Examples of Improvement Efforts

This chapter presents five examples of the use of the Model for Improvement. The skills and areas of knowledge discussed in Chapter Two are illustrated in varying degrees in the examples. These stories are not meant to portray “perfect” applications of the methods presented in Chapters One and Two; rather, they are meant to convey realistic first attempts to use them. The first, third, and fourth examples are from business settings, the second example describes a personal improvement, and the fifth example narrates a teacher’s effort to improve a biology class.

Example 1: Improving the Morning Meeting

The owner of a construction company was frustrated by the difficulties experienced by the managers and site supervisors at their daily morning meeting. The owner would start the meeting by asking if there were issues and problems that needed to be addressed. Also discussed at the meeting was the scheduling of materials and labor for the company’s various projects, as well as other topics.

There never seemed to be enough time to discuss all the important issues. Often, arguments would occur and tempers would flare. When this happened, the rest of the meeting would be devoted to resolving the issue and smoothing ruffled feathers. The meetings would often run past the scheduled one and a half hours. The company had almost doubled its business in the previous year, but the frustrating morning meetings were beginning to visibly hurt the quality of the company’s work.

The owner introduced the idea of improving their morning meetings to his management team. He asked the three improvement questions and obtained the following answers:

1. What are we trying to accomplish? Everyone agreed to investigate ways to make their daily meeting shorter and more effective.
Improvement.

The improvement efforts illustrated in Figure One portray "per-
tumorous" in cycles One and Two; rather,
illustrates a per-
tumorous effort to improve

2. **How will we know that a change is an improvement?** They picked the length of time of each meeting and the number of items or topics covered as measures of improvement.

3. **What changes can we make that will result in improvement?** A group of attendees at the morning meeting brainstormed a list of changes that they thought would result in improvement:

   - Have fewer people at the meetings
   - Meet less often
   - Make and use an agenda
   - Give assignments to prepare for the meeting
   - Quit having the meetings
   - Limit the meeting time for each issue
   - Make decisions by voting
   - End the meeting at 8:00, no matter what
   - Have the owner be more of a dictator during the meeting
   - Keep notes of the meeting
   - Limit the issues to critical ones (with minor issues to be worked out in smaller groups)

The owner was originally upset by several of the ideas for change. He felt that a few of them might be destructive. Then he realized that he could use the suggestion "quit having the meetings" as provocation to himself and others to start thinking about improvement.

In a conversation with the purchasing manager after work that day, the owner suddenly saw a path to follow. The purchasing manager was talking about the process for ordering all their construction materials and equipment. He was describing changes that the purchasing staff had made to their process. The owner realized that there was no process for preparing and running the daily management meeting. They just let things happen as they might. Compared to the process of ordering materials, their meetings were chaos. The owner wondered why the activities for ordering materials should be so clear and understood while the way a critical meeting was run was such a mess. He saw that many of the ideas suggested to improve the meeting could fit together to form a standard process.

**Cycle 1**

*Plan.* The owner and two of his managers spent a Saturday morning designing a management meeting process. They incorporated several of the change ideas into the process, including setting an agenda, having fewer meetings (Monday, Wednesday, and Friday), making assignments before the meeting, submitting topics the day before the meeting to be included in the agenda, and assigning
roles during the meeting (someone to take notes, someone to keep time, and so on). They thought that this new process would cut the weekly meeting time in half. They decided to document the new process and give it out to all the other managers and supervisors for comment.

Do. It took more than a week to get comments back from everyone.

Study. Everyone was worried about the assignments before the meetings and having to submit agenda topics the day before. Most of the managers and supervisors felt that the day before they would not know what the critical issues would be. Some were also concerned about being asked to fill a role, such as notekeeper.

Act. The owner felt that the managers' concerns were due to fear of the unknown rather than any real reason, so he decided to go ahead with the change.

**Cycle 2**

*Plan.* The owner made the following announcement at the morning meeting on Friday: “Beginning on Monday the new process will go into effect. If you do not submit an agenda topic today, it will not be covered in the meeting on Monday. Joe will take notes at the meeting, Mary will keep us on our time schedule, and I will put together the agenda late this afternoon.” Everyone predicted a short meeting.

Do. Only one topic was submitted that Friday, so the agenda the owner wrote had only two items: resolve scheduling problems for the construction site at the college, and figure out why only one agenda topic was turned in.

The meeting was indeed short. The scheduling problem took twenty minutes, but the discussion about submitting agenda topics was even shorter. People said they had issues they would like to have on the agenda but were unsure of the format for submitting them. (Several people said they felt stupid giving the owner some scribbled notes on the back of a napkin, but was that OK?) Everyone agreed to use a form that Joe volunteered to design.

Study. The meeting was short, but for the wrong reason. Issues that should have been discussed were not because people were not comfortable and familiar with the new process. The owner saw that other pieces of the process would have to be defined and people would need some time to get used to it.

Act. Joe designed a standard, simple form for submitting topics, which was used in preparation for the Wednesday meeting. Everyone was to submit at least one topic, even if it was not critical.

**Cycle 3**

*Plan.* The owner would gather the submitted topics from everyone and construct an agenda on Tuesday afternoon. Everyone would get a copy of the agenda to use to prepare for the meeting. Again, Joe volunteered to keep notes and Mary
agreed to keep track of time. Since everyone had been asked to estimate the amount of time for their topic, the owner used these estimates to set the timing for the agenda.

Do. The meeting went well. It lasted three hours. All fifteen topics on the agenda were covered, most in less time than planned. Only one topic was not finished in its allotted time. The group decided to finish it on Friday as per the process.

Study. One of the reasons the meeting went well was that knowing ahead of time what the topics would be allowed people to study and bring information that was helpful to resolving the issue. Everyone agreed that this element alone made the new process worthwhile. They had never been able to resolve more than five issues at any one meeting before. In this meeting, fourteen issues were resolved and one was to be continued.

Act. Everyone was ready to commit to keeping the meeting process. They would continue to refine the process, as appropriate.

Discussion of Example 1

The three improvement questions helped the owner to focus his management team on improving their morning meetings.

Use of data. Although the management team did specify two measures they would track to measure the impact of any change they would try, initially they did not look at the data over time. Later, when they plotted meeting time and number of topics covered, it was easy to see the improvement. Figure 3.1 shows the effect of the change and the pattern that developed after the change. The three weekly meetings lasted, on average, about one hour and twenty minutes and covered an average of 6.8 topics. They did not look into the reasons for the variations in the length of time of the meetings or in the number of topics covered. They could also have used a five-point scale ranging from poor to excellent to evaluate each meeting.

Developing a change. The brainstorming session alone did not produce the new idea for change. They did successfully avoid just adding more of the same (more time, more people, and so on). Further thought about change was stimulated by use of the provocative suggestion “quit having the meeting.” It was only when the owner was outside his normal area of concern that he had the insight for a change. The breakthrough was his realizing that the morning meeting was a process. Improvement was achieved by designing and standardizing the meeting process.

Testing a change. The owner and his management team used multiple cycles to test the change. Their testing was very small scale in cycle 1. They simply asked the meeting participants to visualize using the process and to comment on it. Cycle 2 could have been on a smaller scale. They could have applied the
A new meeting process was proposed for the morning management meetings. The plan was to have a shorter meeting with fewer people, resulting in a change in the meeting's original process. Once a lack of topics on the agenda surfaced, the Monday morning meeting would be more productive. However, the risk of introducing the change was relatively low. Implementing a change involved the following three cycles:

1. Testing a change: The process was introduced to new teams.
2. Testing with new teams: The process was tested in new teams.
3. Testing in the early morning meeting: The process was tested in the early morning meeting.

Cycle 1: Testing a change

The new meeting process was introduced to the morning management meeting. The owner of the meeting would have to run at least one more cycle to implement the change. The implementation cycle will address ways to make the morning meeting process permanent. How will notes be taken and who will take them? What process can be put in place to see that the time limits are kept?

Working with people. Working with others was a key issue in this improvement effort. Early on, it was clear that the meetings would have to be more productive. The problem with submitting topics would have surfaced and the Monday morning meeting would have been more productive. The risk, however, was relatively low. Once there was a lack of topics on the agenda, the problem was addressed immediately.

Figure 3.1. Data on Morning Management Meetings.
effort. How could the owner have created more cooperation? Is he still going to have trouble getting some of his managers and supervisors to participate in some of the roles in the meetings (notetaker, timekeeper, and so on)? Although the owner asked everyone to comment on the new process, if he had gotten other meeting participants involved in designing it, support and participation would have been stronger.

**Example 2: Improving One's Golf Game**

A middle-aged man (we will call him Charlie) decided that his workaholic lifestyle was not good for his health. Charlie wanted to take up a hobby that would provide ample opportunity for exercise but not be too strenuous. After considering a number of possibilities, he settled on golf as the perfect hobby/exercise. Since he had played golf twenty years earlier in high school, he would not have to learn a new sport.

Through a friend, Charlie met some men who played golf every Saturday morning. He told them that the last time he had played he had shot in the upper 80s but that had been a while ago. The men said that they shot between 85 and 95 and that he would fit right in. So, it was agreed that Charlie would join the Saturday group. The first Saturday that Charlie played he shot 130. He was horrified by how poorly he had played and decided to improve his golf game.

Charlie answered the three improvement questions as follows:

1. **What am I trying to accomplish?** Charlie wanted to play golf well enough to fit in with the Saturday group. He wanted to improve his game to get his scores in the low to mid 90s.

2. **How will I know that a change is an improvement?** Charlie's primary concern was the number of strokes it would take him to sink a golf ball in eighteen holes.

3. **What changes can I make that will result in improvement?** Charlie decided that the old clubs he had not played with in nearly fifteen years were the root of his problem. He decided to buy a new set of clubs.

**Cycle 1**

**Plan.** On Friday night, Charlie would shop for golf clubs and use them on Saturday.

**Do.** Charlie went to the local discount golf store and purchased a new set of clubs on Friday evening. With his new clubs in hand he met the Saturday morning group at the course and proceeded to play worse than the week before. Charlie had a truly frustrating, miserable day.
Study. Charlie was ready to quit. Not only had he shot 138 but he had just spent $600 on a set of clubs that had certainly not helped his game! Charlie had forgotten to practice one of the key principles of effective cycles: to test the change on a small scale. He could have done this by renting a set of newer-style clubs or even borrowing a set from his brother.

Act. Charlie knew that he had to try something on a smaller scale in his next cycle.

Cycle 2

Plan. Charlie made a list of several actions he could take that would possibly result in improving his golf game. Some of them were taking lessons, going to the driving range, watching videotapes, and playing at the smaller “par-three” course. Charlie was now so focused on the concept of small scale that he used only that criteria for his next plan. He decided to go to the driving range two nights per week.

Do. The driving range practice helped Charlie gain some consistency in his swing. He noticed that he flubbed (mishit) fewer balls on his second night at the range. He played with his Saturday group and discovered that he had a pretty severe tendency to hit the ball far to the right of the target, the familiar “slice” of the novice.

Study. Charlie shot 118. He was not flubbing the ball nearly as often but he was still unable to keep the ball in the fairway. His small-scale action had resulted in improvement of his score.

Act. Charlie decided to continue his practice at the driving range, but he felt he needed to do more to be able to play comfortably with the Saturday golf group.

Cycle 3

Plan. Charlie decided to take one golf lesson. He arranged to take it early in the week so that he could practice what he learned at that week’s driving range practices.

Do. The lesson focused on the fundamentals. Charlie found that he grasped the fundamentals almost as if he were remembering them from fifteen years before. The practice at the range was more comfortable than it had been the week before. On Saturday, Charlie shot 105.

Study. The lesson combined with Charlie’s weekly driving range practice had really helped to improve his score.

Act. Charlie decided to take another lesson and to continue his driving range practice.

Charlie ended up taking three more lessons, thereby going through three more cycles.
cycles. After the total of four lessons, his score was in the mid 90s. Charlie stopped the lessons and cut back to one practice session per week. As can be seen in the plot of his scores in Figure 3.2, he has maintained his low to mid 90s score ever since.

**Discussion of Example 2**

Although Charlie did use the structure provided by the three questions, he did not use the principle of testing on a small scale in his first cycle. Because of this, he will never know if he could have accomplished his aim without spending $600 for new clubs.

**Use of data.** Charlie did collect data with each of his cycles. The plot of the results of twenty games (see Figure 3.2) shows the impact of his cycles and that a predictable pattern developed after his four lessons. Even after the lessons Charlie's golf scores vary, but within a predictable range. Charlie is able to see that when he shoots a 96 it does not mean he has lost the improvement in his game. Training and practice of the same type after the system is stable probably will not result in further improvement.

**Developing a change.** At the beginning, Charlie thought he knew what the problem was: his old clubs. He did not think about the processes involved in playing golf. He did not spend any time exploring other changes that would result in improvement of these processes. For example, it did not at first occur to him to take lessons because he had taken many lessons when he was younger. After the first cycle, Charlie did think about some other changes he could make.

![Figure 3.2. Charlie’s Saturday Golf Scores.](image)
Testing a change. In his first cycle, Charlie completely forgot about one of the key principles for testing a change: test on a small scale. Even if he had still felt that new clubs would be the best change, he should have borrowed or rented the new clubs. Charlie might also have thought about testing his change on different courses, under varying conditions.

Implementing a change. In improvement efforts as simple as this, implementation boils down to collecting some data to make sure that the improved results are maintained. What will happen when Charlie plays at a different course? What if he plays with a different group of people?

Working with people. Since the changes Charlie made really affected only his game, cooperation with others was not a key issue in Charlie's improvement efforts.

Example 3: A Taxi Driver Improves His Business

John, a taxi driver, wanted to increase his business. He had a daughter who was about to enter college, and for John to be able to pay for it he would have to increase his income by $600 per month. He knew that other cab drivers were able to earn that much more than he was.

As a taxi driver, John spent less than 50 percent of his on-duty time actually transporting paying fares. The best spots to pick up fares usually had long lines, so much of the time was spent waiting for a fare. He drove an average of nine hours a day, five days a week. Picking up fares at the large international airport produced about half of his income.

John did not want to make a change that would simply be more work, such as to work six days per week. He had done so for several years in the middle of a recession. He remembered the stress that a fifty-five- to sixty-hour work week had caused him and his family. He also remembered that working the sixth day had not increased his income by 20 percent as he had thought it would. He remembered being tired often and missing fares that he would have gotten if he had been more alert.

When he asked himself the three improvement questions, John came up with the following answers:

1. **What am I trying to accomplish?** John wanted to increase his monthly income by at least $600 without decreasing service to his customers.
2. **How will I know that a change is an improvement?** With any change he might try, the key measure of improvement was, of course, income from fares.
3. **What changes can I make that will result in improvement?** John talked with other drivers about ways to increase his fare-related income. Most of their ideas seemed like simply more work or more distasteful work. While talk-
ing, however, to an old friend who was now in the limousine business, John got an idea. His friend had installed a cellular phone in his limousine several months before and talked about how it let him speak directly with his customers in a more timely manner.

**Cycle 1**

**Plan.** John decided to rent a cellular phone for a month to see if he could reduce the amount of time that his cab was idle. He wrote his phone number on his business cards. He planned to give these out to passengers he picked up at the airport or train station and tell them to call him directly a few hours before they needed to return.

**Do.** At first, John only gave his card and sales pitch to people who were visiting his city (thinking they would be most likely to remember the service). After a few days, however, someone who lived in the city struck up a conversation about the cellular phone and ended up asking for a card. After that, John gave the card (and pitch) to all his customers who would listen. Although he found himself at the airport more often, during his trial month he often was not waiting in the taxi line.

**Study.** Although he had not tracked the number of return trips to the airport before getting his phone, he was sure that the forty-seven return trips during his test month were at least double what he had had before. In general, he was busier with fares more often than he used to be during his nine-hour workdays. His income for the month, after paying $100 in phone costs, was $740 more than his average for the previous year.

**Act.** John could see that by giving the customer easier access to him, his use of the cellular phone was going to be a permanent way of doing business. He decided to implement the changes by purchasing a cellular phone and having nicer cards printed with more information, such as his hours and a ten-word description of the direct contact services.

**Discussion of Example 3**

John had no trouble using the three fundamental questions for improvement. The questions supported his need to increase his earnings. Having gotten an idea for a change from a friend, the PDSA cycle provided him with a simple, effective way to test the idea.

**Use of data.** John collected data on his earnings from fares and the number of return trips to the airport. However, he did not look at these data over time; he simply compared averages from his one-month test to previous averages. A simple plot of earnings per day over the one-month period may have revealed a pattern over time that indicated some special reason for the increase other than the...
new phone. For example, if almost all the increase in income was from one week when a large convention was in town, a plot over time would have shown it.

Developing a change. John knew that he did not want to try a change that simply meant spending more time at work. He wanted a change that would not only increase his income but would just as likely make his job more enjoyable (by decreasing the time he spent waiting for fares). The phone allowed him to better integrate his services with his customer’s systems. This idea for change came from outside the normal way taxis are operated. It came from someone in a related yet different business. John also took advantage of a new technology.

Testing a change. John applied the principle of testing on a small scale. He rented the cellular phone, wrote his cellular number on existing business cards, and set a one-month time frame for the test. To help determine whether the change was an improvement, John compared his income during the month he used the phone to his average income per month for the year before. This comparison would have been more useful if he had plotted the data on income over time.

Implementing a change. John has not yet addressed any implementation issues. What are the barriers that he might run into over the next six months?

Working with people. The main aspect of interacting with people that John had to worry about was getting the cooperation of customers in calling him when they needed transportation. To help with this effort, he developed a business card and a short sales pitch for the idea.

**Example 4: Improving Service in a Dental Office**

Beth, a dentist, wanted to improve the service to her customers. She had a good reputation for quality of work; she was known for taking great care and time to see that the work was done right. She had two full-time and two part-time assistants, as well as two office administrators (one worked halftime). The two part-time assistants mainly did teeth cleaning, while the full-time assistants helped Beth with dental procedures other than cleaning. Beth was thinking about expanding and selling a partnership to another dentist.

Beth answered the three improvement questions as followed:

1. **What am I trying to accomplish?** Beth decided that if she could increase her patient base by 15 to 20 percent it would justify bringing a second dentist into the practice.
2. **How will I know that a change is an improvement?** Beth felt that the most important measure of her business was the number of people who consistently came to her office for their dental care. She had records of the number of patients she had seen since she started her practice. Because of her good reputation, she knew that many of her patients were not as loyal as she had hoped; the teeth of many of her patients were not as clean as she would have liked.
3. **What will I do?** Beth also knew that many of her patients had anxiety about going to the dentist. So, the answer to this question would have been:

**Cycle I**

Plan. Beth decided to try to attract more patients by expanding and selling a partnership to another dentist. She followed three questions:

1. **When will I start?** Beth decided to start immediately, and followed the monthly meetings to keep track of the results.
2. **What will I do?** Beth developed a business card and a short sales pitch for the idea.
3. **What will I stop doing?** She decided she would have to reduce the time she spent at work.

Do. It took Beth six months to attract two of the three new patients she needed to have a good partnership. Beth needed a second dentist. One of the reasons for this was:

- Increased number of patients
- Increased number of patients
- Increased number of patients

Study. Beth knew that her partners were not as loyal as she had hoped; the teeth of many of her patients were not as clean as she would have liked. She decided to take care of her patients more quickly and reduce anxiety at her office.

Act. Beth knew that many of her patients had anxiety about going to the dentist. So, the answer to this question would have been:
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Beth had a good reputation, many of her patients had been coming exclusively to her for the ten years she had been in business.

3. **What changes can I make that will result in improvement?** Beth was not sure how to answer this question. She felt that the answer was probably in bringing in the latest technologies, but she was worried that this answer could come from her thinking and technical training rather than from what might be best for her patients (existing and potential). She decided that to be able to answer this question well she would need to talk to patients and ask them this question.

**Cycle 1**

**Plan.** Beth chose six names from her list of patients. She made sure that the six patients represented both long-time and newer patients. The plan was to meet individually with each patient outside of the dental office and ask them each three questions:

1. When you have chosen a dentist in the past (not just my office) what were the main things you looked for?
2. What are some aspects of the services you have received from me and my office that would make you recommend or not recommend my services to friends or relatives?
3. What are some improvements you would like to see in the service you receive from my office?

**Do.** It took Beth three weeks to complete the six interviews. It turned out that two of the six patients were seeing another dentist. Beth realized that she did not have a good way to track the number of patients who had changed to another dentist. One of the patients that had quit coming to her talked about many reasons: convenience of location, less expensive, a bad experience during a cleaning, and so on. The other ex-patient said very plainly that after two very painful cleanings she had said, “No more!” All six of the patients interviewed shared their ideas about what makes a good dental visit.

**Study.** Beth had not been aware of two important issues: (1) her patients were not as loyal as she had thought, and (2) her patients were having problems with the teeth cleanings they received at her office. Beth also learned that the patients were not very concerned about new technology. They assumed that she would take care of that. They were more concerned about things that increased their anxiety and comfort before and during a dental visit.

**Act.** Beth decided to make some changes that would specifically affect how teeth were cleaned in her office. She had hired all four of her assistants and she knew that the ones who did the cleaning were as well qualified as the other two. So, the answer was not in blaming the two assistants who did the cleaning, which would have been easy to do.
Cycle 2

Plan. Beth discussed the results of her first cycle with her assistants. Although the assistants were not comfortable at first with the whole discussion, Beth kept pointing out that the reason they were working on this was to improve their service to the patients and that all five of them would benefit from a larger, more loyal patient base. “If patients enjoy their dental visits more, our work will be much easier,” she told them. The assistants all had to agree with this and eventually got excited about their own involvement in the changes. They all agreed that the following changes would make the teeth cleaning process less of a pain for patients:

- Rotate assistants (between working with Beth and doing the cleaning)
- Standardize the cleaning process
- Get patients involved in the cleaning (such as have patients do their own flossing at cleaning with supervision and use it as an opportunity to teach proper flossing)
- Use gentler cleaning tools (especially those that come in contact with the patients gums)

These changes would be developed and tested for two weeks. Also in the plan was to ask patients to rate the cleaning experience relative to past cleanings.

Do. It took more than two weeks to develop the new process. Beth and her staff seemed to have more fun at work as a result of all the interaction among them in making sure the plan was carried out.

Study. The forty-six patients who had cleanings during the two-week test also enjoyed the new process of getting their teeth cleaned, although three patients did not want to do their own flossing. The data from the rating the patients gave the cleanings clearly showed that they experienced less pain and anxiety. Figure 3.3 shows the average rating for each day.

The rotation of assistants between assisting Beth and doing the cleanings had a few problems related to scheduling and technical experience. Beth saw that she would have to set aside some time for training.

Act. The new process was implemented, with the exception that patients were given the option of flossing themselves or having it done by the assistant. Beth asked the office administrator to work on the scheduling problems.

Discussion of Example 4

Beth was initially ready to follow her first idea about bringing new technology into her practice. This would have cost a considerable amount of money and
may not have helped with patient satisfaction at all. The framework of the three questions and the learning experience of the first cycle opened a new direction for her improvement efforts.

**Use of data.** Beth collected data during each of her cycles, including the responses to the six interviews and the comments and ratings the forty-six patients gave the cleaning process. She also had data on her patient base. Variation in the cleaning process was a source of trouble. The variation was reduced by establishing a standard process. The chart of the ratings the patients gave the new cleaning process (Figure 3.3) shows that it took two or three days to get the process working well. Beth and the four assistants all learned and helped each other learn during those first three days. After that, the process seemed to be established, as shown in the chart.

**Developing a change.** This example, like the others, shows that it takes a different approach to come up with ideas that are not just more of what has been done in the past (for Beth, that would have been spending money on the latest technology), to develop a change that is new. Beth asked patients for input. Their feedback helped her to realize that she needed to develop a standard process for cleaning that would result in improvement from the viewpoint of her patients.

**Testing a change.** The two cycles were both small scale yet they involved enough patients to explore a range of conditions. The cycle to test the change was run over a short period with a limited number of patients. The scale of the test could have been made even smaller, if the assistants had first tried the new procedure on themselves or on a small select group of customers.

**Implementing a change.** Beth learned in cycle 2 that training was needed. She also learned that to implement the changes she would need a process for scheduling.
her assistants. These and other maintenance problems would be addressed in an implementation cycle.

Working with people. It was necessary for the five people working together on this improvement effort to support each other in many aspects of their work; scheduling, skills, knowledge, and so on. They needed to cooperate to agree on a standard process. Each of the assistants had to change some aspect of his or her approach to cleaning to conform to the standard process. At the beginning, Beth was able to use the aim of the effort to keep everyone focused and cooperating. Once they all felt ownership of the changes, cooperation grew.

**Example 5: Improving Methods for Teaching Biology**

A teacher of a college-level introductory biology course was interested in improving the methods she used in teaching the course. In particular, she identified the module on cellular respiration and protein synthesis as difficult for the students, especially those who were not majoring in science. As a result of this difficulty their interest was low, which had a negative effect on their enjoyment of the entire course. Grades for the test on this module averaged about sixty-five out of a hundred. In addition, students' interests and abilities in science in general varied widely, which presented difficulties for all the science teachers.

The teacher decided to focus on this topic first and then to use what she learned to improve her teaching of other topics in the course. She used the Model for Improvement to guide her efforts.

1. **What am I trying to accomplish?** The teacher wanted to improve the teaching of cellular respiration and protein synthesis in the introductory science course. She particularly wanted the improvements to help those going into health professions to use the knowledge from this module to understand the results of interventions they would make. She also wanted the improvements to help nonbiology majors understand and appreciate the world around them.

2. **How will I know that a change is an improvement?** The primary measures that the teacher used to know whether the changes were improvements were test scores and observations of the students during class (questions, enthusiasm, posture, and so on).

3. **What changes can I make that will result in improvement?** Two cycles were run to test improvements, one for each of two semesters.

**Cycle 1**

Plan. The teacher's review of the lesson plan for the module indicated that the students may have been overwhelmed with detailed information on the subject
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The teacher of biology faced difficulties in making inroads with students who had difficulty understanding the material. After identifying the students, she addressed their difficulties and adjusted her teaching methods. She developed a simplified handout to highlight the module's major points. She tested the new approach during the next semester.

Do. The plan was carried out. Early in the semester the teacher distributed the handout she had developed for students to follow during lectures. The handout was simplified by using drawings for clarification. Throughout the semester the teacher noted other topics that could benefit from an approach similar to the one being tested.

Study. The teacher observed some improvement in interest in the topic and about a ten-point increase in the average test score (see Figure 3.4). Nevertheless, she was still not satisfied with the teaching of the topic.

Act. The teacher decided to keep the changes made to the lesson plan and incorporate some new ideas for the next semester.

Cycle 2

Plan. The teacher retained the changes made to the lesson plan during the previous cycle and added some other changes, including more time introducing the significance of the material and establishing the context for the subject matter. She also informally incorporated the learning from cycle 1 into other topics in the course besides cellular respiration.

Do. The plan was carried out. The teacher observed that students displayed a substantial interest in the topic relative to their interest in other classes. She discerned no obvious difference in the makeup of the class relative to other semesters.

Study. Student interest in the topic increased from the previous semester and the average grade for the test on the module was eighty. The teacher changed the

Figure 3.4. Average Test Scores for Students Studying Cellular Respiration and Protein Synthesis.
specific questions on the test each semester, but the different versions were believed to be of comparable difficulty. Figure 3.4 illustrates that an improvement in test scores resulted from cycle 2.

Act. The teacher decided to retain the changes made to the lesson plan and discuss them with other biology teachers. She hoped to get the other teachers to incorporate what she had learned into more of the biology curriculum. She also decided to continue her cycles and build on the improvements she had made.

**Discussion of Example 5**

Although the teacher essentially had worked by herself to improve the biology class, she decided to share her learning and improvement ideas with other teachers. While working with the other teachers she can still use the three improvement questions as a framework.

*Use of data.* The teacher relied on the traditional test scores as data. She did take note, however, of other kinds of data, such as the interest of the students, their participation, and so on. She tracked this data over time. Although students' test scores varied quite a bit, the impact of the changes the teacher made is clear.

*Developing a change.* The teacher made changes to the order in which topics were presented. Rearranging the order of the way something is currently being done is a good way to provoke ideas for change. Often, quite simple changes result in significant improvement.

*Testing a change.* Both of the cycles were small in scale (one semester each) and yet they produced results that are obvious improvements. Because the makeup of the class during the semesters in which she tested was similar to the makeup of the class in other semesters, the teacher believed that the improvement she observed was due to the changes she had made.

*Implementing a change.* The implementation issues are simple because the teacher is doing this improvement work on her own. Implementation problems such as resistance and maintaining the change will become more complex when she expands her efforts to include other teachers.

*Working with people.* The need for cooperation will be great when other teachers get involved.

**Conclusion**

The examples presented in this chapter are meant to show that the three questions, the PDSA Cycle, and the skills to support improvement (use of data, developing, testing, and implementing a change, and working with people) are easy to use and practical for everyday applications. Once you understand how these
Examples of Improvement Efforts

methods are meant to work, your next step is to utilize them to make your own changes that will result in improvement. This is where the real learning and the fun begins. The second part of the book explores in more depth all of the ideas and methods presented in the first part, and adds some new ones. As you gain experience in making improvements, the chapters in Part Two will prove more and more useful.