

Lean and Six Sigma in Education

Lean and Six Sigma analytics can help busy school business officials address efficiency issues across the district.

By Steven C. Pereus and Nathan Rohyans



Nearly every school district strives to operate more efficiently, direct more resources to the classroom, and meet or exceed state or community expectations. Rising costs, revenues that don't keep up with costs, and constantly changing standards are making these outcomes difficult to achieve.

Many districts have or are hitting a financial wall that is forcing them to make cuts to programs and service. Superintendents and boards expect school business officials to find creative and innovative ways to solve these challenges without harming education. The traditional

tools and methods that have been used for decades are useful, but are inadequate to meet these growing challenges.

Many leaders don't realize that their districts are full of opportunities to reduce waste and raise efficiency because their measurement and data systems don't identify them. Also, common standards don't exist for most support services. The result: variation in the efficiency of an area such as facilities can be as much as 35% below to 50% above average in a local region.

Our experience with Lean and Six Sigma has shown that these methods can be highly effective for achieving

efficiency gains and operating excellence in educational organizations.

Lean and Six Sigma

Lean and Six Sigma are two concepts that share a similar philosophy, system, and tools and are used by organizations to solve problems and improve operations. Lean focuses on reducing the amount of time required to complete a work process by eliminating waste in the process. Six Sigma identifies and eliminates the defects in a service, product, or process. Lean and Six Sigma methods can be used separately or together.

The literature abounds with case histories of how Lean and Six Sigma have helped organizations as diverse as automotive, aerospace, health-care, the U.S. Air Force, and school districts streamline and simplify their processes, eliminate waste, and achieve operational excellence and customer satisfaction. Lean practitioners see improvements of up to 35% and 70%.

We have used Lean and Six Sigma methods with similar results in education. Using the Lean mindset and methods in educational organizations has identified opportunities that range from savings of \$140 per student to more than \$350 per student.

Lean: The Link Between Data and Improvement

Use of data to make decisions and improve organizations in the fields

of business, healthcare, sports, and nearly every other field of human endeavor is expanding at an accelerated rate. Successful data use for improvement, however, requires three elements: (1) time and trained staff, (2) relevant data and measures, and (3) a system and methodology for using data to solve problems and improve.

Unfortunately, these three factors are often lacking in school district business and operations offices. Lean and Six Sigma analytics and methods can help busy school business officials address each of these issues. Both methods shine a light on opportunities that can't be identified with traditional tools, can reduce the time required to use data, and reduce the time required to capture savings and improve.

Lean Objective: Reduce Time by Eliminating Waste

Lean's focus is to reduce the time required to perform work by eliminating the waste and number of steps in a process. Lean methods examine the inputs, process steps, and quality of outputs of a process.

More than 50 years of experience in improvement across a wide range of industries has led to a large body of knowledge about common sources of waste that add to the cost and time of the process or operation. These sources of waste are illustrated in Figure 1.

The eight sources of waste as applied to education are:

1. Over-production—Generating or buying more of something than is needed.
2. Waiting— Idle time when data, people, or equipment isn't available.
3. Transportation—Unnecessary transportation of people or materials.



Figure 1. The Eight Sources of Waste

4. Over-processing—Extra or unnecessary steps, review, approval, or motion.
5. Inventory—More physical resource or inventory than is needed.
6. Defects—Work that contains errors, lacks something, or must be redone.
7. Motion—Unnecessary physical movement due to workspace organization.
8. Talent—Not fully utilizing or developing talents of staff or students.

An important note on work: Work, from a Lean perspective, has three components: (1) work that is necessary to provide a service that is valued by the customer, (2) incidental work that is needed but doesn't add any value, and (3) work or time that does not add any value. This third category of work can often involve as much as 30% of the time spent on a task or process. Think about the work you or others do. What can be done to reduce the no-value added time?

Lean and Lean Six Sigma in Education

The objective of Six Sigma is to reduce variation, reduce the cost of poor quality and errors, and achieve operational excellence. Lean Six Sigma, developed by Motorola in the 1980s to improve the quality of its pagers, refers to a statistical standard of 99.966% error-free product or service. At first glance, one may conclude that such a standard cannot be applied in education. Schools, however, are full of opportunities to apply Six Sigma, including on-time arrival time for buses, hiring lead times, check accuracy, forecasting accuracy, cleaning quality, safety, and more.

Why worry about the cost of poor quality in education? The need to deliver students to school on time is obvious. In the case of the teacher recruitment process, a slow process can make it difficult to hire staff. Errors often put staff in a firefighting mode, require time to correct, and depending on the type of error, can be costly.

Lean and Lean Six Sigma methodologies work because of the core values upon which the methodology is built. Lean's value system fits well with districts that share the following values:

- **A Focus on the Customer/Client**—Both methods strive to deliver the best possible experience for the right cost for students, staff, the community, and stakeholders.
- **Respect for People**—A high value and deep respect are placed on people based on what they are capable of knowing and doing and contributing to the improvement process.
- **Data-Driven Scientific Method**—Lean tools rely on the use of data and the scientific method to diagnose and improve performance. Lean is an excellent fit with districts that are already using data to improve in the classroom or striving to build a STEM focus.

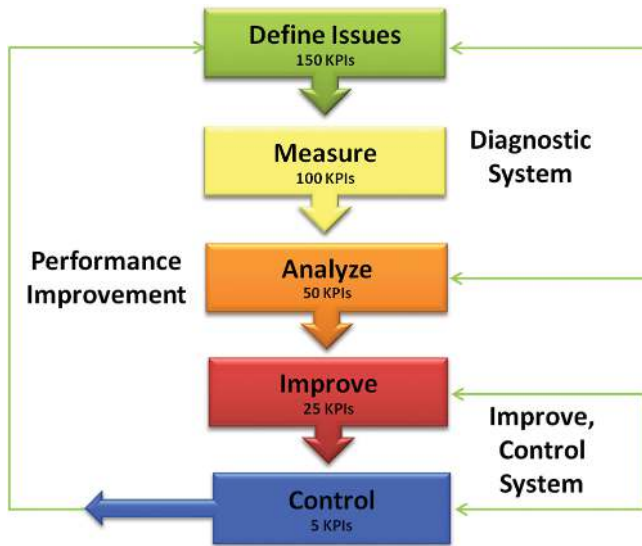


Figure 2. The DMAIC Process and Filter

- **Continuous Learning and Improvement**—Lean strives to assure smart use of all resources, including time, money, knowledge, people, technology, and equipment.

Creating Transparency

Waste reduction and elimination start with transparency or visibility into the sources of the waste. Lean and Six Sigma methodologies, which rely heavily on the scientific method and data, are designed to create visibility and then identify and remove wastes. Lean is like a sonar system on a ship that identifies potential problems (page 12). Without the sonar, the sources of waste will slow down the ship, cause damage, and affect those on board.

Discovery and Improvement Process

Lean uses a systematic process for discovering and solving problems called DMAIC illustrated in Figure 2. Each step in the process is described below. Note that the key performance indicators (KPIs) used at each stage progress from a large number to a vital few. These vital few measures are the root causes of the performance problem or gap.

Define. This first step defines the issues and scope of the problem(s) to be solved. The define process includes data gathering which, depending on the scope of the problem, could use anywhere from 10 to 150 KPIs to define the issue or opportunity. A department level facility assessment could involve 150 measures while custodial operations may start with 25 KPIs.

Measure. This step uses problem-specific measures and data analysis to define exactly how an operation or process is currently working. The measurement step

drills into the operating details that can be influenced or controlled.

Analyze. The analysis step and tools identify the root causes of a problem or specific issues that need to be addressed to solve a problem or improve. Root-cause analysis methods, such as the fishbone method, are used to identify cause-effect relationships and opportunities for improvement. Root-cause analysis methods allow leaders to get behind the drivers of spending.

Improve. The improvement step develops solutions to the problems identified in the analysis step. Brainstorming, standardization, error-reduction strategies, use of best practices, and process-improvement methods are just a few of the tools used in this step. The Five S tool (sort, set in order, shine, standardize, and sustain) is used to ensure efficient organization of materials and work space and could, for example, reduce the time spent looking for something from 30 minutes to 2 minutes.

Control. The control step implements procedures and monitors performance to ensure that the improvement gains can be sustained. Dashboards are a common tool for tracking leading and lagging indicators.

Spotlight on Education Case Histories

Custodial Staffing. Using Lean thinking and proper data analysis, custodians in one Ohio school district were disbursed more effectively among the district, keeping square footage per full-time custodian to an efficient amount. Before the change, square footage per custodian ranged between under 21,000 to as much as 31,000. After some analysis, changes were made to close the gap to between 24,500 and 29,200. This helped balance the workload in the 21 buildings in the district.

Absenteeism. By identifying all the forms of waste inherent in the district's absence and time-keeping process, the district was able to design a new process that saved over \$60,000 in labor and paper costs per year. The process was decreased from over 130 process steps to fewer than 45 process steps.

Textbook Purchases and Inventory. By identifying root causes and the financial impact, the district redesigned the textbook ordering process and reduced textbook costs by just over \$125,000 per year.

Safety. One district reduced its lost-time claims by using Lean methods to identify and eliminate root causes of safety problems across the district. Workers compensation claims fell 45% within three years and 86% after seven years. Insurance-related costs were cut in half.

Facilities Costs. A facilities director in a 7,157-student district in North Carolina reduced operating costs by

almost one-quarter. He used Lean methods to raise custodial productivity, reduce supply use, and cut energy costs.

Other opportunities to apply Lean in district business and operations include:

- Removing sources of waste and poor quality cost from operations.
- Reducing the time required to hire staff.
- Increasing custodial productivity.
- Streamlining internal processes.
- Reducing supply use.
- Speeding the delivery of supplies to the classroom.
- Reducing payroll errors.

Beginning the Lean Journey

Lean and Six Sigma methods can help school business leaders solve a wide range of problems, from error-prone processes to excess supply use and cumbersome time-consuming process.

The first step is to identify the scope of opportunities that exist within your district. Lean analytics identifies the common sources of waste and estimates the cost

of the problem, giving district leaders clear transparency into every area of the district and identifying the financial and performance impact on the district and education.

Once you are aware of the opportunities, you can prioritize, learn the appropriate Lean tools, and with some coaching, learn how to use Lean to solve problems.

At some point, you may want to train a staff member to achieve a Yellow, Green or Black Belt skill status with Lean methods. More importantly than the classifications, however, is open-mindedness to learn new methods, and the ability to use the Lean and Six Sigma tools to solve problems.

The Lean mindset and application will help you make everyone around you perform better, even the skeptics.

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WHAT ENROLLMENT CHALLENGES DOES YOUR DISTRICT FACE?

- INCREASING ENROLLMENT
- DECLINING ENROLLMENT
- GRADE CONFIGURATION CHANGES
- SCHOOL CONSOLIDATION
- FEEDER SCHOOL CHANGES
- FISCAL AND STAFFING PLANNING
- ATTENDANCE BOUNDARY CHANGES
- SPECIAL PROGRAM PLACEMENT
- CLASS SIZE REDUCTION
- BETTER INSIGHT INTO YOUR COMMUNITY
- OPEN ENROLLMENT/ SCHOOL CHOICE
- SCHOOL OVERCROWDING
- NEW HOUSING DEVELOPMENT

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