Hello and welcome to AME 2019.

Thank you in advance for attending my session today. My name is Brent Weichers and I have been in the field of Continuous Improvement for over thirty years. I am a Lean Six Sigma Master Black Belt and my background is in automotive, aerospace, electronics, machining and tool industries. I began my career at Toyota and the bulk of my career was spent with Danaher, owners of Beckman Coulter, Tektronix and Fluke Instruments. I am currently the Director of Continuous Improvement at The Lighthouse for the Blind based in Seattle, WA. An Aerospace and Military Supply manufacturing company with almost 500 employees, 260 of which are blind or blind with other disabilities, in three manufacturing locations across the USA.

Please use the app for any question and follow up about today's session. Today we will be discussing and demonstrating a few Lean and Six Sigma training games that I have used over the years. In the last 20 years I have used feedback forms and now online versions like Survey Monkey to solicit feedback from attendees of my sessions. Just like I will here today from all of you. It's continuous improvement. But in those 20 years of requesting feedback, one of the things that stood out to me were the responses from attendees when asked "what did you like best about the training?"

A large percentage responded with "the activities". Attendees described how the activities and games help drill in the concepts they previously struggled with.

About The Lighthouse

- Now:
  - Modern facility east of downtown
  - $100 Million in Sales
  - Over 470 employees
  - 260 that are blind or blind with other disabilities
  - No longer making brooms
  - Aerospace, Federal government and US Military

On April 2, 1918, The Lighthouse for the Blind, Inc. was incorporated and began changing the lives of people who are blind, DeafBlind, and blind with other disabilities. Originally located in downtown Seattle, the employees assembled brooms and sold them door to door.

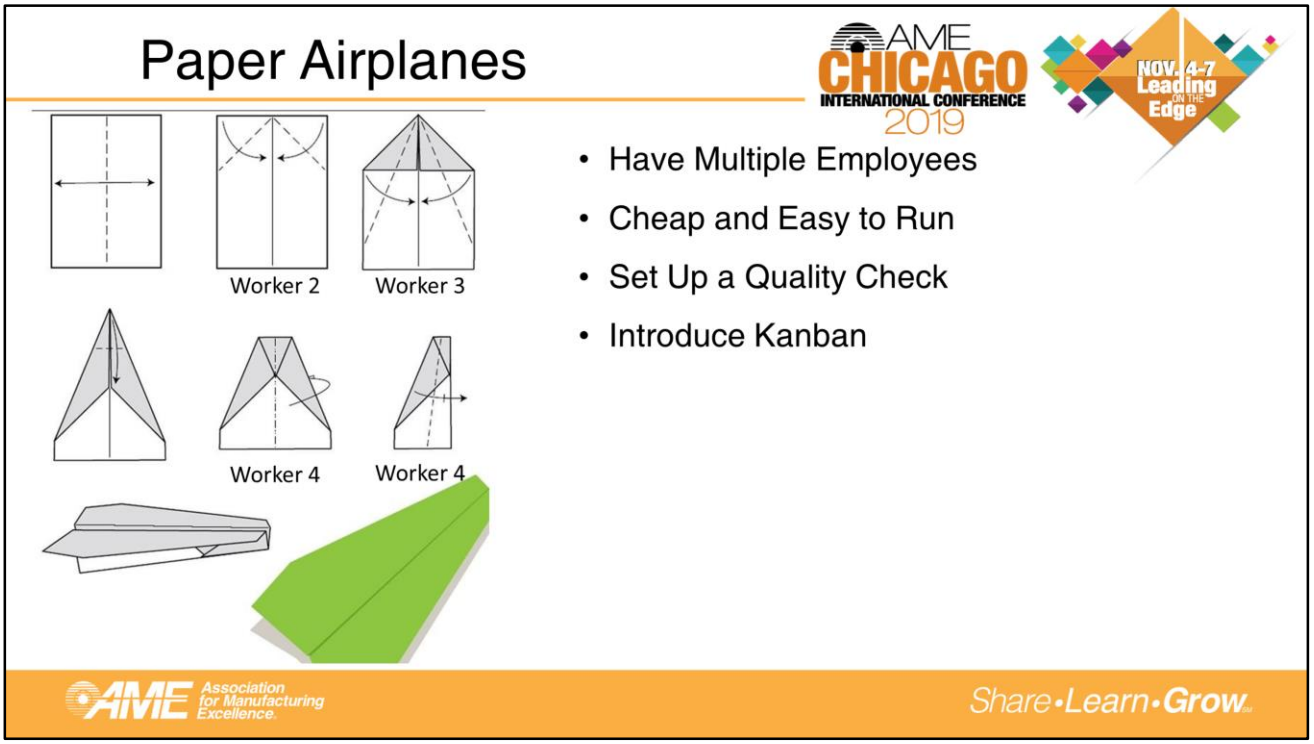
The Lighthouse has been at its current location just east of downtown since 1967. With a major expansion in 1980. We have now expanded to include manufacturing facilities in Spokane, Washington and Summerville, South Carolina.

Currently, Lighthouse employees manufacture aerospace parts, office products, and a myriad of other machined products for customers such as Boeing, Northrop Grumman and the Federal Government, including the US Military. We also provide administrative services for customers like the U.S. Navy and the Defense Contract Management Agency. We also manage Base Supply Center stores for several military bases, one located right here at Point Loma.

The Lighthouse currently employs over 470 individuals, more than 260 of whom are blind, DeafBlind, or blind with other disabilities. 70% of people who are legally blind are unemployed or under employed in this country. Our sales are expected to hit $100 Million this year.

The agenda for my presentation today.
We can talk a little about how to even make introductions a little more fun and interesting.
We will look at games for both Lean and Six Sigma concepts and some just for team building

There is usually the "Introduction" slide. You introduce yourself, your years of experience, title, etc. Name, rank and serial number. With smaller groups I like to have the participants introduce themselves with "two truths and a lie'. Give the participants 60 seconds to develop two truths and a lie about themselves. Have each participant introduce themselves to the group and the group guesses which statements are true and which is false.



I have used many methods to teach the basics of batch vs flow production over the years.

The paper airplane game is a simple exercise that illustrates in a visible and experiential way the difference between pull systems and push systems. They start with an assembly simulation for Round 1, where all 6 workers are used, and one person is the timer.

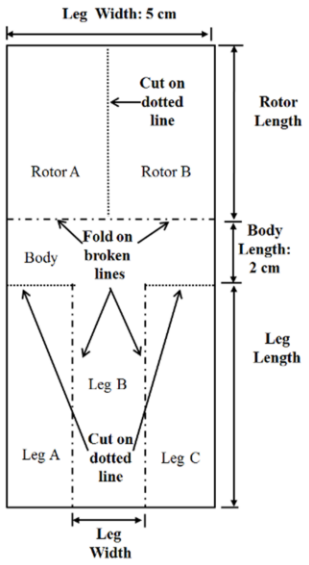
Participants

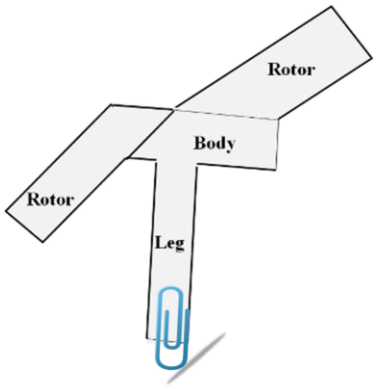
4 Workers, 1 Manager, 1 Material Handler, 1 Timer

This is the “Push” run. Have the participants make planes as fast as they can. Material Handler moving inventory between the participants in lots of 5. At a certain time, the Manager adds a color sheet of paper to the stack and notifies the timer. Once the color sheet hits the shipping dock the time stops.

During the Pull run, participants still build in a lot of five, but now they sit closer and build only to Kanban.

Paper Helicopters





- Better for small room
- Just drop and time
- Set up a DOE
- Change rotor length, leg length, width, etc.

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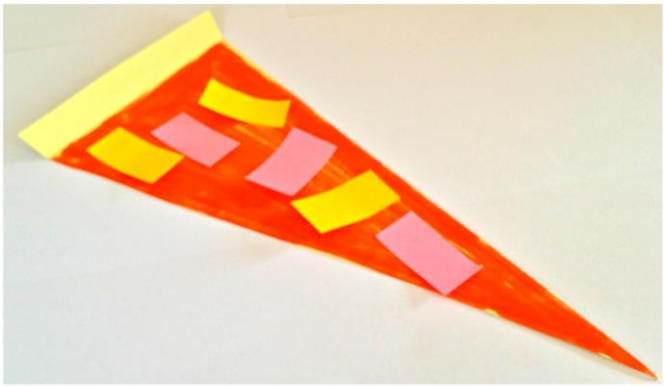
For a smaller space you can consider Lean helicopters. You can train all the other concepts with the helicopters that you do with the folding airplanes. But since you just drop these and time the decent they are great for smaller rooms and for DOE in Six Sigma training. By changing the leg length, rotor length, removing the paper clip, etc. you can have a wide range of option for gathering experimental data.

Kanban Pizza



It’s difficult to teach the principles of Kanban simply by lecturing. People have to experience the principles by themselves to get a feeling for how it all works. By playing a game, you can gain experience without messing up your daily work or getting engrossed in the technical details. This is why we use games and simulations extensively in our trainings. If we can find no suitable game we’ll create one... like the Kanban Pizza Game!

Each team gets paper of different colors, scissors and other materials. They will cut, shape and tape these together to form pizza slices according to the given recipe. Next, explain the scoring system and let each team calculate their score. The scoring system is designed to promote limiting the WIP and also serves as an indirect measure of flow (in our case, it correlates with the lead time as long as people don’t know the exact length of the round, and thereby produces the same behavior). Collect the scores and write them down in a matrix (teams vs. rounds) on a whiteboard or flip chart. At this point you can also ask the teams to pick names for their pizzerias. Now run a new one round with your newly established Kanban system. Again, don’t give any indications of when the round will end, just end it when you feel like it's a good moment in time (after 5-7 minutes). At the end of the round run a debrief and count the points.

Kanban Pizza

Tools Required
Tape
Two colors of Post it notes
Red Marker
Scissors
Yellow Note Pad

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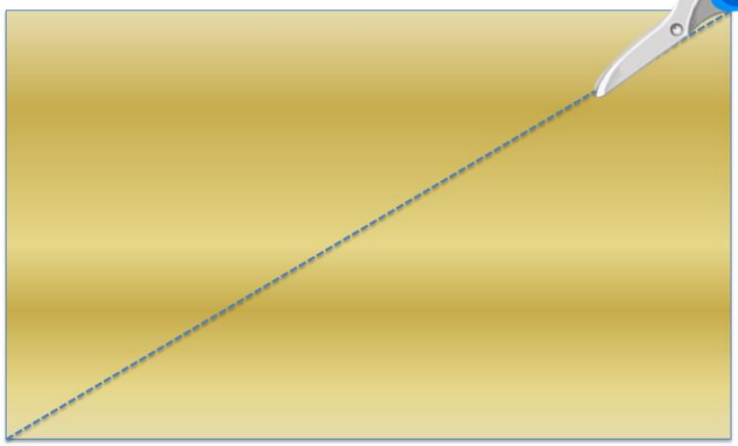
Tools Req:
Pink Post It Notes
Yellow Post It Notes
Red Marker
Scissors
Tape for Kanban squares

Kanban Pizza

1. Yellow paper cut in triangle (Crust)



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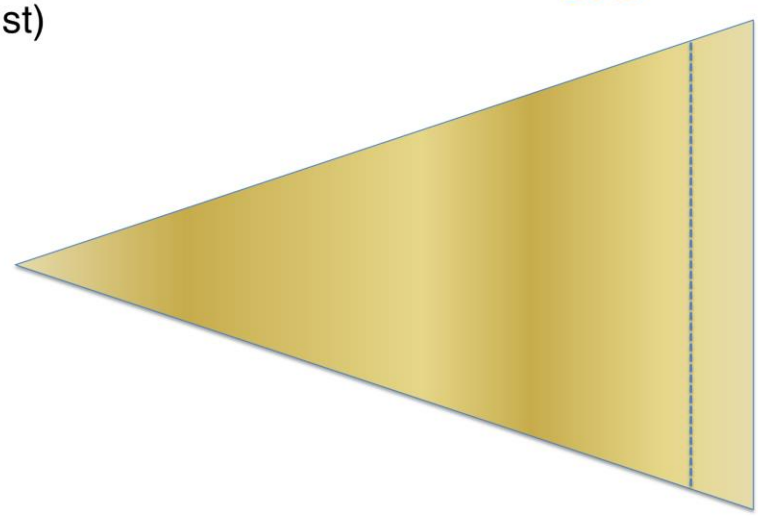
Pizza Maker #1:
As the game starts, we ask our participants to make pizza as fast as they can. Pizza Employee #1, your job will be to cut the page of paper at a diagonal corner to corner making two pizza crusts.

Kanban Pizza

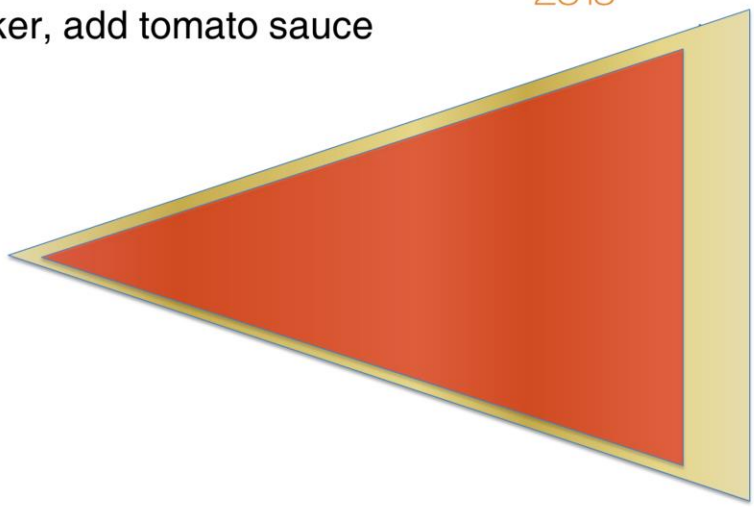
2. Fold end (Crust)



Pizza Maker #1:
Your next job will be to fold one inch from the large end of the crust to create an edge.

Kanban Pizza

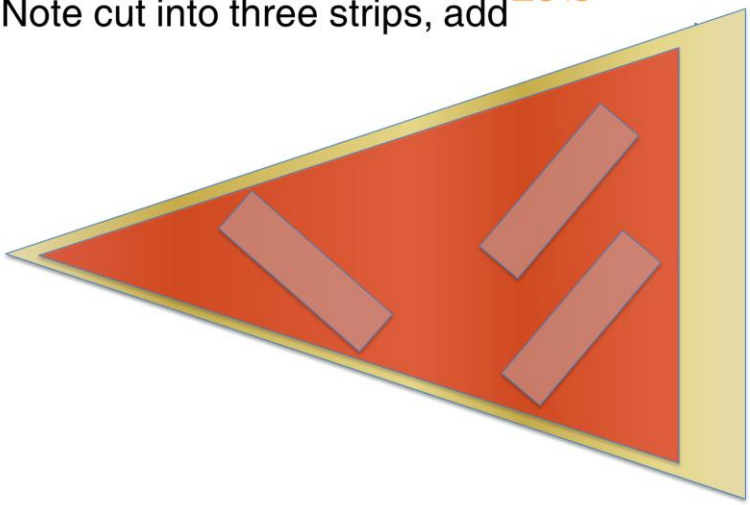
3. Using Red Marker, add tomato sauce



Pizza Maker #2:
Your job will be to spread the tomato sauce from the tip of the crust to the folder edge with the red marker.

Kanban Pizza

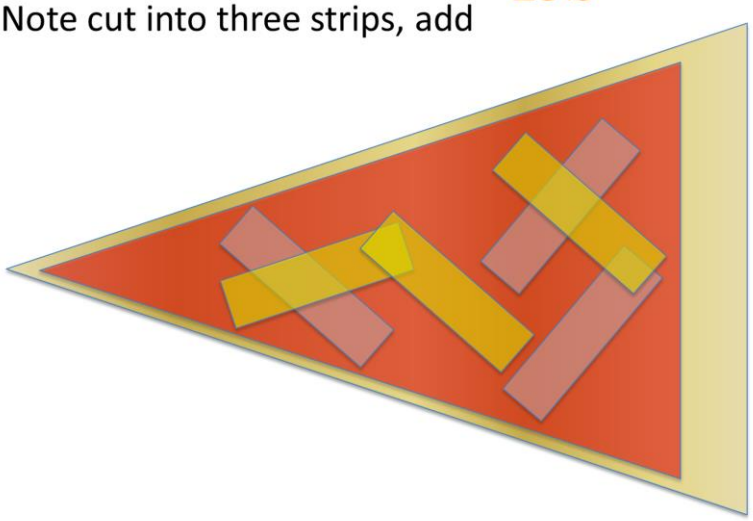
4. Using Pink Post It Note cut into three strips, add ham to pizza



Pizza Maker #3:
Your job will be to cut the Pink Post It note into three even pieces so each has an adhesive end and attach them to the pizza.
This is the ham

Kanban Pizza

5. Using Yellow Post It Note cut into three strips, add pineapple to pizza



Pizza Maker #4:
Your job will be to cut the Yellow Post It note into three even pieces so each has an adhesive end and attach them to the pizza. This is the pineapple. I know, it doesn't belong on a pizza.

Kanban Pizza

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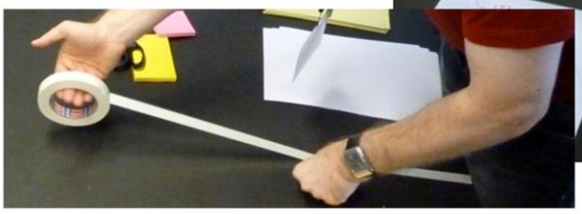
make your workflow explicit
Limit the WiP for each station

5 min time-box



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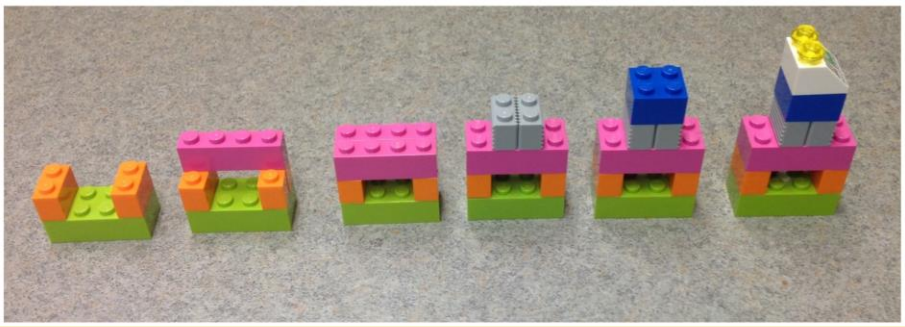
Now, let's review.
In the first round you will see a huge amount of topping go to waste, sometimes we had pizza for the customer, sometimes not. But no one makes any money. With the sale of the pizza minus the waste of WIP inventory.
Now, let's control our flow of the demand with kanban. Set up a kanban square between each operator all the way to the customer.
Now, set a CONTROLLED amount of WIP in front of each operator.
No more orders from the boss via forecast. Our demand comes from the customer.
As a customer takes a slice, more is pulled from the oven. No more is made until the oven pulls from the proceeding operations.

Lego Factory

The LEGO Factory

- Make a Lego product similar to what you manufacture
- Small, easy to transport
- Annoys the TSA
- Tactile



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The Lego Factory.
The same rules apply to the Lego Factory as the airplane folding and the helicopter game. You start building your lot of five, slowly reducing your lot sizes from three to one as the process accelerates. You have a lot more variation so the opportunities to improve in the training gives the trainees more to work with. Participants can set up 5S, Kanban, sub assemblies, WIP. On the plus side you get to buy Legos in bulk, get a Lego VIP card and best of all, put Legos on your expense report and drive accounting nuts.

Lego Factory

Lego Factory KPI				
Team: Alpha				
Pre Kaizen Run of 5				
Min / Sec	Seconds	# of Assoc	Productivity	Labor Cost
03:03	183	6	220	$13.18
Pre Kaizen Run of 3				
Min / Sec	Seconds	# of Assoc	Productivity	Labor Cost
02:03	123	6	148	$8.86
Pre Kaizen Run of 1				
Min / Sec	Seconds	# of Assoc	Productivity	Labor Cost
01:47	107	5	107	$6.42
Post Kaizen				
Min / Sec	Seconds	# of Assoc	Productivity	Labor Cost
00:55	55	5	55	$3.30

Tracks:

- Seconds to complete round
- Productivity
- Labor cost

During the Lego Factory I keep track of each round measuring time, productivity and cost on a special spreadsheet. Getting the trainees to think about the amount of touch time and the lack of flow, WIP and how that relates to cost.

I also keep a historical record of the different teams and how they stack up because people are competitive by nature and they usually ask how they compare. In the first two rounds, the productivity seconds is higher that the seconds to deliver the 5 units. The difference is the wait time between operators. Once the batch size is reduced to 1 the wait time goes to zero.

Very important for operators to see.

Lean Bingo

Lean Bingo. A lot of people on the shop floor have a difficult time staying focused during a training. I introduced Lean Bingo. They pay attention and constantly ask questions trying to get me to "say the word" they need to complete their game card and get the prize, chocolate. The terms can be easily changed and used for other trainings. A random generator makes each card unique. An Excel file that reads from a table.

Catapult Game

"Because there is no better way to learn about Six Sigma tools than with a catapult"

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When training Six Sigma concepts, what process introduces more variation than a Catapult? This is a great game to introduce the tools used in Problem Solving. 5Why, Ranked Pairs, Input / Output Matrix, Pugh Matrix. Using the Range calculation, participants brainstorm the causes, introduce corrective actions and learn to capture data using the scientific method.

How the Catapult Game Works

1. Catapult
2. Ammo

1. Launch your ammo 10 times using all team members
2. All Ground Crew take turns launching
3. Measure the distance from ground zero to landing site
4. Record the data and calculate the range from target for the 10

I purchased these from an online vendor, a rather large one. From Seattle. Starts with an A. But only $10. I have the teams shoot 10 times towards a target and measure how far off target they were.

Then, they kaizen. Using brainstorming tools and quantifying tools like the input / output matrix, the participants make changes based on data then shoot ten more times. With a goal of reducing their range from target by 50%. Most beat that by much more.

Flying Fish

Flying Fish

- Great for Transactional Process
- Gets People Moving
- Makes the TSA Wonder about You

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The Flying Fish Game is a fun way to demonstrate the importance of controlling production or flow with Kanban or Andon signals with the idea of getting processes to cooperate with each other.

I like to start with 5 to 6 Flying Fishes, 20 in all purchased via Amazon for approx. $15. Explain that on your expense report.

I have a "Material Handler" hand 5 over to Operator One after choosing 5 to 6 operators in the group. Make sure they are far away from each other.

Each Operator lines them up side by side, spins each one, then carries them to Operator Two. And so it goes until I have all the Flying Fishes returned to me.

Document the time elapsed for the group to see.

Now, discuss what took so long. Waiting, travel.

Introduce one piece flow. Hand all 20 to Operator one. Have them spin it then toss it to Operator Two. And so it goes. What happened? Did you get a fish before you were ready? How could you tell if you could toss it? Isn't one piece flow supposed to fix everything?

Now, introduce a Kanban signal. Have each operator hold up their hands when they ready to receive a fish. How much smoother was this round?

If you have time, you can ask the obvious question of what you would do next which is usually sitting next to each other.

Dice Game

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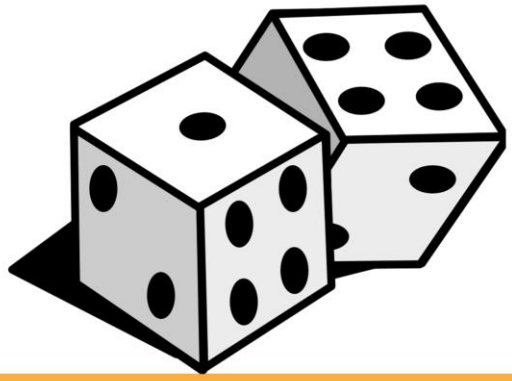
Six Sigma

Normal Distribution Analysis for The Roll The Dice Game



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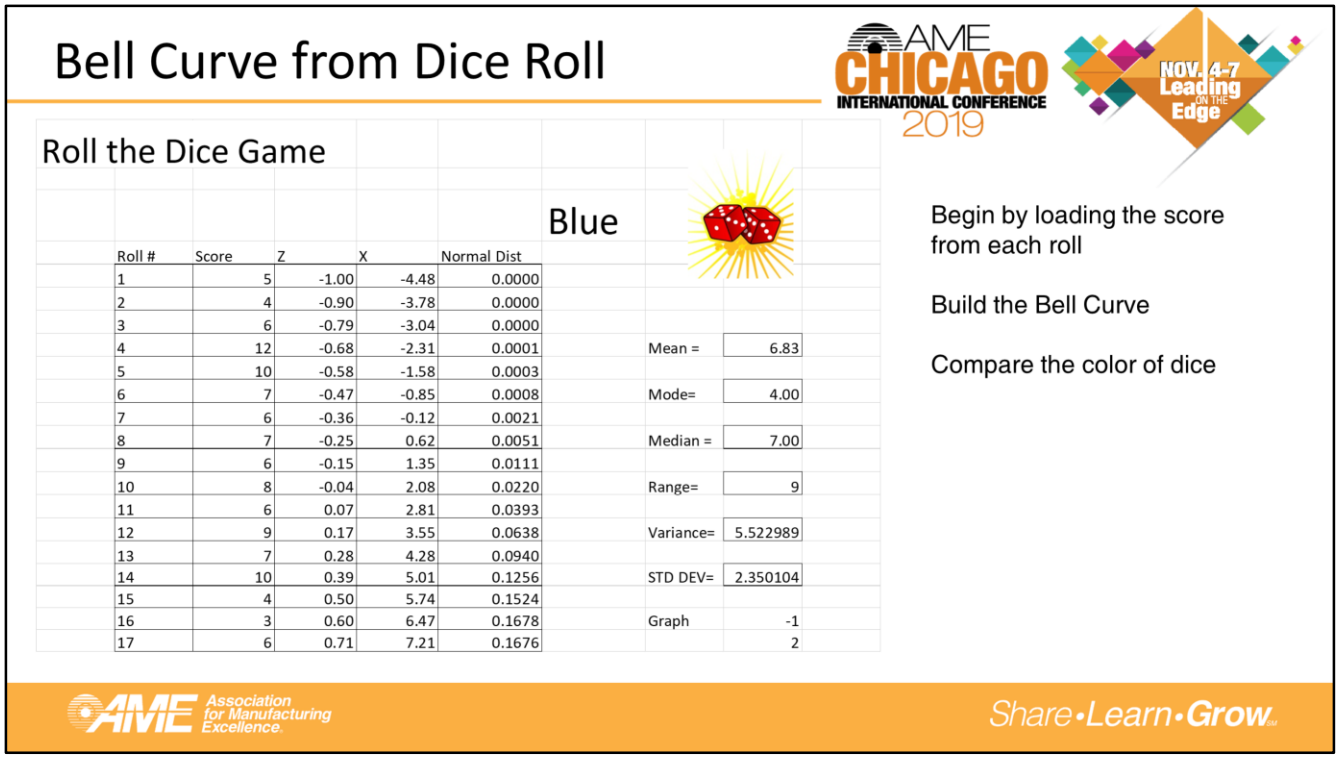
How many of you have had participants nodding off half way through trying to explain distribution analysis or a bell curve? Describing Mean, Mode and the distribution of data is difficult enough.

Bell Curve from Dice Roll



Roll the Dice Game

Blue

Roll #	Score	Z	X	Normal Dist
1	5	-1.00	-4.48	0.0000
2	4	-0.90	-3.78	0.0000
3	6	-0.79	-3.04	0.0000
4	12	-0.68	-2.31	0.0001
5	10	-0.58	-1.58	0.0003
6	7	-0.47	-0.85	0.0008
7	6	-0.36	-0.12	0.0021
8	7	-0.25	0.62	0.0051
9	6	-0.15	1.35	0.0111
10	8	-0.04	2.08	0.0220
11	6	0.07	2.81	0.0393
12	9	0.17	3.55	0.0638
13	7	0.28	4.28	0.0940
14	10	0.39	5.01	0.1256
15	4	0.50	5.74	0.1524
16	3	0.60	6.47	0.1678
17	6	0.71	7.21	0.1676

Mean =	6.83
Mode=	4.00
Median =	7.00
Range=	9
Variance=	5.522989
STD DEV=	2.350104
Graph	-1
	2

Begin by loading the score from each roll

Build the Bell Curve

Compare the color of dice

By using a big set of foam dice, the participants roll 30 times and document the scores. The spreadsheet builds the bell curve and participants compare their data between the colors. By asking participants to choose which set most roll a seven or which set varied the most teaches them how to read the data and how it is used in real life.

And, at the end of a long session, I love to pull this one out of the toy box. Lifeline icons like the 50:50 option, the Phone a Friend lifeline are all here. Works just like the television show, “Who want to be a Millionaire”. With beginner skill in Powerpoint you can easily modify the slide to make the questions and answers anything subject you like.

Leading on the Edge

- Over 80% of Participants Linked Games to Learning
- No Death by PowerPoint
- Allows Participation by All Levels
- Gets People Moving

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Thank You!

Your opinion is important to us!

Please take a moment to complete the survey using the conference mobile app.

Session No: WS/26
Lean and Six Sigma Training Games
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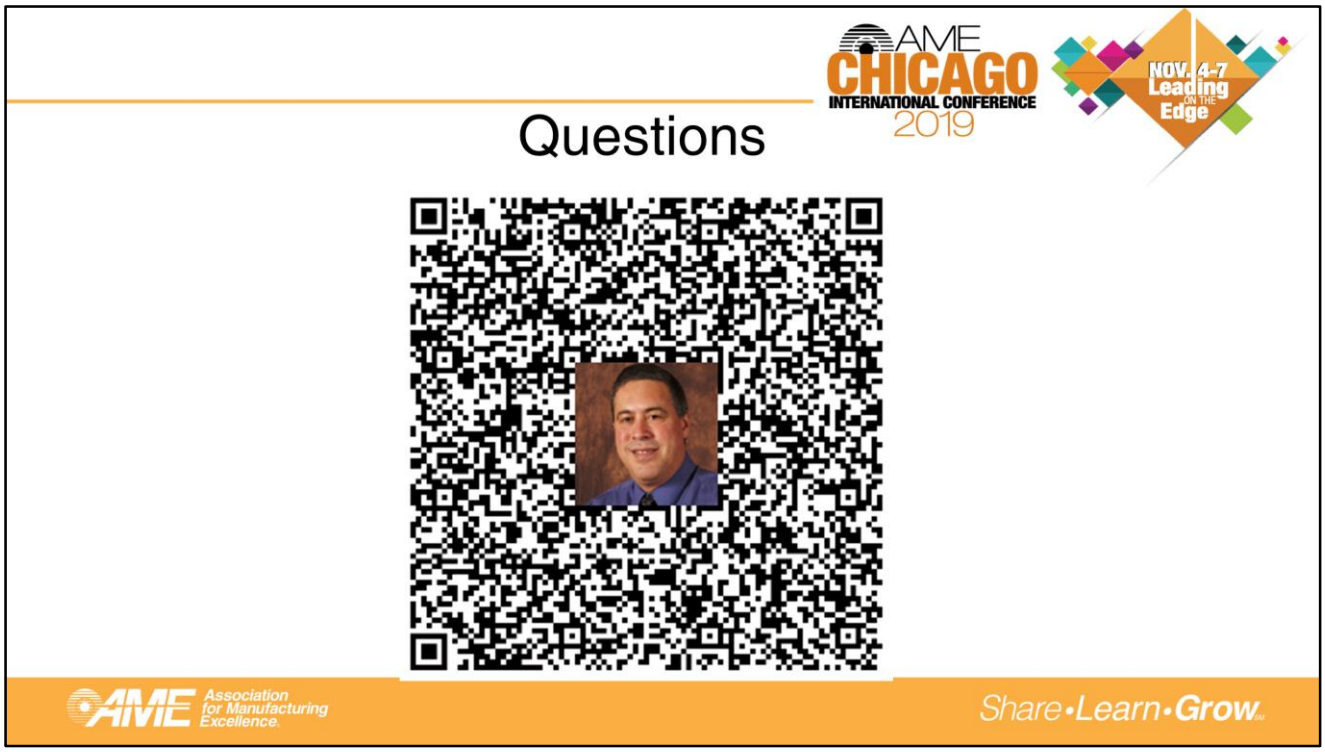

Thank you all for you time. Scanning the QR Code will load my contact information if you have any questions about The Lighthouse or the materials I use in my training sessions, please feel free to contact me. The link below will take you to a cloud folder with all the games demonstrated today.
https://1drv.ms/u/s!ArOi5vy91zOlgacm6v93vKEv7tS1Pg?e=bjc94Z