Tools for Root Cause Analyses

Student outcomes are a main focus of educational systems, but the true causes of these outcomes are often far more complex than they appear. This is often at play when schools and districts identify a problem and attempt different improvement efforts to address the problem, only to see these efforts result in an insufficient change. One reason this can happen is when the true root causes of the problem were not correctly identified and addressed. In the 2017 publication *Learning to Improve,* authors Bryk et al. explain that, "[e]ducational outcomes emerge from multiple processes that interact in classrooms, schools, and districts and in families, community organizations, and public social services." To further complicate matters, new reforms, which come about every few years are, "enacted on top of previous change and those on top of more distal changes…[which can result in] multiple, uncoordinated, and sometimes conflicting guidance…" (Bryk et al., 2017, pp. 65-6).

Improvement science offers tools that are designed to help organize thinking and dig deeper to determine true root causes of complex problems. These tools are designed to help frame education as a system made up of components and subsystems so that we can consider the ways in which these different components and subsystems interact and affect the problem we are trying to solve. We will look at three tools designed to help uncover and address root causes: **fish bone diagrams**, **system improvement maps**, and **driver diagrams**. When these three tools are used together, they can help us organize our thinking and set a coordinated plan in place to address root causes in different components, subsystems, and/or levels within the educational system. Without a disciplined process to understand and organize ideas about a problem, formulating an effective response and enacting a system of appropriate measures is not feasible.

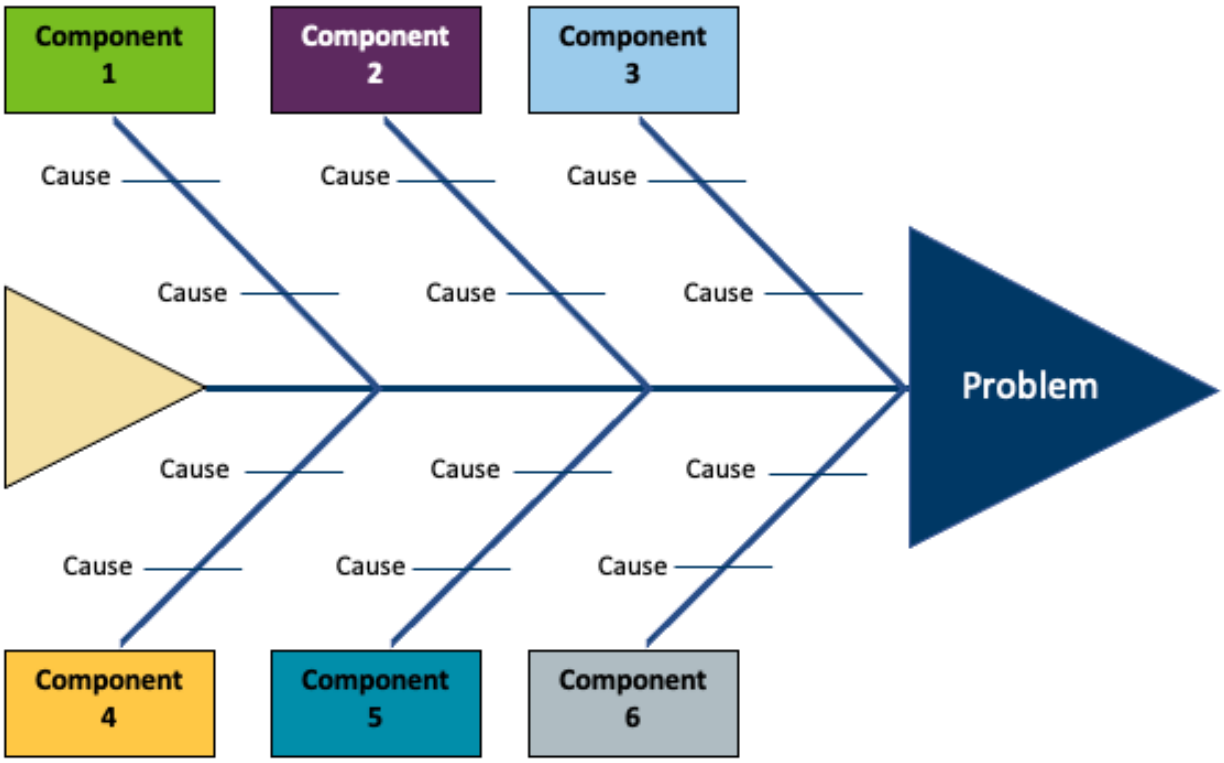
Fish Bone Diagrams

As Byrk et al., explain, the first step in determining the root cause of any problem is to develop a shared understanding of the specific problem or problems that need to be solved by a group, and to consider why the current outcomes exist; that is, what could be the root causes contributing to this problem. Each individual shares knowledge from their point of view to help identify specific components and subsystems that are connected to the problem.

Fish bone diagrams, also known as cause-and-effect diagrams, are designed for use in a group during these initial brainstorm activities to visually show the specific problem and highlight

potential causes. In these diagrams, the "fish head" contains the problem while the "bones" are a component of the system that is likely a contributing cause to the identified problem. Specific interactions or ways in which the components may contribute to the problem are described along each bone. The number of components and number of causes should be adjusted as needed for each specific problem. Figure 1 shows a template of a fish bone diagram.

Figure 1. Fish Bone Diagram Template



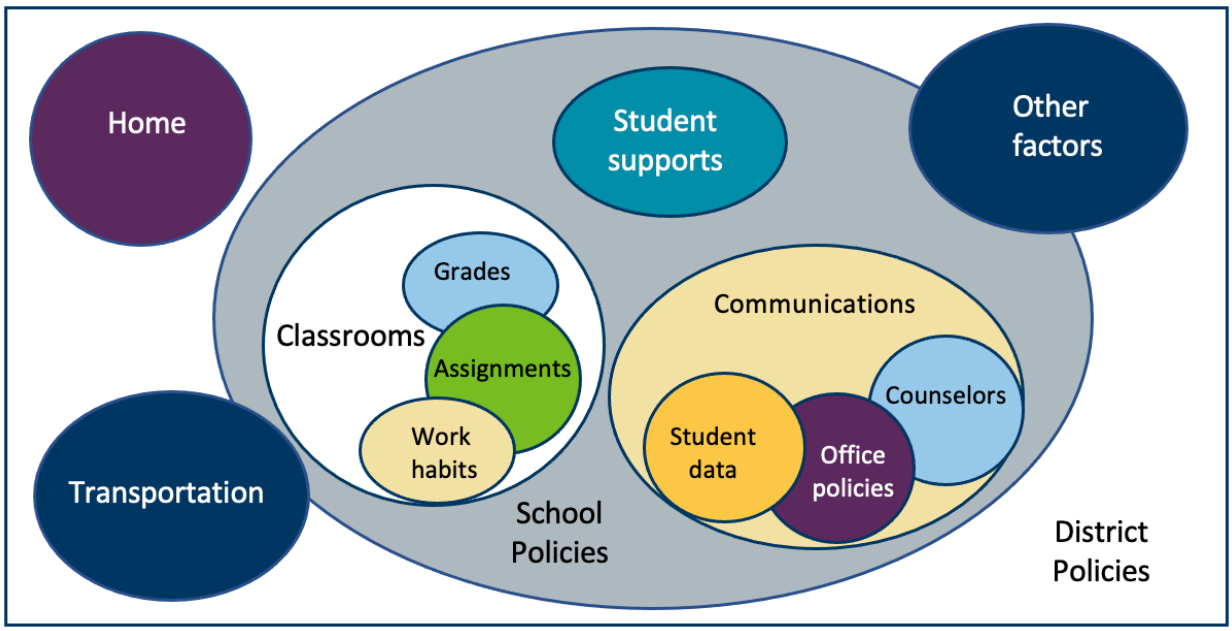
As each component is identified, it is important that all individuals in the group ask probing questions of one another to better understand the connections of a component and how that component is experienced and perceived by each individual based on their role in the educational system. This activity requires honest and sometimes difficult conversations to get at those connections and causes. Byrk et al., remind us that, "no one single person, process, or resource is to blame."

System Improvement Map

System improvement maps are analytic tools that help us organize the information gleaned from brainstorming activities and fishbone diagrams into a visual representation, or map, that

shows where the components exist within the educational system and their relationships to one another (i.e., how they interact). Bryk et al., explain that the overall goal of these maps is not to reveal "every nook and cranny of the organization," but to show the essential components and subsystems that should be addressed in order to respond to the problem. System improvement maps, like the one shown in Figure 2, show where and how (e.g., at what level and to what degree) root causes may exist within the system and highlight their connection to one another and to the problem. To develop a system map, it is important to identify and group components by subsystems. Keep in mind that a component identified on a fish diagram may appear in more than one subsystem because it has more than one purpose or feeds information into more than one subsystem. Subsystems can be the formal organization of the educational system being analyzed (e.g., attendance, counseling, student records, courses/departments), or be more nuanced depending on the specific system and root causes you identified in your fish bone diagram.

Figure 2. Example System Improvement Map



Driver Diagrams

Driver diagrams offer a structure in which to organize various responses or changes to address the root causes identified by fish bone diagrams and system improvement maps. Driver diagrams focus on a, "small set of hypotheses about key levers for improvement, specific

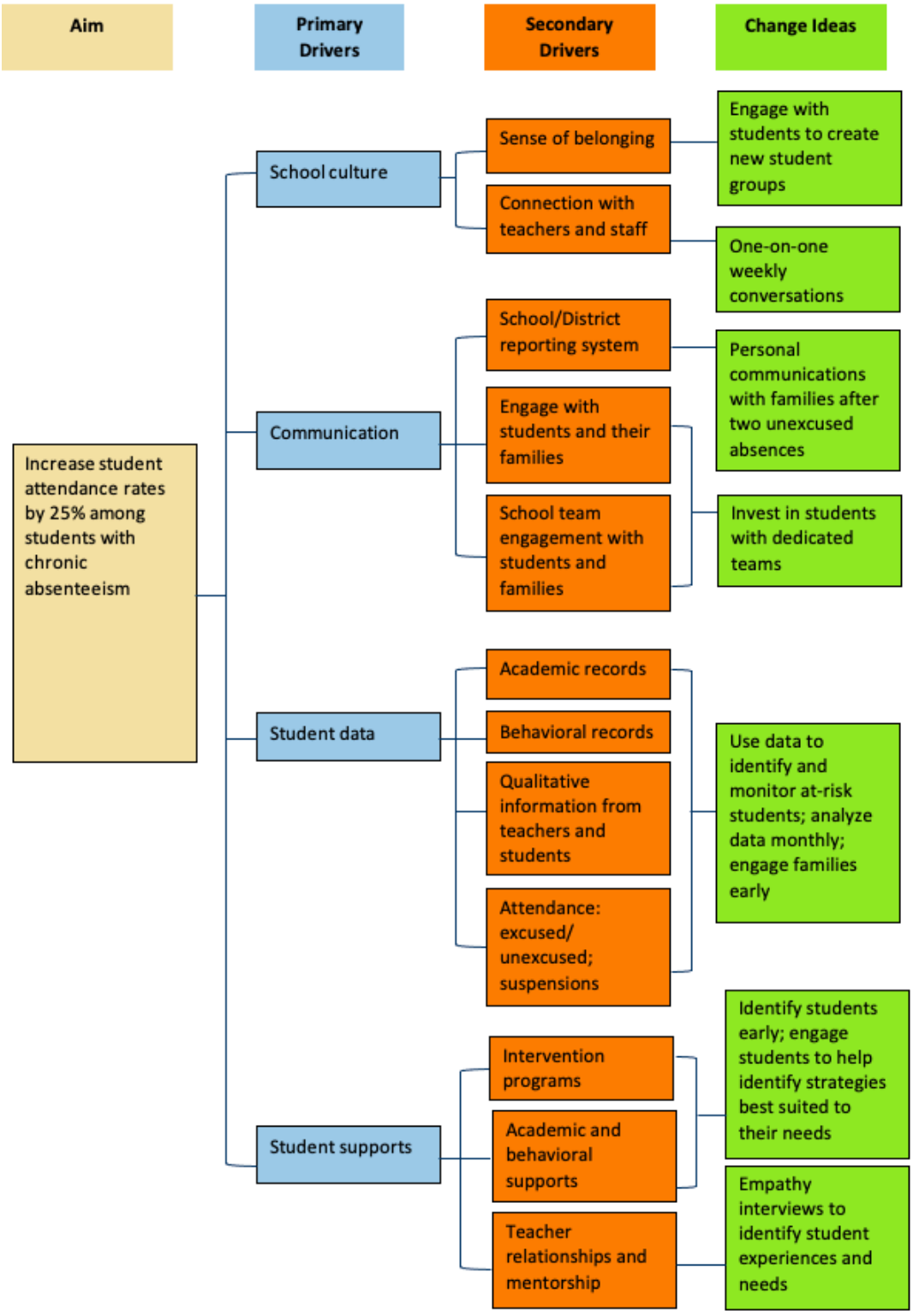
changes that might be attempted for each, and the interconnections that may exist among them" (Bryk, et al. 2017, p 73). In other words, they are useful to helping to determine in what order and at what scale changes will need to be enacted and make visible the complexity of the problem being addressed.

The first step in using a driver diagram is to identify a measurable "aim statement" or goal of the improvement efforts. Next, a set of hypotheses are identified that will help produce the results in the aim statement. These hypotheses are the "primary drivers" in the driver diagram. Each primary driver has associated design details that must be considered and can be included in the driver diagram. In some cases, there are secondary drivers behind one or more primary drivers that need to be addressed before the primary drivers can be addressed (for example, a group needs access to specific student data, but their data system must be updated before it can store and display the data). As a final step, change ideas to address each driver and its design details, are entered into the diagram to capture a plan for a response to the problem. By breaking down each hypothesis, or driver, and entering each piece of information logically into the driver diagram, the complexity of the problem, its root causes, and the plan for changes necessary to improve the problem are made visible.

A template that can be used to create a simple driver diagram is shown in Figure 3, while an example driver diagram is shown in Figure 4.

Figure 3. Driver Diagram Template

Figure 4. Example Driver Diagram



References:

Bryk, A., Gomez, L. M., Grunow, A., LeMahieu, P.G. (201**7**). *Learning to improve: How America's schools can get better at getting better.* Harvard Education Press.