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The main objective of this talk is to give an overview of a new course being developed – The LAI Lean Healthcare Academy. A multifunctional team (medical, engineering, business) has designed the course based upon input from a Voice of the Customer Survey and benchmarking of similar courses. One of the latter is the existing LAI Lean Academy course which is summarized in this talk to provide a context for the new course. Both of these undertakings are part of the Lean Advancement Initiative’s Educational Network, which is briefly summarized on the following two slides.
The LAI Educational Network

42 Member Schools

- AFIT
- Anáhuac University, Puebla (MX)
- AZ State U
- Boise State
- Cal Poly SLO
- Central Community College (NE)
- Cranfield (UK)
- DAU
- Embry-Riddle
- Georgia Tech
- Indiana State Univ
- Indiana University School of Medicine (IUSM)
- ITESM Monterrey (MX)
- ITESM Zacatecas (MX)
- Jacksonville Univ
- Loyola College, MD
- Loyola Marymount
- Macon State Col
- Missouri University of Science & Technology
- MIT
- Montana State
- Old Dominion Univ
- North Carolina State
- Northeastern Univ
- Purdue Univ
- St. Louis Univ, MO
- San Jose State Univ
- Universidad Popular Autónoma del Estado de Puebla (MX)
- U of AL, Huntsville
- U of Iowa
- U of Michigan
- USC
- U of Bath (UK)
- U of LA, Lafayette
- U of Salerno, (IT)
- U of South Florida
- U of Texas Pan American
- U of Tenn, Knoxville
- University of VA
- Wichita State Univ
- Wright State Univ
- WPI

No Cost Collaborative Agreement Signed with MIT
This slide depicts the main mode that EdNet adds value to curriculum development. By bringing together faculty, instructors and practitioners from different organizations to develop and teach courses, it leverages resources to shorten the transition time from knowledge creation to curriculum deployment.

EdNet’s premier example of this is the introductory LAI Lean Academy course covered in the next four slides. The PDCA type cycle depicted in the middle of the slide was executed yearly for six years to produce a well honed and well tested curriculum summarized in the next 4 slides.

The new LAI Lean Healthcare Academy is part way through its first cycle. Building on the experience base of the existing LAI Lean Academy, it can be anticipated that a refined and tested LAI Lean Healthcare Academy will be produced in fewer than 6 cycles – hopefully within 3.
This and the next slide give an overview of the LAI Lean Academy. A key piece is the strategy outlined in the bottom right. Instructors have jointly developed the curriculum and jointly taught it in venues other than their home institutions. They donate their time for the development and receive a fee when delivering it. By working together they leverage their resources and knowledge, as well as learn from each other. The initial offerings were taught at LAI member company sites to young (and sometimes veteran) workforce members, all of whom were new to lean. With this initial impetus, the course spread to open enrollment offerings through University of Alabama Huntsville and MIT, and then to campus venues. Most importantly, the instructors integrated the curriculum into their core campus courses in whatever way made sense for their local situation. EdNet has also emphasized bringing academicians together with industry practitioners, as the latter are the source of knowledge for this domain. EdNet studies have documented that faculty participating in this undertaking have increased their lean six sigma competency one full level (from 3.2 to 4.2) using the proficiency scale shown in Slide 7.
This is a list of most (but not all) of the concepts, terms and tools covered during the standard 3 day LAI Lean Academy course. The course assumes no prior knowledge of lean six sigma. There are no prerequisites for the course.

The course schedule is not given in these slides, but it consists of three full (8-5) days, broken into a number of modules. Fifty-percent of the contact hours are allocated to active learning using team based simulations, exercises, case studies, and a plant tour. A major simulation which spans all of Day 2 is a Lego based aircraft production enterprise. Assembly, supply chain and engineering content is covered by the simulation. Two guest speakers are scheduled for the course to bring real world experiences to the audience. The remainder of the time is devoted to lectures which span about 400 Power Point Charts, each with speaker notes. All modules have been professionally video taped to provide “master” examples for new instructors.
Before and After student proficiency is measured with a structured self-assessment tool. Topics on the previous slide are organized into 12 knowledge areas. For each area, the student is asked to assess their proficiency using the scale shown on this slide. The average of their proficiency over the 12 areas and for all the students for each of 20 offerings is shown on this slide. Note that the Proficiency Scale is quite non-linear. To go from 0 to 1 might only require a slide or two coverage of a topic. While to go from 4 to 5 might require months of practical implementation. The curriculum is designed to get students from level 0 to somewhere between level 2 and 3. With the exception of 3 outliers to be explained, the results show this can be achieved for a wide range of audiences using a single core curriculum.

The course was initially offered in a 5 day format. For efficiency needs, it was condensed to a 3 day format. Average final proficiencies for the 5 and 3 day courses are 2.7 and 2.5, respectively. There was some loss of student proficiency as a result of the condensation, but a 2 day savings in resources. There is no discernable correlation of final proficiency with initial proficiency level. This is in keeping with the course design which assumes no prior knowledge.

The two outliers on the top of the chart represents semester long classes of upper level undergraduate IE students who received the same basic core curriculum augmented with additional project work, more time for discussion, and additional plant tours. The results show they achieved a higher level of proficiency with this deeper treatment.

The outlier on the bottom represents a train-the-trainer offering where the class of 30 instructors had a high initial proficiency level. In line with the course design, this group did not improve their proficiency. Their objective was to learn this particular curriculum in order to implement it. A group of instructors, including ones from this class, was surveyed to find out how much their proficiency had improved as a result of collaborative curriculum development and teaching the LAI Lean Academy. The survey results revealed that, on average, instructors proficiency went from 3.2 to 4.2. This is indicated by the magenta segment of the bar in the bottom data group.
At this point, the LAI Lean Academy course is “proven” and is now available for wide deployment. This is the first known “open source” lean six sigma course or non-commercial educational uses.

Looking forward to the new LAI Lean Healthcare Academy, a tremendous amount of knowledge and experience can be directly transferred. The pedagogy for teaching lean six sigma fundamentals has been honed and proven. This includes simulations, exercises, module structure, and other elements. The proficiency measures shown on the previous slide can be used not only to assess student progress, but also to assess customer expectations as will be shown in the following slides. We also know how to effectively engage a large number of instructors from multiple institutions which leads to diffusion of the course material into degree granting program courses. The overall mission of the EdNet is to get lean six sigma content embedded in courses for degree granting programs.
This slide recounts the initial milestones for the new LAI Lean Healthcare Academy. The team is following a structured product development approach with alpha, beta, prototype versions, testing and so forth. The VA has agreed to provide a class to test the first offering of the curriculum. The second offering will be an open enrollment subject through MIT’s continuing education program.
Eight professionals are collaborating to bring this new course to reality. The 5 main instructors represent three domains: medical, engineering and business. They include faculty and practitioners. And they represent 5 different schools so that the outcome will immediately find its way to 5 different campuses, in keeping with the EdNet’s mission. Given the importance of simulations, two experts will focus on the development of a lean healthcare simulation that will be used throughout the course. The initial version of this comes from University of Iowa. The team is rounded out with a PhD in curriculum design.
Voice of Customer Survey

- Instructor team scoped potential course content into 10 Knowledge Areas comprising 99 possible topics
- Subject matter experts asked for their desired level of proficiency in these areas and topics for a graduate of a three day introductory course
- Used LAI Lean Academy Proficiency Scale: UNAWARE … EXPERT
- Electronic survey distributed via networking
- 48 completed responses received

Slide is self explanatory
Survey respondents we asked to assess their own lean proficiency for the 10 lean healthcare knowledge areas. Interestingly, the results covered the entire range from 0 to 5! There was clear break between those greater than 1.9 and those less than 1.3. The latter group could be considered surrogate for future students, and the former group as lean experts. Survey data has been tracked separately for these two groups.
Survey respondents were more or less evenly divided into 4 major groups, with a smaller remainder of “others”. The medical staff group was less proficient than the other three major groups. Survey data has also been analyzed by domain subgroups, but is not reported here. Although 48 respondents does not represent a statistically significant sample, it provides many more inputs to the curriculum design than those of the 8 team members.
Many detailed results were obtained from the survey. Two top level charts are shown in this and the next slide. This slide shows the overall average results for the desired level of proficiency in the 10 knowledge areas for a graduate from a 3 day course.

The first thing to notice is that the Pros desire proficiencies in the range of 2-3. This should be quite achievable based upon the previous experience. The Newbies expect less proficiency after 3 days, and we should be able to exceed their expectations.

The Pros put more emphasis on fundamentals over tools, methods and applications. Although the difference is not numerically large, remember that the scale is quite non-linear. This is not an either-or choice. Both fundamentals and tools will be taught. But the emphasis should be on understanding why the tool is useful and what it is being used for. People and Organizations was a topic that both Pros and Newbies desired proficiency, and this will be very much a part of the new course.

Implementation was given a lower priority than the instructors expected. It is marginally higher than the context for implementing lean healthcare and an understanding of healthcare enterprises.

Summing up, the VoC survey results indicate a balanced curriculum which assures that students understand lean six sigma fundamentals. The new course will cover all these areas, with emphasis reflecting this input.
VOC on Specific Topics

Pro's Desired Proficiency of 99 Topics

No demarcation between most & least important topics
Cannot cover all topics in 3 day course

VOC survey was helpful guide for course developers
Day 1 of the course will be framed in a clinical context with teams of students at each table representing a clinic, including registration, triage, treatment, diagnostics (x-ray, ekg), pharm, discharge, and maybe even foreign language translation. A clinical simulation will utilize lean principles to see the process, find the waste, and enable smoother flow. Opening modules will cover the background of lean and the context driving healthcare improvement. The first of three people and organizational modules will address the critical role everyone plays in a lean improvement, emphasizing: respect & trust, alignment of goals, and teamwork. A guest speaker involved in lean implementation will add real world examples.

Day 2 will introduce the patient value stream in a tertiary facility, likely in an ED context. Student teams at tables will represent different departments for the now expanded simulation. The opening module will address defining Value in healthcare. Value stream mapping and analysis will occupy the morning. The afternoon will address the impact of variation, six sigma basics, and the critical topic of safety. The second people module will focus on communicating across boundaries of teams and departments.

Day 3 will take the lessons from Day 2 to envision a future state for the patient value stream and how to implement it, again using the simulation from day 2. The remainder of the topics on Day 3 will be at the medical center enterprise level covering enterprise implementation, high performance organizations, and an enterprise guest speaker to “pull it all together”.

Students will be asked to bring to the class an “improvement opportunity” from their home organization. At the end of the course, they will have created an A3 plan for that improvement. This will be built incrementally with home assignments on days 1 & 2 and a final working session on day 3. Course instructors will help students during breaks and before or after class as needed.
EdNet

Topics Covered

- 5 Whys
- 6S
- 8 wastes
- A3 approach
- Balanced scorecard
- Balanced work
- Capacity, throughput, queuing
- Cause and effect diagrams
- Check Sheets
- Current state
- Customers – internal and external
- Cycle time
- Effective communication
- Enterprise stakeholders
- Failure modes and effects analysis (FMEA)
- Flow
- Future state
- Just-do-it
- Kanban
- Lean is a journey
- Lean is a way of thinking
- Little's law
- Mistake proofing
- Muda, muri, mura
- Non value-added time
- Pareto charts
- Perfection
- Plan-do-study-act (PDSA)
- Point of use
- Policy deployment
- Process maps
- Project selection and prioritization
- Pull
- Relational coordination
- RPIW
- Single piece flow/cells
- SIPOC
- Six-sigma
- Spaghetti diagrams
- Standard Work
- Standardize-do-study-act (SDSA)
- Takt time
- Teamwork fundamentals
- Value – multiple perspectives
- Value added, non-value added, waste
- Value stream flows: people, info, material
- Value stream mapping and analysis (VSMA)
- Variability reduction
- Visual control
- Wait time
- ..... and more
The EdNet has now started its journey into Lean Healthcare. It is building upon its earlier journey of the LAI Lean Academy. Only time will tell where this new journey takes us. Our hope is that the new LAI Lean Healthcare Academy will be a magnet for drawing new members to the EdNet and to the course instructor team so that a core curriculum can be developed and diffused into many academic and other venues. Given our past experience, this will also increase the overall lean competency of those who actively participate.