

University of Tennessee at Chattanooga

UTC Scholar

ReSEARCH Dialogues Conference Proceedings ReSEARCH Dialogues Conference Proceedings
2020

Apr 14th, 1:00 PM - 3:00 PM

The problem-solving workshop: adapting process improvement methodologies for K-12 educators

Madison Chan


University of Tennessee at Chattanooga

Follow this and additional works at: <https://scholar.utc.edu/research-dialogues>

Recommended Citation

Chan, Madison, "The problem-solving workshop: adapting process improvement methodologies for K-12 educators". *ReSEARCH Dialogues Conference proceedings*. https://scholar.utc.edu/research-dialogues/2020/day1_presentations/53.

This presentations is brought to you for free and open access by the Conferences and Events at UTC Scholar. It has been accepted for inclusion in ReSEARCH Dialogues Conference Proceedings by an authorized administrator of UTC Scholar. For more information, please contact scholar@utc.edu.



The Problem-Solving Workshop:
Adapting Process Improvement Tools for
K-12 Educators

—

Madison Chan, Engineering Management

Contents

- Current State and Opportunity
- Guiding Assumptions
- Goals and Plan
- Initial Workshop Session
- Results and Feedback from Session
- Reasons for Lack of Engagement
- Proposed Programs
- In Summary
- Questions

Current State

Lean and Six Sigma are used to **save** companies in manufacturing **millions** of dollars and **increase efficiency** across the board.

Process improvement has also been used in **healthcare** and **non-manufacturing** business operations.

One area that has remained largely unaffected is **education**.



Lean and Six Sigma are two prominent process improvement methodologies that were developed in the manufacturing sector to solve problems, improve quality, and increase efficiency. They include guiding principles, step-by-step processes, and a variety of tools.

The Opportunity

The structure of schools has changed very little in the past hundred years.

Schools are heavily **process-based**, **hierarchical**, and notoriously **lacking in funds and resources**.

Although Lean and Six Sigma have been applied to education on a case by case basis, **there is no widespread movement or easy path to integrate it**.



Additionally, with schools, we have the opportunity to use Lean and Six Sigma for something beyond turning a profit. Schools are a critical part of the education of society, and this keystone is underfunded and suffering. Financial pressure produces adverse effects for students and educators alike, and fuels the flames of hot button issues like teacher strikes and charter schools. Finding a way to alleviate this pressure would be not only be beneficial to schools, but society as a whole.

Guiding Assumptions

Schools **lack the resources and funding** to provide for students and educators.

Lean and Six Sigma could be used to help schools **run more efficiently, save time and money**, and **foster a data-based problem solving atmosphere** in education

How can Lean and Six Sigma be taught to educators in a way that does not encroach upon their current duties and remains applicable to the work they do?

Based on the two assumptions above, the result of research, knowledge of current events, and conversations with educators and other professionals, we developed the following guiding question for our research:

How can Lean and Six Sigma be taught to educators in a way that does not encroach upon their current duties and remains applicable to the work they do?

After much discussion and debate, we decided that a series of workshops would be the best approach to test, as a flexible method that allows for easy collaboration.

Goal of the study:

Can a workshop series be developed to teach process improvement tools to educators in a **cost-effective, efficient, and scalable** manner?

After deciding that we would be piloting a workshop series to test this theory, we came up with the goal of our study with three important parameters:

The series must be cost-effective and efficient, because we already knew that two of the main issues facing educators were their lack of time and lack of resources/money. In order to gain traction and be successful, it would need to cost little to no money to participate and use their time in an efficient manner. We would have to find a way deliver all the material and give the educators adequate practice within a small, flexible time frame that wouldn't inconvenience them and would provide them with a good value. Lastly, it would have to be scalable. The overarching goal of the study was to produce something that could be replicated around the country. So the material would have to be easily conferrable to another team and be able to be taught without extensive training or instruction.

The Plan

- **3-Stage Workshop Series**
 - **Stage 1: Basic Instruction**
 - 3 hour session covering background and nine basic tools
 - **Stage 2: Practice the Tools**
 - Educators find problems/opportunities in their schools and practice the tools taught in the workshop with guidance
 - **Stage 3: Final Stages and Reinforcement**
 - Educators come back together to share what they've found, complete the DMAIC cycle, and receive reinforcement on all the topics covered

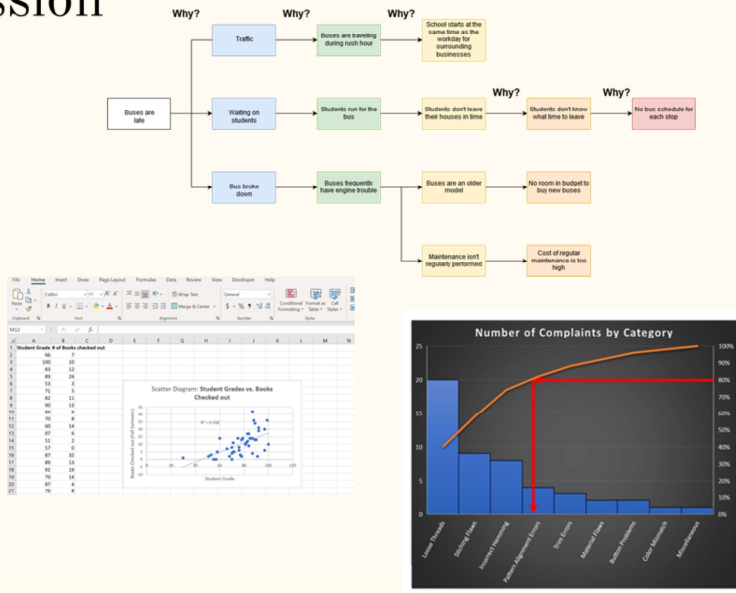
With those requirements in mind, we developed a 3-stage workshop series. The first stage would cover basic instruction, familiarizing the participants with the theories and tools required for Lean and Six Sigma. The second stage would be remote, allowing the participants to apply their knowledge to their daily activities and investigate issues that could be addressed with process improvement principles. The workshop team would support them during this time and be available for consultation. The participants would come back together for a third stage, taking the issues they had previously identified and working through them with trained Six Sigma and Lean professionals.

After setting this plan, we began outreach for the event, getting a flyer designed, sending out emails to Hamilton County educators, and advertising online and through word of mouth. We also began developing the curriculum for the first workshop session.

Initial Workshop Session

Content Covered:

- Overview of Six Sigma
 - Overview of Lean
 - Teams
 - Overview of DMAIC process
 - Define Phase
 - Brainstorming
 - Affinity Diagrams
 - Process Flowcharts
 - Fishbone Diagram
 - Why-why Diagram
 - Check Sheets
 - Scatter Charts
 - Pareto Charts
 - Tools in Excel Demo
 - Measure Phase
 - Check Sheets
 - Surveys
 - Interviews



This is an overview of the content covered during the initial workshop session. We used the body of knowledge for the Six Sigma exams as a guide when developing the curriculum, and then adjusted specific tools and topics according to our needs. We also developed several examples, like those shown on this slide, specifically for education, since many of the examples used in Six Sigma courses are manufacturing-based, and we were concerned that this would be harder to understand and apply.

Initial Session



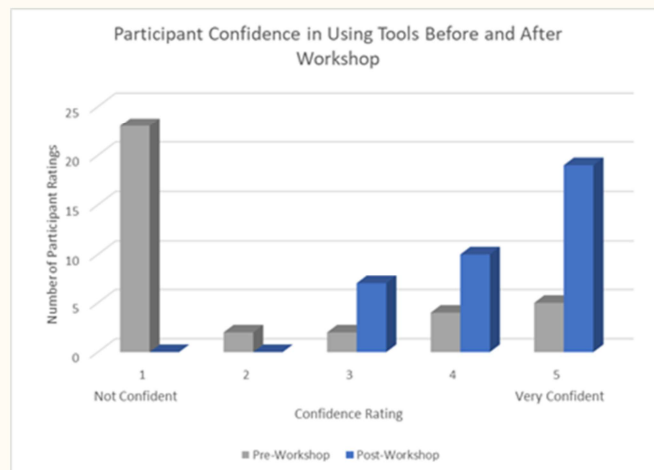
The first workshop session was held on Saturday, October 26th in the EMCS building. We had four participants in attendance, representing four local Hamilton County Schools and all with STEM and technical focuses. The workshop consisted of a 3-hour session, taught via PowerPoint Demonstration by myself and Dr. Aldo McLean. Three surveys were conducted with participants to measure responses to and the effectiveness of the workshop.

Effectiveness of Using Workshop to Teach Tools

Can the workshop be effectively used to teach these tools? → Do teachers feel more confident using these tools?

-Lack of time to test proficiency

-Confidence rating used as benchmark



These results from surveys taken before and after the workshop show that the participants experienced a dramatic increase in overall confidence in using the tools we covered during the session. The participants were asked to rate each of the tools on a 1-5 scale indicating how confident they would be using that tool. As you can see, the majority of the pre-workshop results clustered around the 1s, or “Not confident”. By the end of the workshop, there was a clear shift to the more confident side of the spectrum, shown in blue. There wasn’t enough time to test the participants’ use of the tools, so we used confidence as a benchmark rather than factual knowledge about the tools based on the assumption that confidence is a better indication of whether or not the participants will actually use the tools. They may test highly in knowledge, but still be reserved about using the tools, and in order to implement these practices, we needed to know that the participants would actually use them.

These results indicated that the session had achieved its purpose of communicating both the value and intent of the tools, and that the workshop format was, at least in part, successful.

Qualitative Feedback

This workshop was a great intro to the six sigma/lean concepts and how to possibly apply them in education.

Far exceeded my expectations. This is very beneficial to my work

Very good seminar with tools I can use directly to work on problems.

Average score on helpfulness of workshop was **9.25/10***

100% of participants said they would “highly recommend” the workshop to other teachers and administrators

*On the 1-10 Helpfulness scale (10=very helpful)

The qualitative feedback produced positive results. We received comments like those shown here, saying that the workshop was a good introduction to the concepts and that the tools we taught could be used in their jobs. Our quantitative results were also very promising. On a ten-point scale, with ten being “very helpful”, the participants rated the workshop an average of 9.25. On top of that, all of the participants said they would highly recommend the workshop. These findings agreed with our experience during the workshop, where we observed the educators to be engaged, interested in the topic, and vocal about the benefits these topics could have on their classrooms and schools. This made the results of the second stage even more surprising.

There was a 0% participation rate in the second stage.

At the end of the workshop, we had walked participants through the next stage in the process. We explained that we would check in with them every two weeks to see how things were going and collect any observations that they had about problems in their schools. All of the participants expressed an interest in continuing. However, we received no response to any of the emails sent out the first week, or any week after. We sent group emails, individual emails, reached out via our Slack channel and even called the schools, but received no response. After two months, we decided that we could not continue with the planned third stage and decided to step back and analyze what had caused the lack of engagement when recruiting for the workshop and the abrupt drop in engagement after the initial session.

Reasons for Lack of Engagement

- Manufacturing vs Service-based approach
- Focus on topics that were not primary pain points
- Lack of upper management/administrative support
- Not mandated
- Lack of grassroots support

After looking at the data and collecting data from conversations with current and retired teachers, we came up with the following reasons for the lack of engagement we were seeing.

The first was centered around our approach. Six Sigma and Lean are deeply rooted in manufacturing. Although it has widespread applications, there are certain aspects that don't translate well and need to be adjusted. Manufacturing has a product-based approach, where you can count widgets that are acceptable and those with defects. Schools are really more of a service-based industry rather than manufacturing. Although you do have inputs and outputs and everything runs on strict processes and metrics, the outputs (in this case, students) have a large role to play in how successful they are, and that success can be difficult to measure quantitatively. This made for a more tenuous connection than we anticipated and spoke less to educators when we needed every advantage to capture and retain their interest.

Likewise, the issues we focused on and showed educators how they could fix were not their primary pain points. Conversations with educators revealed that some of the primary concerns for teachers were frustration with diminished instructional time, expending of personal resources for students, and a disconnect with administration- things that could be addressed with Lean and Six Sigma, but that we had not focused on due to their low priority in a Six Sigma sense (i.e., not easy to measure, not a large impact on the bottom line). In failing to address these issues, we were failing to give educators the motivation they needed to become and stay invested.

Another struggle this study faced was the lack of administrative support. This is usually referred to as upper management support in industry, but refers to the same thing: if the people at the top are not supporting and encouraging the rest of the organization to participate, the likelihood of it happening is very slim. We tried to counteract this by getting the school district to provide professional development credit for the series, which they did, but there was no real push from the district- it was tacit approval at best.

Sometimes events or other occurrences that need participation can overcome a lack of interest with requirement. Schools have been using it for years- would students do anything if it wasn't mandatory? This workshop wasn't mandatory in any way, so we couldn't make up for other factors that we fell short on. A similar workshop was conducted with local educators at the University of Tennessee Knoxville after our session and was very well attended. That event was mandatory for staff and supported by their administrators.

And in the midst of these other factors, there remains the power of grassroots support. Educators are far more likely to participate if their colleagues are already invested and actively encouraging participation. We had no voice within the community to champion our cause.

All of these factors show that although the concept was good and even useful to educators, we lacked the leverage to attract the numbers we hoped for and keep them engaged.

Proposed Programs

- University-Based Workshop Sessions
 - Collaborations with universities to offer free workshops to teachers
 - Least financial burden for schools
 - Could benefit from “One UT” grant
- Process Improvement Coach
 - Takes advantage of current resources
 - Builds grassroots support
- Process Improvement Professional Led
 - Expensive, but thorough
 - Best chances of adoption
 - Expert guidance



Based on the issues discussed in the previous slide, we present these three solutions as potential ways to move forward with this Lean Six Sigma workshop integration concept.

The first is university-based workshop sessions. These are the most similar to the study conducted and would be the easiest to implement. They also represent the smallest financial burden for schools, as the partnership with local universities would likely be at little or no charge to them. A workshop-based collaboration grant has already been submitted through the UT system, and if funded, could provide a foundation for this proposed series. However, unless there is clear administrative support and/or requirements, it is likely to suffer from some of the same engagement issues as this study.

The second proposed idea is a process improvement coach. Many are familiar with the athletic coaches in high schools that also teach courses. This would work on a similar basis, with select educators devoting part of their time to carrying out process improvement projects and instructing other teachers on best practices. Like the athletic coaches, they would be expected to also teach a reduced load, likely with subjects that complement the material, like statistics. This idea has a slightly higher cost, since faculty would likely need to be hired to split the additional workload, but it would still be cheaper than hiring a dedicated staff member or professional, and comes with the benefit of creating grassroots support among staff members.

Which brings us to the last option, hiring a process improvement professional (someone trained and certified in Lean and Six Sigma. Would likely need a Green Belt or Black Belt). This is no doubt the most expensive of the three options, although costs could be slightly

offset by having the process improvement professional working with multiple schools. This method takes advantage of a confident and practiced professional, something that a process improvement coach would probably not be. A professional would be well-equipped to start projects at the school and begin to instruct administrators and staff in Lean and Six Sigma. Projects would likely be completed more quickly and at a lower costs, and the rate of adoption would probably be much higher than the previous two.

In Summary

- **Education**, and in particular, K-12 education is an area that is relatively new to Lean and Six Sigma methodologies and **shows great potential**.
 - There is a **need for an accessible way** for schools to adopt these methodologies.
 - This study tested **one potential method**: a workshop series.
-

In Summary cont.

- Although the study suffered from a lack of engagement, feedback from the workshop was **positive** and indicated that it was **well-received**.
 - The learnings from this workshop are used to **propose potential programs** to be tested in future studies.
-

Questions? Please contact:

Madison Chan: gw288@mocs.utc.edu

Aldo McLean: aldo-mclean@utc.edu

Thank you!