contribute to a problem. For example, if an initiative produced very strong results, engaging in these activities could help the Team capture lessons to scale up in other areas of the district's work.

OVERVIEW OF ROOT CAUSE PROTOCOLS

Below are five possible approaches for engaging in a root cause discussion, listed in order from simpler to more complex activities. Each has its own strengths and challenges when working with different groups. Read through them all and consider trying each of them out within the District Data Team to get an idea of how they work and how well they would engage other audiences. Any of them can be used with any sized group, but some general suggestions for use are below.

In choosing the approach that is best for the situation, the Team will want to consider the complexity of the problem and the depth of additional analysis needed in order to gain agreement on the root cause. It will also want to ensure it has the time and facilitation skills required to conduct the activity successfully.

- **Why, Why, Why?**—This protocol is a relatively quick and informal technique for identifying root causes of problems. It can be used by individuals or groups of 3–8 people, and requires little facilitation. This technique is especially useful to start a discussion and determine if there is disagreement among the participants. A more formal process should be used for in-depth discussion.
- **20 Reasons**—This protocol works well with a large or small group. It enables the group to brainstorm many issues related to a particular problem and then carefully consider whether they are actual causes or simply excuses.
- **Fishbone Analysis**—This very formal protocol works well with groups of about three to five participants. The protocol provides the chance for the group to consider and discuss many possible explanations for a problem and enables participants to categorize causes.
- **Graphic Representation**—This protocol enables a group to discuss, analyze, and display relationships among contributing factors. In essence, the group creates a visual representation of the problem or situation, including all the factors that influence it and possible solutions that have come to light during the analysis. This highly collaborative technique works best with groups of up to five people and requires a somewhat skilled facilitator.

- **Dimensions Bulls-Eye**—This protocol, derived from the Department's Performance Improvement Mapping (PIM) process, is a lengthy but effective way to brainstorm possible root causes, sort them into one of three dimensions of district improvement, and prioritize key root causes for action. This process works best with a group 7–10 people and requires strong facilitation.

Each of these activities should steer participants toward evaluating the extent to which existing systems and structures are functioning as intended and genuinely impacting teaching and learning. The end result of any of these activities should be that the group has a clear and uniform idea of the problem, its potential root causes, and how the Team will proceed to take action.

Regardless of the method used to surface root causes, it is important for the Team to identify evidence that verifies its ideas. If the Team is not careful, it can unwittingly reinforce false perceptions and negative stereotypes. Thus, Team members should constantly ask each other "*How do you know?"* When available information and data have been consulted, the Team should discuss whether significant evidence exists to confirm the Team's hypothesis about the causes. Without this self-check against valid evidence, the root causes that the Team identifies to target for action may not be deemed credible by stakeholders.

After completing any of the *Root Cause Analysis Protocols*, the Team should return to the *Writing a Problem Statement* worksheet and prepare a newly aligned view of the problem and potential solution.

Activity 4.2 Root Cause Analysis Protocols

These activities can facilitate the Team's discussion of root causes. The protocols can be used in many different situations to explore problems in a collaborative way. The Team should select the approach that seems best for its particular group or situation, or create its own using these as templates.

(4.2.1T: Why, Why, Why?)
(4.2.2T: 20 Reasons)
(4.2.3T: Fishbone Analysis)
(4.2.4T: Graphic Representation)
(4.2.5T: Dimensions Bulls-Eye)

FACILITATING THE PROCESS

The Team should think strategically about which groups to involve in the process of root cause analysis. While the District Data Team on its own could likely generate valuable insight on a problem, it is often best to engage those closest to the problem in the identification of the root causes that, if addressed, would improve the situation. As well-intentioned as the Team may be, it may miss valuable information by not going closer to the source.

For example, a district might consider having teams from a number of different schools engage in the protocols, then notice the patterns that emerge, and use that information to decide how to best leverage district resources. Whether school or district personnel are conducting the activity, the focus should always remain on the teaching and learning and those factors that most directly impact it.

> If we believe that all students can learn, and they aren't, then we need to look at what *we* can do differently.

Each of these root cause protocols is based on the premise that adult behavior and district processes impact student learning outcomes. If we believe that all students can learn, and they aren't, then we need to look at what *we* can do differently. While some root causes may indeed be out of the district's hands, such as student mobility or the effects of poverty, the District Data Team needs to look very closely at how the district conducts the business of educating students and what aspects of this work may or may not be contributing to the problem at hand. When done well, engaging in a root cause activity can promote honest and sometimes difficult conversations about how personnel in all corners of the district conduct their work, including the members of the Team itself.

However, participants frequently disagree about root cause explanations for the original problem, the sequence of causes and effects, or the relative importance of various possible causes during the brainstorming phase of this activity. The group may even come up with explanations that are directly contradictory to one another. This has some important implications for facilitating the process of discussing root causes.

- Any time a protocol requires brainstorming, keep the group focused on first listing as many ideas as possible. Do not allow debate, discussion or even comments like great idea at that time. Once *all* the ideas are generated, the group can then ask for clarifications, probe for greater understanding, and move past less important disagreements to focus on more significant points
- The Team should encourage and record dissenting views rather than immediately dismiss any that might arise. The subsequent discussion and reflection will sometimes reveal which perspective

is more likely to be true. If this does not happen, the Team can consult research and local knowledge for more insight

- Many of the ideas generated in the activities should be regarded as biases, opinion, or conjecture until proven otherwise with data or research. The Team must objectively look at the assumptions it holds and check them against research, data, and expert opinion. Just because everyone in the group happens to agree does not mean any given potential root cause is right
- In fact, unlike cars that won't start, we often don't really know the right answer. The Team has to pick one potential root cause that, based on data analysis, research, and local knowledge, seems like it may make the most impact, and then try to resolve it. By monitoring progress, evaluating results, and continuing the inquiry process, the Team can model the truly adaptive nature of education where educators learn the work by doing it, and develop the answers together along the way

When designing the format for a discussion of root causes, a district may want to assign a facilitator who can help the group with these key points, as well help the Team:

- Ensure all Team members have an equal voice in sharing observations of the evidence that has been gathered
- Put as much data on the table as possible, from high-level to fine-grained observations
- Challenge each other's assumptions and generalizations by asking why and what's the evidence?
- Be prepared to be surprised

The Team might also consider engaging stakeholders directly in these discussions, as a way to gain new perspective on the topic as well as gain buy-in on the strategies that emerge from this work. This could be especially important if the Team is small and/or is not very representative of the stakeholders impacted by the problem, such as if it only consists of district-level personnel.

Once the Team has clearly defined the problem and everyone has agreed to a general strategy to alleviate it, the Team might feel ready to move straight to building an action plan with specific goals, timelines, and data collection points. But, before moving on, it is important to begin making connections to research and local knowledge, looking outward for information that might be helpful in shaping the Team's work.

CONNECTING TO RESEARCH AND LOCAL EXPERTISE

By this point, the Team has clarified the problem and has articulated:

- The original undesirable situation (the problem)
- The desired outcome (the goal)
- The underlying problem causing the original problem
- The solution to that underlying cause

Up to this point, the Team has worked on its own—or perhaps with some input from stakeholders—to identify the underlying problem and a proposed solution. Taking time to consult local experts, research literature, and others outside the District Data Team who have gone down the same path, can increase the effectiveness of the plan for action, as well as increase its credibility and validity.

The attached *Problem Investigation Plan* guides the Team to articulate the information it wants to gather prior to going out and getting it. Taking this step can help the Data Team maintain focus prior to diving in to what could be an overwhelming amount of research and information.

When consulting research, the District Data Team should be mindful that the Internet makes it much easier to connect to a wide range of scholarly research—however, not all research is good research. The District Data Team has a responsibility to ensure that the research it uses is credible, and as such should look for research from credible independent sources.

4.3.2R: Educational Research Websites includes a list of useful websites that can connect districts to other websites with searchable educational research reports. This list, while by no means meant to be

comprehensive, can serve as a starting place for gathering credible researched reports related to the problem the Data Team is addressing and interventions the Team is considering. In addition, Team members may want to consider tapping academic and/or research institutions directly, whether by linking to their own undergraduate and/or graduate institutions, or by connecting to those located in or near their district.

When identifying local knowledge and expertise that can further clarify the problem and aid the development of an effective action plan, the Team may want to consider:

- Who has credible perspectives and expertise related to this problem?
- Who has knowledge of relevant content, systems, and history?
- Who has a solid understanding of the experiences of the stakeholders impacted by this problem? Who among the stakeholder group(s) itself may have valuable insight?
- Who does the Team not usually hear from, and whose expertise could be valuable at this point?
- Who can the Team trust to share knowledge and lessons learned that may deviate from what is commonly held as truth?

Activity 4.3 Problem Investigation

This activity helps the Team identify assumptions that need to be checked and questions that need to be answered about a problem or potential intervention. Several websites are provided to help connect the Team to related research.

(4.3.1T: Problem Investigation Plan)
(4.3.2R: Educational Research Websites)

CATALOGUING PROBLEMS UNDER INVESTIGATION

The District Data Team can facilitate the endurance of a data-driven decision making initiative by beginning to capture the work and evidence from improvement efforts. This will allow the district to begin creating a database (either electronic or in file cabinets) of questions and problems people have addressed, strategies they have used, and the results of those efforts. In addition, having a systematic way of organizing the results of various inquiry processes will make it much easier to make connections to research in professional journals, books, and web resources. Using categories in a database will allow the Team to create a searchable catalogue of improvement efforts over time, removing the need to rely only on the institutional knowledge of district personnel.

The next activity is designed to give the District Data Team a systematic way to capture problems. The Team should begin by documenting information relevant to the inquiry process in which it is engaged. Over time the Team can collect information from other teams, as well as from its own subsequent inquiry processes. The way the Team elects to capture and share this evidence and knowledge is highly unique to its local systems, personnel, time, and resources. As the Team engages with the template, it will likely want to refine the categories and format to suit local needs and initiatives. However, beyond determining the exact headers on a template, the Team also needs to make a long-term plan for collecting, storing, and using this information.

Activity 4.4 Problem Catalog Template

This template contains a model for a catalogue of problems being addressed by groups throughout a district.

(4.4.1T: Problem Catalog Template)

MODULE SUMMARY

The *Knowledge* module is intended to strengthen the transition that a Data Team makes between initial data analysis and subsequent action. It is meant to help a group take a broad look at what it now knows, after having engaged in data analysis, and compare it to what else is known, prior to thinking about what do to next. Spending time and purposeful effort in the *Knowledge* step of the inquiry process can strengthen the Team's understanding of the problem before it enters the *Action* step.

Essential steps in the process of turning information to knowledge are formally stating the problem being worked on and beginning to investigate strategies for improvement by consulting research and local knowledge and expertise. In order to accomplish these two items, it is frequently necessary to spend some time calibrating the entire Team around what the real problem is (or might be) by exploring perceived underlying root causes. These can be challenging conversations at times, so it is best to conduct them using a protocol designed to facilitate safe discussions about root causes. The Team should consider the value of engaging stakeholders in the knowledge-building phase, for example by including stakeholders in discussions of root causes.

The District Data Team should emerge from this stage in the process with a clearly articulated problem statement that outlines the original problem, the suspected cause, the goal for improvement, and a proposal for moving forward.

The next module, *Action*, guides the Team in articulating a logic model and crafting or revising a plan to take action on the identified problem.

For more information on this and other district support resources, or to share feedback on this tool, visit http://www.doe.mass.edu/sda/ucd/ or email districtassist@doe.mass.edu.

WRITING A PROBLEM STATEMENT 4.1.1T

Purpose	To formalize a problem in order to focus action.
Description	This framework[1] helps a Team to discuss a problem in depth and write an agreed-upon statement about how it will be addressed. The process forces the Team to think purposefully about who is affected by the problem, possible causes, and potential solutions.
Time	About 1 hour.

Related Documents
4–Knowledge Module

Directions: As a Team, work through the boxes from top to bottom to craft a problem statement. The next page contains a completed sample of the *Writing a Problem Statement* worksheet. A blank copy of the worksheet appears on the last page.

Original problem or focusing question	Restate the initial problem that launched this inquiry process, or rewrite the focusing question or one of the clarifying question as a statement.
Stakeholders who are most affected by the problem	Who is most directly impacted by this problem? Alternately, who would benefit the most if this problem were resolved?
Type of problem	For example, skills, attitudes, knowledge, resources, or something else.
Suspected cause of the problem	Based on the data analysis and/or the root cause analysis, what does the Team think is the most significant cause(s) contributing to this problem? What, if addressed, would make the greatest impact on resolving the problem? (Include specific evidence).
Goal for improvement and long-term impact	The wishes, dreams, and general vision describing the target. The Team will write a clearer, measureable goal statement in *Module 5*.
Proposal for addressing the problem	High-level strategy that represents promising practices drawn from research, local knowledge, and local expertise. (Note sources if possible). This will become the basis for subsequent action planning.
Final problem statement	Tie the above statements into 3–5 coherent sentences that could be easily understood by a wide range of stakeholders.

[1] Adapted from Sagor, R. (2000). *Guiding School Improvement Through Action Research*. Association for Supervision and Curriculum Development, Alexandria, VA.

Sample of Completed *Writing a Problem Statement* Worksheet

Original problem or focusing question	♦ Students are not reading at grade level by grade 3.
Stakeholders who are most affected by the problem	♦ Third grade students at our school.
Type of problem	♦ Resources: Without good information about where our kids are starting, we have no way of knowing if our goals may be unattainable for some of them.
Suspected cause of the problem	♦ Teachers don't get sufficient training and support in our reading program. ♦ Students' reading levels are not measured accurately in grades K–3.
Goal for improvement and long-term impact	♦ We want all our third graders to read at grade level or above.
Proposal for addressing the problem	♦ Start a teacher mentoring program in reading. ♦ Implement more rigorous reading assessments in grades K–3.
Final problem statement	♦ Many third grade students at our school do not read at grade level. ♦ We believe that this is a result of teachers not having sufficient training in our reading program and not accurately measuring students' reading levels in grades K–3. ♦ We want all third graders at our school to read at grade level or above. ♦ We will start a teacher mentoring program focused on reading and implement more rigorous reading assessments in the primary grades.

Writing a Problem Statement Worksheet

Original problem or focusing question	
Stakeholders who are most affected by the problem	
Type of problem	
Suspected cause of the problem	
Goal for improvement and long-term impact	
Proposal for addressing the problem	
Final problem statement	

WHY, WHY, WHY? 4.2.1T

Purpose	Determine a root cause for a problem.
Description	A Team brainstorms answers to “Why?” a problem might be happening in order to arrive at an agreed upon root cause.
Time	< 30 minutes.

Related Documents
4–Knowledge Module
4.2.2T: 20 Reasons
4.2.3T: Fishbone Analysis
4.2.4T: Graphic Representation
4.2.5T: Dimensions Bulls-Eye

Directions

Why, Why, Why? is a relatively quick, informal way to identify root causes of problems. Start by writing the problem being addressed and then ask the group to give a reason for “Why this might be happening?” Record the answer after the first “Because” and then ask the question again in reference to the first “Because.” Repeat the process three to five times, asking “Why?” for the previous “Because” until the group feels that it has arrived at the root cause of the problem. If after three to five questions and answers, the group does not agree that it has found a root cause, consider using another root cause protocol in the Toolkit.

Problem/Barrier/Issue

_____

_____

_____

_____

Why?

Because: _____

_____

_____

Why?

Because: _____

_____

_____

Why?

Because: _____

_____

_____

20 REASONS 4.2.2T

Purpose	Determine a root cause for a problem.
Description	A Team or large group brainstorms 20 reasons why a problem might be occurring in order to come to agreement about what the real cause of the problem might be.
Time	45 minutes to an hour.

Related Documents
4–Knowledge Module
4.2.1T: Why, Why, Why?
4.2.3T: Fishbone Analysis
4.2.4T: Graphic Representation
4.2.5T: Dimensions Bulls-Eye

Directions: Use a computer and projector to display the *20 Reasons* worksheet on the last page, or use chart paper to recreate the simple list.

1. Begin by writing the problem in the box at the top of the page.
2. Ask the group to give possible reasons for why the problem may be occurring. It may be helpful to use a round-robin response order to get people started, but try to allow the team to call out reasons as they come to mind. Record them all until you have reached a full list of 20 reasons.
3. Allow the group to review the list silently for a few moments.
4. Ask each member to identify what s/he thinks might be the root cause of the problem. Place a checkmark next to the statement as s/he speaks and encourage him/her to explain his/her reasoning before moving on to the next person.
5. Continue to facilitate the discussion until the group feels that it has identified a potential root cause.

Key Points

- It should be emphasized that this is a brainstorming activity and all responses are welcome and valid.
- You may find the last several reasons are more difficult to come up with, but frequently the effort is worth it, as the root cause will likely appear near the bottom of the list.
- Many problems do in fact have more than one root cause. It is fine to identify more than one root cause, but do push the group, through reflection and discussion, to narrow the list to no more than three root causes.

Additional Information

Participants frequently disagree about explanations for the original problem, the sequence of causes and effects, or the relative importance of various possible causes during the brainstorming phase of this activity. Rather than allowing debate during the brainstorming of the list, keep the group focused on listing possible reasons first. When the group reflects individually to identify possible root causes, it can move past less important disagreements to focus on the root of the problem.

The group may come up with explanations that are directly contradictory to one another. If this occurs, record them all rather than immediately dismissing any. The reflection and subsequent discussion will sometimes reveal which are more likely to be true.

Example of Partially Completed *20 Reasons* Worksheet

Problem: *Our ELL population struggles to meet proficiency on the ELA section of MCAS.*

#	Possible Explanation	Root Cause?
1	*ELL students have a wide variety of needs and abilities that are difficult to meet.*	
2	*Programs we have for ELLs are not being implemented effectively in every school.*	
3	*Many teachers have not received enough PD and support to help them work with ELLs effectively.*	
4	*Many ELL students also have learning disabilities.*	
5	*The number of ELL students in our schools is increasing faster than we thought.*	
6	*The MCAS requires high levels of comprehension of vocabulary that may be unfamiliar.*	
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20 Reasons Worksheet

Problem:

#	Possible Explanation	Root Cause?
1		
2		
3		
4		
5		
6		
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11		
12		
13		
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FISHBONE ANALYSIS 4.2.3T

Purpose	Determine a root cause for a problem.
Description	A Team works through a formal fishbone diagram to brainstorm and individually rule out possible causes in order to arrive at an agreed upon potential root cause.
Time	1 hour.

Related Documents
4–Knowledge Module
4.2.1T: Why, Why, Why?
4.2.2T: 20 Reasons
4.2.4T: Graphic Representation
4.2.5T: Dimensions Bulls-Eye

Directions: Follow these steps to complete the fishbone diagram.

1. Write your problem in the box at the "head" of the fish.
2. Identify major categories and write them in the boxes. (The diagram has four "ribs" and boxes, but you may have fewer or more than that. The first time you use this tool, try to use four.)
3. For each major category, brainstorm possible causes. Write them next to the appropriate "rib" of the fish.
4. Analyze each possible cause identified to determine whether it is a root cause by asking:
   - Would the problem have occurred if the cause had not been present?
   - Would the problem reoccur if the cause was corrected?

   If the answer to both of these questions is no, you have found a likely root cause.
5. Place checkmarks next to ideas that are not root causes.
6. Circle root causes.

Key Point

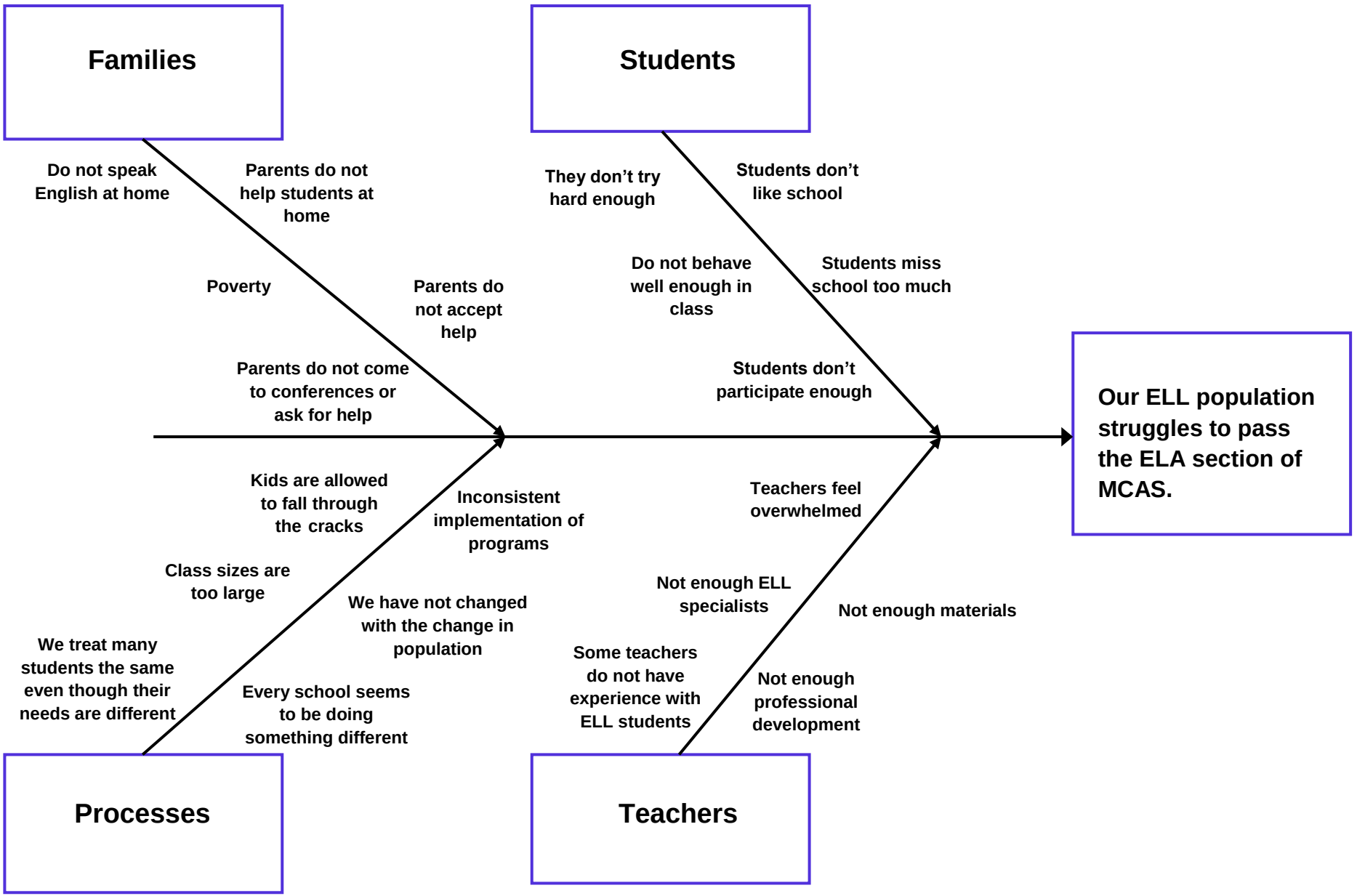
- The categories used most often when addressing problems in student achievement are Students, Families, Processes, Curriculum, and Teachers, but categories may vary depending on the problem.

Additional Information

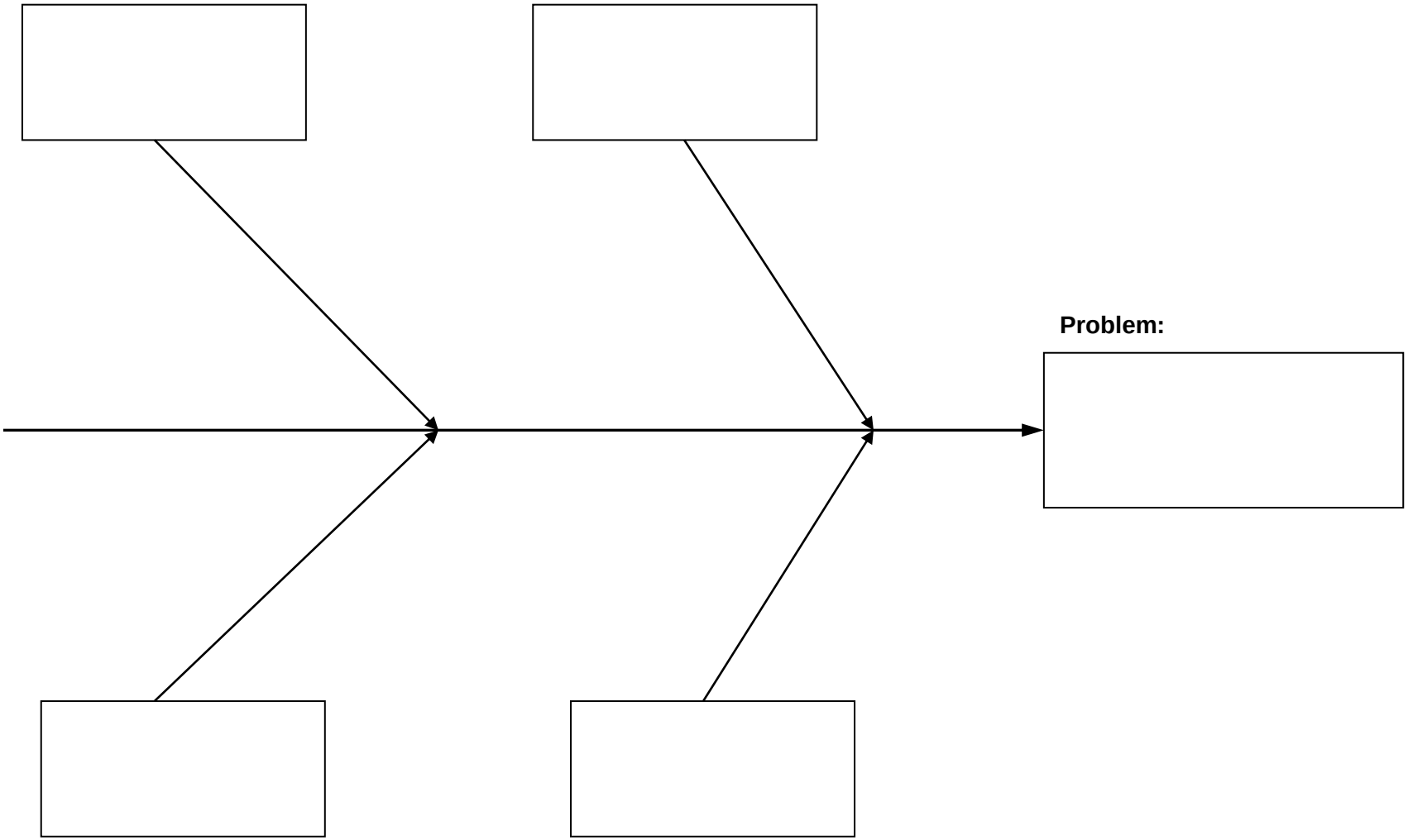
During the brainstorming, participants may come up with possible causes that do not fit easily into one of the previously identified categories. This can indicate a need to identify a new category or broaden an existing category. Do not discard an idea solely because it does not fit into a previously identified category. The purpose of the major categories is to provide a structure to guide the brainstorming. These categories should be used to inspire, rather than restrict, participants' thinking.

In the early stages of the process, participants often use the activity as an opportunity to vent frustrations and criticisms. This can be acceptable in the beginning, but be sure to steer them in a more constructive direction as the activity progresses.

Example of Completed *Fishbone Diagram*



Fishbone Diagram Worksheet



GRAPHIC REPRESENTATION 4.2.4T

Purpose	Determine a root cause for a problem.
Description	A group works together to design a graphic representation of a problem and the processes that surround it to identify areas of strength and weakness to address, including potential root causes. This technique enables a group to discuss, analyze, and display relationships among factors, so members can simultaneously see the big picture and the fine details it's comprised of. This highly collaborative technique works best with groups of up to five people.
Time	90 minutes to 2 hours.

Related Documents
4–Knowledge Module
4.2.1T: Why, Why, Why?
4.2.2T: 20 Reasons
4.2.3T: Fishbone Analysis
4.2.5T: Dimensions Bulls-Eye

Directions: Use the following steps as guidelines in developing and reflecting on a graphic representation about a problem or situation. Bear in mind that the steps are intended as a reminder to help you through the process. In practice, the process is less linear than this sequence of steps implies. To complete this activity, you will need chart paper, markers, and sticky notes.

1. Identify a problem and write it on chart paper.

2. Working independently, brainstorm factors that influence the situation and write them on sticky notes. (Allow approximately five minutes).

3. Compare and discuss the factors suggested by different members of the team, adding, discarding, and revising factors as needed.
   - Look for duplicates. A factor that was suggested by multiple members is likely to be relevant and important. Select one and discard the others.
   - Look for similarities and consider combining ideas that are similar, but not exactly the same.
   - Refine ideas that are imprecise.
   - Consider whether each factor is too specific or too general.
   - Debate and decide whether each factor is relevant.

4. Arrange the sticky notes on the chart paper in a pattern that indicates how the factors are related.
   - Cluster related ideas.
   - Discuss their relationships.
     - Does one have a strong impact on another?
     - Which is the cause and which is the effect?
     - Do two or more factors combine to affect another factor or group of factors?
     - Are two or more factors influenced by another factor or group of factors?
   - Arrange the sticky notes to show the relationships.

5. Experiment with different arrangements for the sticky notes. Once the team has reached consensus on an arrangement for all the factors, draw circles and arrows on the chart paper to clarify the relationships.

6. Study the entire graphic representation with a critical eye, asking questions such as:
   - Are the relationships between variables shown correctly?
   - Are there other variables or issues that should be added?

   Revise and refine the overall arrangement based on the answers.

7. Focus on each relationship individually, asking such questions as:
   - Do we know for certain that these factors are related in this particular way?
   - What evidence do we have that enables us to make this conclusion?

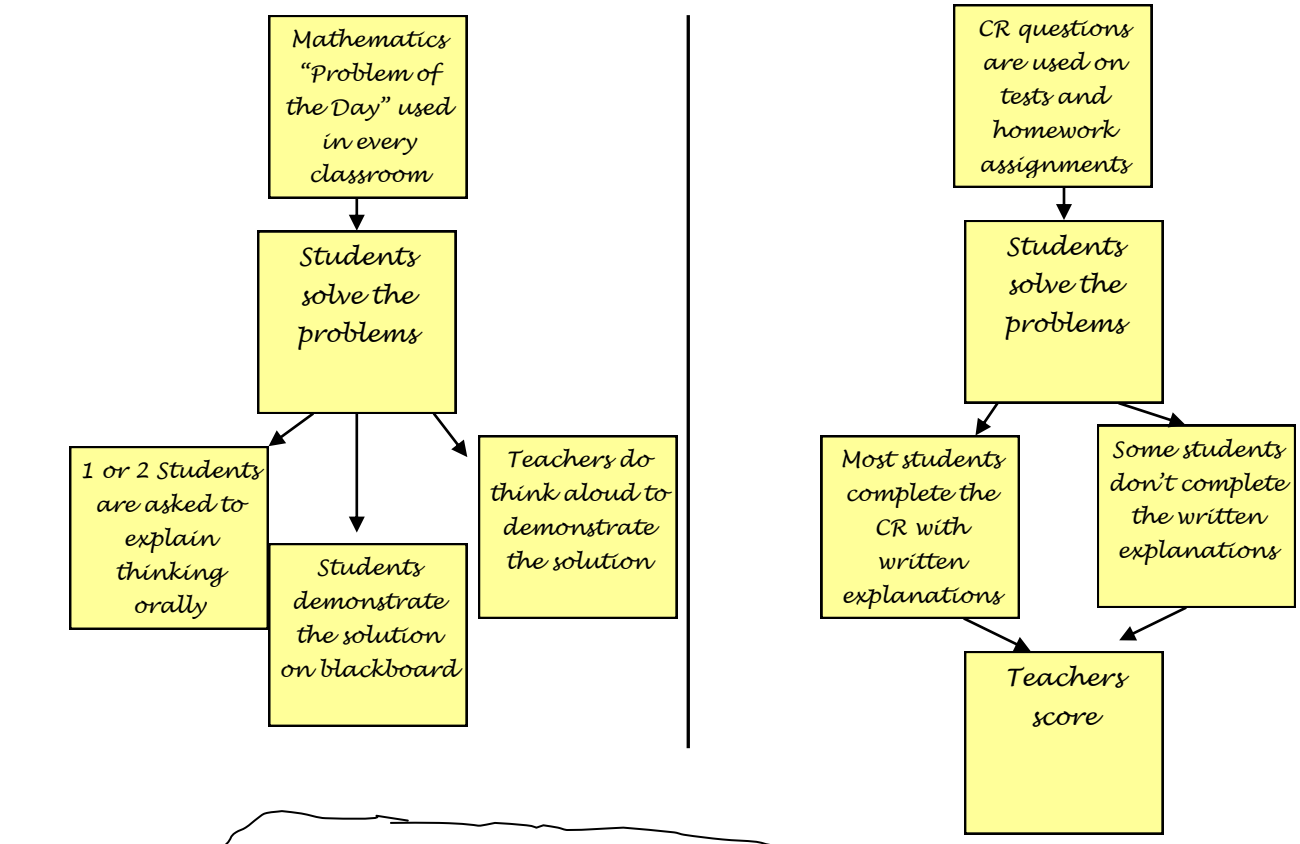
8. If there are relationships that you believe are valid and important, but you cannot be certain that they are, list them on another piece of chart paper and note how you could investigate them further.

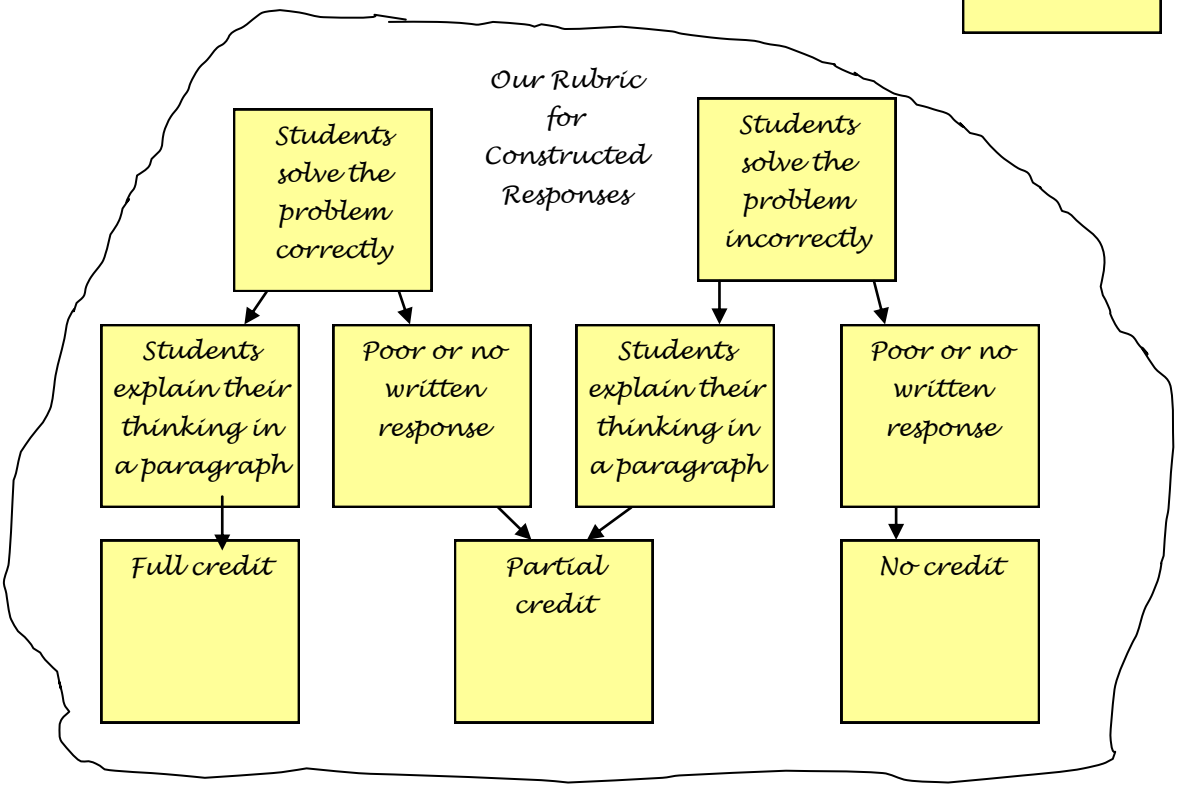
9. Study the graphic representation and identify factors on which to focus solutions by asking such questions as:
   - Which factors seem to be at the root of the problem?
   - Would a significant change in one or two factors solve the problem?

Adapted from *How To Conduct Collaborative Action Research*, by Richard Sagor, 1992, ASCD, Alexandria, VA.

Graphic Representation Example

Many of our students score poorly on constructed response (CR) questions in mathematics.





DIMENSIONS BULLS-EYE 4.2.5T

Purpose	Determine possible root causes for a problem.
Description	This protocol will help a Team brainstorm possible root causes, sort them into one of three dimensions, and prioritize key root causes for action.
Time	1–2 hours.

Related Documents
4–Knowledge Module
4.2.1T: Why, Why, Why?
4.2.2T: 20 Reasons
4.2.3T: Fishbone Analysis
4.2.4T: Graphic Representation

Note: This activity is an adaptation Step Four of the Performance Improvement Mapping (PIM) process—*Identify the most significant causes of the weaknesses in students' knowledge and skills*—available at http://www.doe.mass.edu/sda/regional/pim/.

Directions:

1. Write the inference or conclusion from your data analysis (*3.3.1T*) where all can see, e.g., flip chart or projected by an LCD.
2. Brainstorm all the possible underlying causes that might have contributed to this outcome. For each potential root cause, write a short summary on a piece of paper and tape it on the wall where everyone can see and read it.

   Note:

   - The group may want to give individuals silent think/work time before brainstorming as a group.
   - Make sure that the written causes are specific enough to be interpreted after the discussion is over. For example, a cause written as curriculum does not describe what really is lacking.
3. Once the brainstorm is complete, consolidate any duplicate or very similar ideas. However, avoid consolidating causes in ways that make them too broad and vague.
4. Review all the causes and note any that are outside of the direct control of the district, e.g., those dealing with student behavior, families, or the community. For each of these causes, discuss the following:

   - Is this potential root cause important enough for the district to focus time and energy on as part of an action planning process?
   - If so, can this cause be stated in terms of something over which the district has control?

   After discussing each of these causes, the Team has two options:

   - Rewrite the cause in terms of actions the district could take, such as securing resources, modifying processes, and/or shifting actions of district personnel. (See examples below).

- Put the cause aside to be dealt with at another time (Remove it from the wall and record it on a "waiting room" list. The Team may want to discuss this list at a later time with district leadership, the School Committee, Union leadership, and/or community partners).

Examples of rewritten causes:

Problem	Brainstormed Root Cause	Rewritten and Refined Cause
Students do not know how to read grade level text fluently and with comprehension (7.10)	Students' families don't read to them at home.	**The district lacks supplementary reading interventions** for students who do not make adequate progress through regular classroom instruction.
Students do not know how to estimate and compute with fractions, including simplification of fractions (8.N.10)	Special education students refuse to memorize the rules for computations involving fractions.	**Special education teachers lack a variety of strategies** for teaching computational skills involving fractions.

5. Once all causes have been written in terms that represent things over which the district has control, sort them into one of three dimensions by moving the papers on the wall. It may help to have a separate flip chart or wall space designated for each realm.

    - **Core realm**: Contains factors that most directly affect student outcomes. These tend to be classroom-level factors.
    - **Enabling realm:** Contains conditions that *must* be in place in order to make the core elements successful in affecting student outcomes. These tend to be a mix of school- and district-level factors.
    - **Supporting realm:** Contains conditions that are *helpful* toward making the core elements successful in affecting student outcomes. These tend to be a mix of district- and community-level factors.

Note that the amount of control that teachers and the school have is greatest at the center. Conversely, district control is greatest in the enabling and supporting realms. The district has the unique perspective, responsibility, and authority to act at the enabling and supporting levels in order to make systemic improvements that affect student learning and achievement.

Dimensions of district improvement:

Realm	Definition	Sphere of Implementation	Amount of School and Teacher Control	Amount of District Control
Core	Factors that most directly affect student outcomes	Classroom	School and teachers have a great deal of control	District has responsibility, but less direct control
Enabling	Conditions *necessary* in order to make activities in core realm successful	School	School has some control	District has significant control and leverage
Supporting	Conditions that are *helpful* in making activities in core realm successful	District/ Community	School has little control	District has some control and leverage

6. Once all potential root causes are sorted, review the enabling and supporting dimensions. If there are very few causes in either of these categories, ask the Team to consider what other factors might affect the problem the Team is investigating and add any new ideas to the list.

Stop: If the data analysis in *3.3.1T* yielded multiple conclusions, repeat this process for the other conclusions (problems) before proceeding further.

7. Once the Team has generated and sorted potential root causes for each of the conclusions, look across all the causes and ask:

    - Are there any issues that arose in one brainstorm that are similar to those in others, suggesting they affect multiple areas within the district?
    - Do these causes primarily affect a subgroup of students, teachers, or other stakeholders, or do they affect a much wider segment of the population we serve?

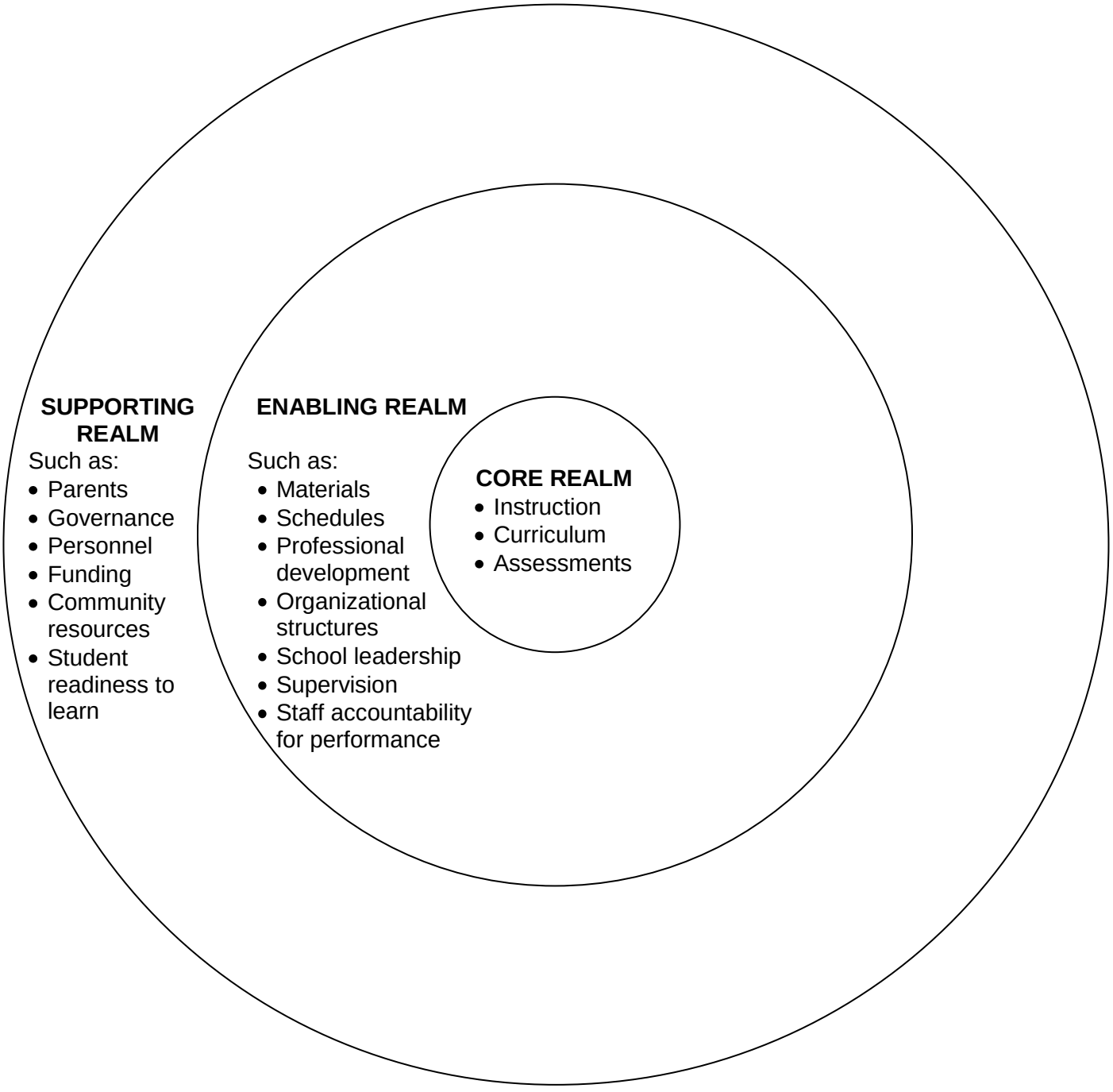
    Consolidate the issues that affect multiple areas or stakeholders. Record these in worksheet *4A: Far-Reaching Causes*, and record the remainder in *4B: Problem-Specific Causes*.

It would be impractical to address all of the causes identified. Therefore, narrow the list of causes to identify those which can be addressed most productively by the district.

8. Rate each cause based on the impact it is likely to have on student learning and achievement, and on the amount of control the district has over it. Causes that rate high on the amount of impact and the amount of district control should become the focus of subsequent action planning.

Dimensions of District Improvement

- **Core realm:** Contains factors that most *directly affect* student outcomes: instruction, curriculum, and assessments.
- **Enabling realm:** Contains conditions that *must* be in place in order to make the core elements successful in affecting student outcomes.
- **Supporting realm:** Contains conditions that are *helpful* toward making the core elements successful.



Adapted from: Conley, David T. (1997). *Roadmap to restructuring: Charting the course of change in American education*. Eugene, OR: Clearinghouse on Educational Policy and Management

4A: Far-Reaching Causes

Record the potential root causes that apply to *a number* of identified problems, function areas, or groups of stakeholders.

Guiding Questions:

1. Which potential root causes have the greatest impact on the work of the district?
2. Which causes does the district have the most immediate control over?
3. What evidence does the Team have to verify its theories about why this problem exists?

Potential Root Cause	**Impact on student achievement** 1 = minimal 2 = some 3 = substantial	**District's control** 1 = very little 2 = some 3 = a lot	**Evidence**

Worksheet 4B: Problem-Specific Causes

Use this worksheet to record the potential root causes that apply to *only one* identified problem, function area, or group of stakeholders. Be sure to indicate the target for each potential root cause.

Guiding Questions:

1. Which of these potential root causes have the greatest impact on the work of the district?
2. Which causes does the district have the most immediate control over?
3. What evidence does the Team have to verify its theories about why this problem exists?

Problem, function area, or stakeholder group	**Potential Root Cause**	**Impact on student achievement** 1 = minimal 2 = some 3 = substantial	**District's control** 1 = very little 2 = some 3 = a lot	**Evidence**

PROBLEM INVESTIGATION PLAN 4.3.1T

Purpose	To structure a research effort aligned with a problem.
Description	This document serves as a way for a Data Team to identify questions that need to be answered about a problem being addressed in the Data-Driven Inquiry and Action Cycle.
Time	30 minutes.

Related Documents
4–Knowledge Module
4.3.2R: Educational Research Websites

Directions:

1. Restate the underlying problem and proposed solution articulated in the *Problem Statement*.

2. As a group, brainstorm questions about the problem or proposed solution that should be checked before moving forward. It can be useful to note the underlying assumptions the group has, e.g., that a certain factor is the most significant root cause, or that a certain solution will have the greatest impact, and translate those into a question for investigation. If the list is long, the Team may want to prioritize them.

3. For each question, complete the information below until all are captured and a clear plan to investigate each is identified. Copy the table as many times as necessary to document how the Team will address each question it has about the problem or solution. It is not necessary to consult both research *and* local expertise for each question.

Example:

Problem or solution under investigation: *Teachers don't get sufficient training and support in our reading program, so we are going to start a teacher mentoring program.*

Question we have:	What other districts similar to ours have implemented mentoring programs focused on reading, and how well did they work?	**Lead Investigator:**
Research sources to consult:	Local university teacher training department Regional Laboratory Reference Desk	District teacher developer
Local expertise to consult:	MA ESE Literacy Office Collaborative of districts Principal and coach at a high-performing school in our district	District literacy director
Date for completion:	Three weeks from now	

Problem or solution under investigation: _____

Question we have:		**Lead Investigator:**
Research sources to consult:		
Local expertise to consult:		
Date for completion:		

Question we have:		**Lead Investigator:**
Research sources to consult:		
Local expertise to consult:		
Date for completion:		

Question we have:		**Lead Investigator:**
Research sources to consult:		
Local expertise to consult:		
Date for completion:		

Question we have:		**Lead Investigator:**
Research sources to consult:		
Local expertise to consult:		
Date for completion:		

EDUCATIONAL RESEARCH WEBSITES 4.3.2R

Purpose	To connect districts to websites with searchable educational research reports.
Description	This list can serve as a starting place for gathering researched reports related to the problem the Team is addressing and interventions the Team is considering.
Time	N/A.

Related Documents
4–Knowledge Module 4.3.1T: Problem Investigation Plan

	Website	Brief Description
1	http://www.eric.ed.gov/	**ERIC**—Education Resources Information Center; a federal site for collected educational resources, including research.
2	http://ies.ed.gov/ncee/wwc/	**What Works Clearinghouse**—A website operated by the Institute for Education Sciences to provide "a central and trusted source of scientific evidence for what works in education."
3	http://ies.ed.gov/pubsearch/	**IES REL Network**—Institute for Education Sciences search engine for publications, including research from 10 Regional Education Laboratories.
4	http://www.relnei.org/referencedesk.2009-12-31.php	The **Regional Educational Laboratory Northeast and Islands (REL-NEI)** is part of the Regional Educational Laboratory Program. The REL-NEI Reference Desk is a free service that provides quick-turnaround responses to education-related research questions, offering a quick scan of existing research.
5	http://edadmin.edb.utexas.edu/datause/index.htm	**U. of Texas at Austin: Data Use Website**—Dept. of Educational Administration, College of Education; includes publications; site developed by Chief Data Champion Jeffrey Wayman.
6	http://www.sedl.org/	**SEDL—**(formerly the Southwest Educational Development Laboratory); a private, nonprofit education research, development, and dissemination (RD&D) corporation based in Austin, Texas.
7	http://www.rtinetwork.org/	**RTI Action Network**—A program of the National Center for Learning Disabilities.
8	http://www.ideapartnership.org/journals.cfm	**The IDEA Partnership**—Reflects the collaborative work of more than 55 national organizations, technical assistance providers, and organizations and agencies at state and local levels. Click on "MANY VOICES" to find hundreds of articles and citations from web-based journals and other periodicals; they are building a larger online library to open in March 2010.
9	http://www.promisingpractices.net	**Promising Practices Network**—RAND corporation's website, whose stated purpose is "providing quality evidence-based information about what works to improve the lives of children, youth, and families." All of the information on the site has been screened for scientific rigor, relevance, and clarity.

PROBLEM CATALOGUE TEMPLATE 4.4.1T

Purpose	To give the District Data Team a systematic way to capture problems.
Description	This template contains a model for a catalogue of problems being addressed by groups throughout a district.
Time	Ongoing.

Related Documents
4–Knowledge Module

Problem Catalogue

Problem ID Number	Problem Keywords	Full Problem Statement (or summary)	Subject Area(s)	Academic Content Standard(s)	Team Investigating	Date Begun	Date Completed	Results Available (location)
0	*K–5, ELA, Mentoring, Training, Assessment*	*• Many third grade students at our school do not read at grade level.* *• We believe that this is a result of teachers not having sufficient training in our reading program and not accurately measuring students' reading levels in grades K–3.* *• We want all third graders at our school to read at grade level or above.* *• We will start a teacher mentoring program focused on reading and implement more rigorous reading assessments in the primary grades.*	*ELA*	*N/A*	*Reading Intrervention*	*13-Jan-09*		*Reading Intervention*
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Collected Research and Practice Literature: Articles and Sources

Associated Problem ID Number(s)	Associated Problem Keywords	Title of Article, Study, or Other Item	Source: Publisher or Website	Location or Person with Copies Available?	Date Added to this List
0	*K–5, ELA, Mentoring,Training, Assessment*	*[Article Title 1]*	*[Website link]*	*Online*	*2/8/2010*
0	*K–5, ELA, Mentoring,Training, Assessment*	*[Article Title 2]*	*[Publisher name]*	*Central comptuer network drive*	*1/13/2010*
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