Some basic instructions on how to conduct the Red Bead Experiment or Red Bead Game.

The Red Bead Experiment can be conducted with a Lightning Calculator Sampling Bowl or Sampling Box. While Dr. Deming used 80% white beads and 20% red, you will find this experiment done with 80% white and 20% colored. The colored beads add another dimension to the demonstration. This will be self evident as the script is read.

This is a clever demonstration of the futility of most management systems for improving quality. Dr. Deming often refers to it as a stupid experiment that you’ll never forget. The experiment is described in a form similar to Dr. Deming’s presentation in his seminars. As will be described at the end, it can also be adopted for very small groups and even a one on one presentation.

The experiment starts with a sampling device that has 80% white and 20% colored beads, normally red beads, hence the name “red bead experiment”. The fact that the some sampling devices have various colored beads instead of all red is of no consequence, the experiment works just as well. It is necessary however to have 20% colored beads to go along with the text of this demonstration. If different colored beads are used instead of all red, then the colors can represent different kinds of defects. (This will become clearer as the demonstration is described.)

The objective of the bead factory in the demonstration is to make white beads. The customer will not accept anything but white beads, all colored beads are defective. The colored beads themselves represent defects in an organization’s business processes. They represent a faulty machine or tool, a bad engineering design, a defective part, a procedural flaw, an unreasonable change request, … all the things that can and do go wrong with a process. Supervisors and management control the number of red bead in the processes that are given to the workers. Now, let’s proceed assuming that management has developed and purchased the white bead process for the workers of this experiment.

The Red Bead Experiment

The instructor should take on the role of the department foreman or department supervisor and first of all selects his work team. Realizing that one of the objectives of this demonstration is to point out management prejudices, the instructor can use whatever slogans or phrases he believes fit his particular audience. It many start like the following.

Foreman: Okay I need eight bodies. (Pointing to people he wants to select) Can you count? Okay you’re hired. Can you push buttons? Okay you’re hired. You don’t have to think, you just have to do what I tell you. You’ll be on an apprenticeship for a while and if you work out we’ll hire you. We believe in high quality. We need good people.

So the process goes until all nine people are selected. The roles they will perform are as follows:
Foreman (the instructor)Worker 1 – Bob (assuming fictitious names for this description)Worker 2 – DorothyWorker 3 – HenryWorker 4 – CalvinWorker 5 – CarolWorker 6 – JudyInspector 1 – RonInspector 2 – MartyChief Inspector – Darwin

What will happen is that each worker will take turns drawing a sample of 50 from the sampling device. If you are using a sampling bowl then use the 50 hole paddle. If you are using a sampling box then designate the 50 hole pattern that you will use. This can be done verbally, mark on the face of the box with a water based transparency marker, or mask off the excess holes with masking tape, etc. Once a sample is drawn, then it will be checked by both inspectors (this high quality company has 200%
inspection) who will independently write down the number of colored beads they count and show it to the chief inspector. The chief inspector will compare the counts, record the information on a data sheet and a graph, and then announce the number of colored beads drawn in the sample. The data sheet will show the names of the six workers and how many colored beads they each draw for the four days of the experiment. The data sheet will look like the sample data shown in figure 1. The graph will have six plot points for each day for four days.

After the samples are counted, the beads are returned to the sampling device and another sample is drawn (shaking the box or mixing the bowl adds to the demonstration). Obviously the percent defective is a constant 20% but the actual percentage will vary with each sample due to sampling error and this is where the spoof begins. While there are some lessons in statistics than can be taught from this experiment, the real punch line is in the way the instructor conducts the demonstration and allows people to see themselves and the futility of management practices for improving quality. Each instructor has to know is audience and how far he can push his points without turning them off.

As the experiment is carried out over the four days the instructor uses the results of the samples to make his points. Realizing that the data will most likely vary between 1 and 19 (determined from the control chart calculations for UCL and LCL for a process that is 20% defective and sample sizes of 50). There are a variety of points that can be made. The exact order that the instructor will make the points will be dependent on the actual data developed in the experiment. However, after 24 samples you will have enough high and low readings along with increasing and decreasing trends to make all the points.

**Clear Instructions**

The first point of the demonstration has to do with giving clear instructions. Management often believes that if they make the objectives clear then the problems will go away. It could go something like the following:

Foreman: Bob you know that our job is to make white beads, the customer will not accept colored beads. You make white beads by first of making sure that the material is well mixed. If it is not mixed well you will have trouble making white beads. (Demonstrate how you want the box shaked or the beads mixed in the bowl) You then turn the box over and hold it completely flat while you push this button on the end and white beads will fall into the holes. (If you are using a sampling bowl then the describe how the paddle is to be used to draw a sample.) Place the paddle into the bowl at the end, scoop deep into the beads and raise the paddle slowly at an angle of precisely 30 degrees and let the extra beads roll off the paddle. Now I’ve described the job for all you very clearly. I’m sure that all of you can now make white beads. Bob, would you please make our first batch of white beads.

Bob draws the first sample and shows it to the inspectors who record the count and they show it to the chief inspector. He then announces that we have 14 red beads. If colored beads are used then let red beads be red defects, green be green defects, yellow be yellow defects, etc.

Still have the chief inspector count and record the total number of colored beads, but have him also report the different number for each color. The instructor can then use this to attach more blame to the worker, i.e. “Yellow defects, you know they are the worst kind and most costly to repair,” and so on.

Foreman: Bob I’ve told you that the customer will only accept white beads, colored beads are not acceptable. Did you mix the material and hold the box completely flat like I told you? (Did you hold the sampling paddle at precisely 30 degrees?)

Bob: Yes I did

Foreman: Well you must not have been paying attention. Dorothy can you please make us a batch of
white beads? Remember all that I’ve told you. (repeat the appropriate instructions again). Dorothy draws a sample and it comes out to be 12 colored beads. Foreman: Well Dorothy that is better than Bob, but you must not have been paying attention either. Let me repeat the instructions once again. (repeat the appropriate instructions) Henry will you please run this process. Remember that the customer will only accept white beads.

**Intimidation**

Henry then draws a sample and it comes out to be 15.

Foreman: Henry I need to talk to you. Didn’t you hear me when I gave all these people instructions on how to make white beads? What were you doing at the time, dreaming of some date you were going to have with Judy? I thought you said you wanted a job. We bring you here, give you clear instructions, show you how to make white beads and you still don’t do it. What’s the matter with you? Now I’m telling you people, you all better start paying attention or I’ll have to fire all of you. Calvin it’s your turn.

**Praise and Comparison**

Calvin draws a sample and it comes out at 8 colored beads. Foreman: Now that’s much better. Calvin you are catching on. Calvin got the same instructions as the rest of you and he is now beginning to master the process. He was almost twice as good as Henry. We are going in the right direction now. Henry, you especially need to watch Calvin and see how he did it. In fact, the rest of you should all watch Calvin and see how he does it. Carol, it is your turn.

**Banners and Slogans**

Carol draws a sample and it turns out to be 10.

Foreman: Carol, I told you to watch Calvin. He knows how to do it. Now all of you listen up. We have firm quality standards at this factory. Didn’t you read the quality first banner over the door of the factory? See that poster on the wall over there, it says “Satisfied customers are happy customers and that means they will buy more.” Quality is critical to our survival as a company and you know what that means for all our jobs. This company has to get the silver star quality award. It is crucial to our success in the market place. Judy please show us how it’s done.

Judy draws and sample and it come out to be 6. The foreman then walks over and talks to the chief inspector.

Foreman: Darwin, here is a prime example of quality improvement. You see once I pointed out to everyone that we are really serious about quality at this factory, people started to improve. Judy ran the best batch of white beads that we’ve seen so far. I think that we need to put a poster by everyone’s machine instead of just a few on the wall that we have.

You know if we buy some of those quality first buttons we all could wear one and give one to every employee that improves. I’m sure that we can drive the point home more about quality. While today wasn’t the best I’m sure we’ll do better tomorrow. (while walking over to Judy) Judy, excellent job. Keep up the good work.
Incentives

Tomorrow comes and the foreman asks Bob to run his batch of white beads. Bob runs his sample and it comes out at 10. Foreman: Bob you’ve done better than you did yesterday but we are still going in the wrong direction. I’ve talked this matter over with our management and we are going to institute a quality bonus for everyone who runs good parts. If you guys and gals will all do better we will have a big pizza party and bonus for everyone.

After the bonus scheme is in place Dorothy draws 5, Henry draws 6, and Calvin draws 8 colored beads. The foreman then talks to the audience as if they were the management. He is explaining the value of the bonus scheme.

Foreman: Well after we instituted the bonus scheme that I recommended things got better immediately. While things have been going up and down we are still much better than we were yesterday. I think that our people are finally getting the message and all our efforts with the new quality banners and quality first buttons are paying off. We are definitely on the road to zero defects. I think that we should design another button with a big zero in the middle that is surrounded by gold stars that we can present to our best employees. In fact I would like for one of you to speak at our employee meeting and tell them about this exciting new zero defects button program.

Blame

Carol and Judy then each draw 11 colored beads. The foreman is very upset that things are going bad after he has told management that things were improving. He then goes over to the chief inspector and discusses the problem with him. Foreman: Darwin, I’m really upset. These people don’t care. Here you give them a good job and show that it is possible to improve and what do they do, ignore you and make life easy for themselves. I know that our incentive scheme was working, look at the results. I think Carol and Judy are spending too much time talking to one another and not paying attention to their job. I think that I’ll warn both of them about their performance and tell them if I catch them talking again that I’ll have to discipline them.

Performance Appraisals

This process continues again and again until all 24 samples have been taken. The data is then summarized for display and the supervisor then rates everyone’s performance. The data is then placed on an overhead projector or summarized on a chart pad.

Foreman: Bob, you started off bad and then improved slightly. You have got to do better. Dorothy, you started off bad, then you improved, then you fell off the wagon again, and then improved again. You need to pay closer attention to your work and gain more consistency. Henry, you started off terrible and then you finally caught on. You have the same problem as Dorothy, you need more consistency. Calvin, your the best employee in the department, but you still have room for improvement. You could be the first employee to earn the zero defects button that the manager talked about at the employee meeting. Carol, your performance needs to improve. Your overall rating was good. You can do better if you stop all that talking with Judy I warned you about. Judy, you need to pay attention to your work. You started off good and something must have distracted you. I think it was all the talking with Carol.

The foreman should now take on the role of explaining the results to management as he turns to the audience. The focus can now be on the graph and the noting of the various trends. The same praise and blame is offered for the trends. An evaluation of the trends for each day and an overall comparison of
each of the workers may be appropriate at this point, as you try to present the results with the best possible explanation. The supervisor would then promise that they can do better and explain all the new quality programs that are in place to address the problems, i.e. posters, etc. He would make special note that he had warned the Judy and Carol and gave them unfavorable performance evaluations.

What this means is that given a 20% defective process, and with sample sizes of 50, that the number of colored beads will vary over 99% of the time between 1 and 17 just due to random chance. In the demonstration we knew that it was random chance because we controlled the experiment by virtue of a constant number of beads. In actuality, we have what Dr. Deming calls a “stable process,” or a system that is varying only because of random chance. This random chance is also referred to as only being affected by “chance or common causes.” Note that a stable process may still turn out faulty items.

**Deming: The Fourteen Obligations of Top Management**

1. Create constancy of purpose for improvement of product and services.

2. Adopt the new philosophy.

3. Cease dependence on inspection to achieve quality.

4. End the practice of awarding business on the basis of price tag alone. Instead, minimize total cost by working with a single supplier.

5. Improve constantly and forever every process for planning, production, and service.

6. Institute training on the job.

7. Adopt and institute leadership.

8. Drive out fear.

9. Breakdown barriers between staff areas.

10. Eliminate slogans, exhortations, and targets for the work force.

11. Eliminate numerical quotas for the work force and numerical goals for management.

12. Remove barriers that rob people of pride of workmanship. Eliminate the annual rating or merit system.

13. Institute a vigorous program of education and self improvement for everyone.

14. Put everybody in the company to work to accomplish the transformation