
Using “Four Days with Dr. Deming” to Train Organizations

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1

Introduction

Four Days with Dr. Deming: A Strategy for Modern Methods of Management was written to be used both as an introductory text for Dr. Deming's Message and to be used in training people in understanding his ideas. There is no real substitute for having attended the Deming Four Day Seminar. The book comes as close as is possible to experiencing the Seminar. This report gives a brief idea of how to go about presenting Dr. Deming's ideas in a corporate setting.

Covered in the report are some thoughts concerning the trainer, the audience, the methodology and the syllabus for each type of audience. If this report is sketchy, it is because the authors of the book are working on a training manual and are using this report as an interim step.

The Trainer

Large corporations have training departments that are quite up to the task of educating members of the corporation. In other organizations, the training function is not as well defined. This section sets out the requirements for training when using the text *Four Days with Dr. Deming: A Strategy for Modern Methods of Management*.

The ideal instructor is skilled in two aspects of the task: understanding of Dr. Deming's ideas and the skill to train all levels of management and workers. The authors of the book can help corporations in either or both of two ways. First they can train management and staff directly. Alternatively, they can train instructors in the organization in how to present the material properly.

The Need to Understand Dr. Deming's Ideas

Dr. Deming's ideas are very profound. While a trainer can teach these ideas with some general knowledge of them, the trainer faces two problems. One problem comes about if the trainer does not understand the idea. The authors have seen lack of understanding result in lack of conviction. This is carried over into the audience. The trainer must be enthusiastic that the Deming ideas will help the company. If this enthusiasm is not present, the negative impact will be transferred to the trainees.

A second reason for the trainer to be immersed in the Deming concepts is that the teaching is best done with a large amount of student participation. As a result, tough questions are asked by the students. If the trainer is inadequately prepared to answer these questions, the student will get an erroneous negative impression of Dr. Deming's ideas.

The Ability to Teach Dr. Deming's Ideas

There are people in corporations who have mastered Dr. Deming's ideas but have never formally taught them to others. They may very well be good natural teachers. Then again, they may not know how to present the material most effectively. The corporate training department can help these people. There are some thoughts listed below to help both the novice and more professional instructor.

The Audience

There are several different groups making up the audience. It is worthwhile segmenting these groups and setting separate aims for each group. Among the groups identified in this report are senior managers, middle managers, supervisors, professional staff, and all other staff. Each corporate training office may choose to enlarge or collapse these groups.

It is recommended that the groups be taught in separate sessions. However, the authors have found that the presence of a senior manager at every session sends a message to the rest of the team that is most valuable. Far from restricting free exchange, members of the group often see the presence of a senior person as an opportunity to tell management some facts.

If the organization has one or more unions it is important to coordinate the training with the union leadership. In general it has been found that unions find the Deming ideas to be fair. Where the management has been sincere in using these ideas, unions have gone along. It is necessary to involve them as early in the process as possible. The training of the staff without the union's cooperation will become a major issue. By early openness and union participation in the training much misunderstanding can be avoided.

The training of union leadership may be among any of the groups below. This is a matter of determination based on the prevailing conditions.

Audience: Senior Management

Since senior management deals with policy issues, it is natural to build a curriculum that meets their needs. Emphasis and discussion should center on systems, the aim and other policy issues contained in the material. As described below, senior management should be the first group to study the book. A critical mass of the managers (see page 197 of the book for definition) need to adopt the concepts before starting to teach lower level management or staff.

The trainer has a deep responsibility to fully understand the Deming concepts before instructing senior management. Failing to understand the Deming notions, the trainer may misrepresent or not represent the ideas properly or effectively. It is best for senior management to be trained by masters of the Deming concepts.

For an example of a successful deployment of training in an organization see page 115 of the book. While this is an example of a successful transformation, the principles discussed above were followed. The author believes that this led to the success.

Audience: Middle Management

The training of middle management needs to consider their requirements. Middle managers generally carry out the policy of senior management. It is important for them to have a clear understanding of senior management's policy with regard to what they are studying. Their studies are more directed to learning how the organization structures itself with respect to the material covered in the text.

It may be that a company does not feel comfortable with a particular issue. The company may as a policy decide to implement some issues immediately and continue studying the others. This must be made clear to the middle management so that they do not become confused. It is a good idea for a senior manager to attend the training sessions to be on hand when difficult questions arise. The trainer, who is either a subordinate or outsider is often not in a position to handle these hot issues.

Audience: Supervisors and Professional Staff

The training for supervisors and professional staff is much more structured. Once the policy issues are decided, the structure of the training is set. It is necessary, however to discuss the reasons for any deviation from the policy. This should be done by a manager who can represent the organizations views.

Audience: Other Staff

The training of the rest of the staff can follow. Since the policy is set, this training is more informational and covers the points that management wants to emphasize. In particular it is important to cover the company aim to be sure that it is truly understood. It is considered important that the company aim be presented by the most senior manager available. This not only allows correct answers to questions but also sends a signal of the importance of these issues to the company.

Management may opt to cover certain issues in more detail than others. The training can be structured.

Methodology

The suggestions for the methodology are based on much experience with presenting the contents of the book to all levels of personnel in various organizations. These are not the only methods, but they are time tested to work.

Order of Presentation

It is important that the different stakeholders in the corporation receive the presentation in turn. If a lower level group hears the presentation before the higher level group has adopted the ideas presented, the lower level group will be frustrated. Their frustration stems from the inability to immediately put to use some of the concepts that they have learned. For instance, if the lower level group decides that appraisals are bad for the organization before this has become the organization's policy, they must continue to give appraisals in spite of their conviction. They will feel betrayed in that they were taught one thing and told to do another. This can call the whole process into question.

Suggested Methods of Presentation

Adult education or androgogy requires lots of hands on techniques to be effective. Experience indicates that the concentration span of adults is relatively short. The skilled trainer understands this and so varies his or her performance continuously.

The most effective method for presenting the material appears to be in teams. Teams of five or six people appear to be the most effective.

Teams

It is the author's practice to pre-assign the team member. Based on a knowledge of the organization, the trainer should consult with the highest level of management to determine who should work together on a team. As a rule, it is best to have members from different areas work together.

Teamwork is not a natural way of operating. Successful teams are distinguished from unsuccessful ones by the amount of training they receive. It is recommended that after the original ice breaker described below, the team members are give a brief introduction of how to act as teams. Each team member is assigned a role to play. A job description for various team members is shown below:

Reader The reader reads any material that the group requires to do their work.

Reporter - The reporter records the group's answers on a work sheet to submit for a group grade.

Encourager - The encourager encourages full participation by asking all members to offer their opinions, views, or answers.

Calculator - The calculator does the calculations that the group needs. The checker checks these calculations.

Runner - This is the only person in the group allowed to ask the teacher to help the group. He/she asks for assistance only if no one else in the group can solve the problem.

Checker - The checker has two responsibilities. First, he/she double-checks all answers on individual papers as well as the one paper the group will turn in for a grade. The checker is also responsible for making sure everyone knows and can explain the answers.

Facilitator - The facilitator keeps the meeting orderly. If necessary, the facilitator reminds the group of the Johnson & Johnson "T" for discussion. The facilitator calls on the members of the group and summarizes for the recorder.

1 Team Assignments

The team members are assigned initially alphabetically by their last and first names. After each activity or team session, the team members rotate the positions. Not all positions need to be used.

Team members must also be taught to understand what is involved in participating in a team. The teams as a group list the attributes of teams. There are a large number of social skills available

for the team to list. Breeden and Mosley identified the attributes shown in Table 2.¹ One way of eliciting the attributes is to ask the class to identify the characteristics of a quality team working in a conference room. If you open the door to the room what would a good team look and sound like? What would a bad team look and sound like?

Listening	Encouraging participation
Summarizing	Checking for understanding
Contributing ideas	Moving quietly to the group
Expressing feelings	Requesting further rationale
Using quiet voices	Criticising ideas, not people
Expressing support	Accepting other right answers
Explaining answers	Giving directions to the group
Asking probing questions	Relating past learning to present

2 Team Attributes

A training tool is a “T” chart such as accountants use. The attribute or social skill is placed on the horizontal bar. The vertical bar divides this into two parts. On one side the class lists what the attribute looks like. On the other what the attribute sounds like.

One of the most important attributes is criticising ideas, not people. In the heat of a team effort careless words can lead to serious misunderstandings. The trainer should explain to the class that when disagreement exists, it is best to first state your understanding of the view you consider incorrect. Perhaps your understanding is at fault. Perhaps you misunderstood a nuance. It give the other party a chance to clarify his/her view. In any case, it is flattering to hear that a person’s view has been considered to the extent of trying to understand it. This approach tends to make the discussion rise to the plane of ideas, not personalities.

The Red Beads

The book, *Four Days with Dr. Deming: A Strategy for Modern Methods of Management* follows Dr. Deming’s lesson plan. It is suggested to deviate from this plan to some extent. An excellent icebreaker and important topic is the subject of chapter 5, the Lessons of the Red Beads. This exercise starts the class with a common understanding of an experience all witnessed. It goes a long way to illustrating Dr. Deming’s findings.

Syllabus

The various lesson plans described below are merely suggestive. They can be changed as needed. The change of starting with chapter 5 helps to reduce the amount of time required for the other material. Much of the power of chapter 5 is in the way it demonstrates Dr. Deming’s ideas. Dr. Deming lectured to five hundred people at a time. They came expecting a lecture not training. The placement of the red bead experiment was at a critical point in the lectures to help the student see what had been discussed in theory.

¹ Breeden, Terri and Janice Moseley, *The Middle Grade teacher’s Handbook for Cooperative Learning*, Nashville, TN, Incentive Publications 1991 page 16

Not every trainer has Dr. Deming's charisma nor reputation. Therefore, it is necessary to set the stage more quickly than Dr. Deming needed to do. The red bead exercise is a perfect starting point.

Apart from this change, the rest of the syllabus follows the pattern set by Dr. Deming. Those who attended earlier seminars with him may be amazed to see a difference in approach from the early 1990's. The authors feel of the book feel that they may have contributed to this change. When sending an earlier draft to Dr. Deming for his review they included the overview of page 8. At the time it reflected the way Dr. Deming taught the seminar at that time. Page 8 came back with the comment, "We have to rethink this." After that Dr. Deming switched to the format now shown in the overview.

The time estimates for each section of the syllabus are approximate. They are there to give the trainer a notion of how to set up the session. The authors of the book are working on a more detailed and better instructor's manual which will be complete with overheads and materials needed to give a good course on Dr. Deming's ideas.



2

Study Guide

Listed here is a generalized syllabus. It needs to be modified for individual audiences. For instance, the amount of discussion for staff members of the organization will probably be less since it deals more with understanding than with setting policy.

The teaching objectives are the same for each type of audience. The difference in presentation is the amount of policy discussion involved. For senior management, the policy discussion is paramount. For other management a discussion of the implication of the policy is important. Supervisory and professional staff will be called upon to interpret the issues and so should spend their time in discussing this important aspect. The rest of the staff will be trained in the understanding of the issues.

The time elements indicated are based on experience with dealing with the various issues. They are most applicable to senior management. Other audiences will likely need less time.

In general the meeting room should be equipped with a minimum of an overhead, screen, and flip chart. The room must be large enough to accommodate the group as well as allowing for breakouts and the bead exercise. It is desirable to set the room up in a classroom style using tables and chairs for the students. Avoid crowding the students. Give ample room to spread out books and notes. It has been found useful to angle the student tables in a herringbone pattern. This gives better visibility of the trainer and the audiovisuals.

The front of the room should be able to accommodate the audiovisual equipment, a table for the trainer and enough room for ten people to move about comfortably.

The Lesson of the Red Beads

Teaching Objective

1. The purpose of this exercise is to learn from a simple but realistic experiment some basic elements of Dr. Deming's ideas.
2. This experiment is an excellent icebreaker.

Reference

See pages 86-102 in *Four Days with Dr. Deming*

Time Required

Approximately 3 hours are required for the exercise, follow-up and team discussion.

Materials

Four Days With Dr. Deming

Beads in container or bead box.

Paddle with 50 holes.

Overheads & pen

Notes on Method for Exercise

There are several ways to do this exercise. There is a small difference in using an open bead container or a closed sampling box. Dr. Deming's own preference was a sample of 2,000 wooden beads of which 400 were red and 1,600 were white. The beads were kept in two plastic containers with lids. One container, which held the beads and paddle fit into the larger one for traveling. His paddles were made of wood, metal and nylon. They all had a way of holding them and had 50 holes or indentations to hold the beads. Five holes in one direction and ten in the other.

Dr. Deming played the role of the foreman using a typical Frederick W. Taylor management approach. After selecting ten people from the audience, six willing workers, two inspectors, a chief inspector, and a recorder, he trained them. (See pages 87 and 88 for training methods.)

After training, he had each operator draw a sample as taught. Day one consisted of the six willing workers each drawing a sample. At the end of the day, he ranked the six willing workers. Day 2 is a repeat of Day 1. At the end of Day two, Dr. Deming introduced signs and slogans. At the end of Day 3, he brings in the threat of firing. Day 4 sees the six willing workers reduced to three. The fifth day with three workers falls within the statistical limits of the process.

The author prefers a slightly different approach leading to the same results. The use of a closed container with plastic beads seems to have some advantage. The selection and training of the staff is the same as the one Dr. Deming used. After the results of Day 1 are known, the best worker is rewarded while the worst worker is put on probation. The signs and slogans are shown. The workers are asked to sign the slogans as their pledge that they will no longer make mistakes (generate red beads.)

After Day 2, the review again praises and blames the workers. The author at this time introduces an incentive, a bar of chocolate to the worker with the lowest number of red beads. After Day 3 the chocolate is awarded and the threat of firing made. On Day 4 three workers are laid off. It often happens that the worker winning the chocolate on Day 3 is laid off on Day 4. Day 5 is operated in the way Dr. Deming used.

Dr. Deming disliked plastic beads because they adopt a static charge and create special causes. The static charge is used by the author to show the impact of the environment on the system.

The advantage of a closed system not only prevents loss of the beads but also allows the class to answer the question how can one improve the process. A common answer is to remove the red beads. The trainer then displays the box and shows that the beads are behind a cover that is screwed down. To get the beads out, one has to unscrew the cover. "Who holds the screwdriver," asks the trainer. "Management," answers the class.

Following the Bead Exercise

Construct a control chart of the data. Use an np-chart for this purpose. Show the chart on the overhead. Explain the chart. Cover the chart average, upper control limit, lower control limit. Most likely the points will be randomly distributed around the average. If this is indeed the case, make the point that only common causes exist and that the process is predictable. If possible, show how this data compares to an earlier set of data that you did. DO NOT USE OTHER PEOPLE'S DATA. It may not be the same process.

Discuss with the class the following questions:

1. After computing the cumulative average of red beads on Day 1, 2, 3 and 4, the result will be some amount, say 9.1 red beads among the drawing of 50 beads. There are exactly 20% red beads in the bead box. What is the long run average if we repeat the experiment? Most people will say 20%. This is wrong. The reason is that we are not taking a random sample. The trainer must be able to explain the difference between a random and mechanical sample.
2. What factors influence a mechanical sample? Using the bead box, the trainer tries to elicit from the class the five elements of a process: Method, material, machine, people and environment.
3. What was wrong with keeping the place open with the three best workers? What is the operational definition of best? Best yesterday or best tomorrow? The action did nothing to change the process. Actually all six workers were from the same population and their scores were from common causes only.
4. Was setting a target of three beads realistic? No. Management knew nothing about the system or its capability. The three bead goal was wishful thinking.
5. Prepare a Parato chart of the total of four days of red beads for the six willing workers. Prepare a Parato Chart from the data. Question: What are the vital few and the useful many? Answer: there are none. Use the c-chart method to show that each worker came from a common process.
6. How can we improve the process? Removal of the red beads is a common answer. Use the explanation given above.

Team Discussion of the Implications

Then break the group into teams and give the teams elementary training in team work. Have the teams answer one question each selected from the list of questions for chapter 5 (questions 82-92 on pages 207-208.)

Chapter 1. The Need for Transformation of Western Management

Teaching Objective

1. The purpose of this exercise is to learn why business management had to undergo a change.

2. Discuss the applicability of this section to the organization. What would it be like if no mistakes were made and everything worked exactly as intended?

Reference

See pages 10-32 in *Four Days with Dr. Deming*

Time Required

Approximately 1-½ hours are required for the lecture and team discussion.

Materials

Four Days With Dr. Deming

Overheads & pen

Notes on Method

Prepare a half hour lecture to cover the key points in chapter 2. Cover superstitious learning, America after World War II, our balance of trade, quick fixes, and forces of destruction. How do these issues affect the organization?

Team Discussion of the Implications

Then break the group into teams and have the teams answer one question each selected from the list of questions for chapter 1 (questions 1-4 on pages 203.)

Chapter 2. A System of Profound Knowledge

Teaching Objective

1. The purpose of this exercise is to gain an understanding of the System of Profound Knowledge. Learn that there are four components each interacting with one another.
2. Discuss the applicability of this section to the organization. Do we have an aim? (Sometimes called vision statement or mission statement.) Are we satisfied with it? Can every employee tell us what it is?

Reference

See pages 34-44 in *Four Days with Dr. Deming*

Time Required

Approximately 4 hours are required for the lecture and team discussion.

Materials

Four Days With Dr.. Deming

Overheads & pen

Notes on Method

Prepare a half hour lecture to cover the key points in chapter 1. Some topics to cover are Systems Theory, Aim, Sub-optimization, Variation, Theory of Knowledge (epistemology), and Psychology.

Team Discussion of the Implications

Then break the group into teams and have the teams answer one question each selected from the list of questions for chapter 2 (questions 5-39 on pages 203-204.) It is best to break up the team work into four parts: one on systems, one on theory of knowledge, one on understanding psychology and one on understanding variation.

Chapter 3 Obligations 1 through 5.

Teaching Objective

1. The purpose of this exercise is to learn about the first five of the 14 points
2. Discuss the applicability of this section to the organization. Are we satisfied with our aim? What is the implication for our organization to adopt the new philosophy? Are we getting the most from our inspection? Do we have hidden inspections? Is our purchasing policy ok? What do we do for continuous improvement?

Reference

See pages 46-67 in *Four Days with Dr. Deming*

Time Required

Approximately 3 hours are required for the lecture and team discussion.

Materials

Four Days With Dr. Deming
Overheads & pen

Notes on Method

Prepare a half hour lecture to cover the key points in chapter 3. Cover constancy of purpose, aim, what is meant by “Adopt the New Philosophy”, the need for inspection, the “All or Nothing” inspection plan, purchasing policy, Taguchi loss function, and the cycle of learning.

Team Discussion of the Implications

Then break the group into teams and have the teams answer one question each selected from the list of questions for chapter 3 (questions 40-71 on pages 204-7.)

Chapter 4. Obligations 6 through 9.

Teaching Objective

1. The purpose of this exercise is to learn about the next four of the 14 points
2. Discuss the applicability of this section to the organization. Is our training program to our liking? Do people know what is their job? Do we understand the difference between leadership and management? How do we drive out fear? Are there barriers between departments. How do we break down barriers between departments.

Reference

See pages 70-83 in *Four Days with Dr. Deming*

Time Required

Approximately 2 hours are required for the lecture and team discussion.

Materials

Four Days With Dr. Deming
Overheads & pen

Notes on Method

Prepare a half hour lecture to cover the key points in chapter 4. Cover training for skills, leadership, Fear and barriers.

Team Discussion of the Implications

Then break the group into teams and have the teams answer one question each selected from the list of questions for chapter 4 (questions 72-81 on pages 207.)

Chapter 6. Obligations 10 through 14.

Teaching Objective

1. The purpose of this exercise is to learn about the last five of the 14 points
2. Discuss the applicability of this section to the organization. Do we use slogans? What do they do for us? How do we know? Do we need quotas? Why? Do we use MBO? Why? What are we doing to develop our people? Do they have pride in their workmanship? How do we know? What are we doing about the education and growth of our people? How do we transform?

Reference

See pages 104-115 in *Four Days with Dr. Deming*

Time Required

Approximately 2 hours are required for the lecture and team discussion.

Materials

Four Days With Dr. Deming
Overheads & pen

Notes on Method

Prepare a half hour lecture to cover the key points in chapter 6. Cover slogans, exhortations, arbitrary targets, numerical quotas, lazy people, MBO, MBP, pride of workmanship, annual merit reviews, education, and transformation.

Team Discussion of the Implications

Then break the group into teams and have the teams answer one question each selected from the list of questions for chapter 6 (questions 93-105 on pages 208-209.)

Chapter 7. The Seven Deadly Diseases.

Teaching Objective

1. The purpose of this exercise is to learn how some of the points already studied can be misapplied and thereby hurt us.
2. Discuss the applicability of this section to the organization. Do we have any of the five deadly diseases that apply to organizations? What can be done about it?

Reference

See pages 118-132 in *Four Days with Dr. Deming*

Time Required

Approximately 1 hour is required for the lecture and team discussion.

Materials

Four Days With Dr. Deming
Overheads & pen

Notes on Method

Prepare a brief lecture to cover the key points in chapter 7. Cover the seven deadly diseases. Point out that number six and seven are applicable to the United States only.

Team Discussion of the Implications

Then break the group into teams and have the teams answer one question each. The question for each team is, "Do any of the deadly diseases apply to us?" "If so, why and what can we do about it?"

Chapter 8. Obstacles

Teaching Objective

1. The purpose of this exercise is to learn about obstacles to achieving quality.
2. Discuss the applicability of this section to the organization. Do we have any of these or other obstacles in our organization? What damage do they cause? How do we know? What can we do about it?

Reference

See pages 134-145 in *Four Days with Dr. Deming*

Time Required

Approximately 2 hours are required for the lecture and team discussion.

Materials

Four Days With Dr. Deming
Overheads & pen

Notes on Method

Prepare a half hour lecture to cover the key points in chapter 8. Cover instant pudding, copying, and gadgets.

Team Discussion of the Implications

Then break the group into teams and have the teams answer one question each selected from the list of questions for chapter 8 (questions 106-110 on pages 209.)

Chapter 9. The Funnel.

Teaching Objective

1. The purpose of this exercise is to learn about tampering
2. Discuss the applicability of this section to the organization. Do we tamper? How can we tell? What do we do about it?

Reference

See pages 104-115 in *Four Days with Dr. Deming*

Time Required

Approximately 1-½ hours are required for the lecture and team discussion.

Materials

Four Days With Dr. Deming
Overheads & pen

Notes on Method

Prepare a half hour lecture to cover the key points in chapter 9. Cover the various funnel rules and the use of control charts.

Team Discussion of the Implications

Then break the group into teams and have the teams answer one question each selected from the list of questions for chapter 9 (questions 111-118 on pages 209.)

Chapter 10. Operational Definitions.

Teaching Objective

1. The purpose of this exercise is to learn about the impact of operational definitions.
2. Discuss the applicability of this section to the organization. Do operational definitions affect us? How and what can we do about it?

Reference

See pages 158-161 in *Four Days with Dr. Deming*

Time Required

Approximately 1 hour is required for the lecture and team discussion.

Materials

Four Days With Dr. Deming

Overheads & pen

Notes on Method

Prepare a brief lecture to cover the key points in chapter 10. Cover what constitutes an operational definition.

Team Discussion of the Implications

Then break the group into teams and have the teams answer one question each selected from the list of questions for chapter 10 (questions 115-118 on pages 210.)

Chapter 11-13. Management of People, System of Measurement and Other Topics.

Teaching Objective

1. The purpose of this exercise is to learn about some concepts growing out of the previous topics.
2. Discuss the applicability of this section to the organization. Do we do a good job of managing? How do we know? Do we act on data? If not, why not? If so, how do we know that the data is reliable?

Reference

See pages 164-193 in *Four Days with Dr. Deming*

Time Required

Approximately 2 hours are required for the lecture and team discussion.

Materials

Four Days With Dr. Deming

Overheads & pen

Notes on Method

Prepare a half hour lecture to cover the key points in chapters 11-13. Cover managing through use of reliable data.

Team Discussion of the Implications

Then break the group into teams and have the teams answer one question each selected from the list of questions for the last chapters (questions 119-134 on pages 210-211.)

Wrap-up.

Teaching Objective

1. The purpose of this exercise is to tie in what has been learned to the organization.

Time Required

Approximately 1 hour is required for the discussion.

3

Resources

This section contains some selected resources. It is not an exhaustive list. The list of books is taken from the bibliography on page 219 of *Four Days with Dr. Deming*. It is advised for the trainer to be familiar with all the references listed in *Four Days with Dr. Deming*. The full list of books in *Four Days with Dr. Deming* makes a good starter library for any organization.

Books

Deming, W. E., *Elementary Principles of The Statistical Control of Quality*, Second Printing June 1952. Tokyo: Nippon Kagaku Gijutsu Remmei, 1951.

-----, *Quality, Productivity and Competitive Position*, Cambridge, MA: Massachusetts Institute of Technology, Center for Advanced Engineering Study, 1982.

-----, *Out of the Crisis*, Cambridge, MA: Massachusetts Institute of Technology, Center for Advanced Engineering Study, 1986.

-----, *Foundation for Management of Quality in the Western World*, A paper delivered at a meeting of the Institute of Management Science in Osaka, 24 July 1989; updated 1 September 1990.

-----, *The New Economics*, Second Edition, Cambridge, MA: Massachusetts Institute of Technology, Center for Advanced Engineering Study, 1994.

Audiovisual Materials

There are at least two sources for audiovisual material concerning Dr. Deming's ideas. The one that the author uses is called, "The Deming Library." It is produced by Claire Crawford-Mason and distributed by

CC-M Productions
810 Cedar Street
Silver Spring, MD 20910
Voice: 800-453-6280

Fax: 301-585-2321
E-mail: ccm@nmaa.org

Volume II is particularly germane, but all are worth viewing.

Materials

Bead boxes are distributed by a number of organizations. Many can be found in magazines dealing with statistics and quality. The American Society for Quality Control publishes *Quality Progress* among other magazines while the American Statistical Association publishes *The American Statistician* among other publications. Some sources known to the authors are

Quality Enhancement Seminars
1081 Westwood Boulevard, Suite 217
Los Angeles, CA 90024-2911
310-824-9623

or

The George Washington University/CEEP Book & Video Center
Academic Center Room T 308
801 22nd Street NW
Washington, DC 20052
800-424-9773
Quantities are limited

or

Lightening Calculator
P.O. Box 611
Troy, MI 48099-0611
810-641-7030

The bead and paddle containers of the first two resources follow Dr. Deming's format. The last reference sells both closed bead boxes and open bead and paddle containers among other statistical experimental tools.