



Is it Time for Six Sigma in Education?

by Leslie Gardner

Over the last three years, I have led a series of workshops for high school and middle school teachers in Indiana to introduce them to supply chain management, its potential for economic development and the career opportunities in supply chain management for their students in the future. These workshops incorporate a mix of slideshows to introduce concepts, hands-on activities to illustrate how the concepts work, and field trips and guest speakers to demonstrate concepts in real world applications. Quality is a key element of these supply chain workshops because some of the greatest quality problems arise from dysfunctions in supply chains.¹

Hands-on learning

Before introducing quality, I like to begin by getting workshop participants to think about process design, with the goal of inspiring them to design quality into the teaching and learning processes in their own classrooms. I do this with two hands-on learning experiences.

1. The first hands-on learning experience is a poker chips-and-dice simulation of a just-in-time (JIT) manufacturing system. It shows the contrast of push and pull systems and the importance of a batch size of one. It also demonstrates the effect of variation as a cause of waiting and delays in a system. The simulation leads participants through a problem-solving process to improve the flow of chips through the system by reducing batch size and reducing variation. This helps prepare the teachers for visits to organizations where they see implementations of JIT, lean, *kaizen* and Six Sigma.

2. The second hands-on learning experience introduces the teachers to precedence diagrams, program evaluation review technique and critical path method (PERT/CPM), and line balancing in the context of making a key lime pie. Participants time the tasks in making the pie during a demonstration, develop a precedence diagram, think through the process of making the pie, assign tasks to group members and then actually make the pie to see how well their



process design worked. They also perform quality assurance by eating the pies—everyone's favorite part!

Customers and products

While the pies are cooling in the refrigerator prior to quality assurance, we have a discussion about the meaning of quality. Quality is often defined in terms of customer needs and wants, so we first attempt to determine the customer of public education at the high school and middle school levels. Teachers in the workshops have proposed various groups as their customers, including students, administrators, parents, community and society. The most interesting comment made by one of the teachers was: "My customers should be the adults that the children I teach will become, but with the way everything we do is measured with standardized tests, it feels like the customer is really state government."

When asked about what their product is, most of the teachers responded that their students are their products, although a few said it was the instruction they deliver. Most of them elaborated on the concept of students as products by adding some product attributes, such as students being able to solve problems, achieve their educational and career goals, and being able to function in society. Most of the teachers are concerned that the situation of students being customers and products at the same time means significant adaptation is necessary in applying quality models from manufacturing to education. This problem is not unique to education. It is also a problem when applying quality models to other services such as healthcare.

We follow up the quality discussion with a field trip to a company to see quality initiatives in action. We have visited a variety of companies over the series of workshops, including Subaru, where the teachers learned about *kaizen*, and Cummins, where the teachers learned about Six Sigma. Teachers are familiar with school improvement plans, which are required of all public schools in Indiana, but they have never really applied quality tools to improve teaching and learning in their own classrooms. Seeing examples of small scale process improvement in industry that yielded big dividends was certainly inspiring for the teachers. I showed examples of improvement efforts in my own classroom in the workshops that demonstrate it can be done in



education, but we need to get quality tools into teachers' hands and we reward them for using them.

Six Sigma in K-12

ASQ's Koalaty Kid was one program that successfully helped put quality tools into teachers' hands, but its use was not widespread. One of the program's key strengths was it involved students in improving their own learning.

Is it time for Koalaty Kid to reemerge as Six Sigma for education? Imagine the possibilities of breakthrough performance if teachers were Black Belts (BB) or Green Belts and students were Green Belts or Yellow Belts. High school math teachers already have the mathematical and statistical background to be BBs. Students graduating from high school with some Six Sigma background would have a competitive edge in the workforce. Six Sigma already has been applied to postsecondary education in some instances.^{2,3} Are we ready to do this on a K-12 level? Could Six Sigma become as widespread in education as it is in business?

Before this can become a reality, several hurdles must be overcome. First, education is usually nonprofit. In this tight economy, the financial benefits associated with Six Sigma projects are desirable for schools, but academic achievement is a better area for schools to attain breakthrough performance using Six Sigma. The problem with academic achievement is if the customers and products are the adults that the students will become, this introduces a time delay of as much as 10, 20 or even 30 years before it is possible to measure the meaning of academic achievement in real-world terms.

In the world of supply chains, information delays can wreak havoc and 10 to 30 years is a huge delay. Shorter-term measures must be used, but we must be careful about what we choose because we will get the kind of behavior that our measures encourage. For example, customer satisfaction in terms of what students want now and what they will want their education to do for them in 10 years can be different. My college students would be thrilled to avoid doing homework about normal curves and standard deviations so that they could spend time playing games on their mobile devices or go out with their friends, but that will not serve



them well in graduate school or on the job. An even bigger problem is that we are preparing students to live and work in a world 20 to 30 years into the future that will likely be different from the one we live in now.

None of these hurdles are insurmountable, but we need to start thinking about what adaptations need to be made. It is time for Six Sigma in education, and we can do it.

References

1. S. Thomas Foster, "Furthering the Study of Global Supply Chain Quality Management," *Quality Management Journal*, Vol. 18, No. 2, 2011, pp. 7-9.
2. John Wilkerson, "Applying Lean Six Sigma to Postsecondary Continuing Education," 2008, <http://asq.org/edu/2008/12/lean/applying-lean-six-sigma-to-postsecondary-continuing-education.final.pdf>.
3. John Wilkerson, "Five Keys to a Successful Higher Education Lean Six Sigma Deployment," 2008, <http://asq.org/edu/2008/02/six-sigma/five-keys-to-a-successful-higher-education-lean-six-sigma-deployment-en.html?shl=088687>.

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