Progress Report
XYZ Company Review Results
February 17, 1998
By Tony Ingle

This is the second report in the XYZ Company training evaluation project being conducted by Wade Carter of the College of Textiles at North Carolina State University and Tony Ingle, an independent consultant and graduate of the College of Textiles. The training class chosen for this assessment is the two-day “Spun Yarn Manufacturing Program” conducted by Wade Carter and College of Textiles staff.

As outlined in the “College of Textiles Training Assessment” handed out to XYZ Company class participants (see Appendix 1), the assessment program consists of a Preview exam which pre-tests participants on Day 1 of the training to gauge initial knowledge of the subject matter, a Review exam given immediately after the training on Day 2 to gauge the accumulation of knowledge; and a Follow-up given in two to six months to gauge long-term knowledge retention. The ultimate goal of the assessment program is to provide concrete data indicating the degree to which the training program has impacted the participating firm, in this case, XYZ Company. The Preview and Review have now been completed and the data has been analyzed. A total of 31 participants completed both the Preview and the Review. This report will include primarily the results for these 31 participants. See Appendix 2 for a summary of results.

In order to determine the impact that the training will have on the firm, we will rely on several ideas. First, the information presented in the course is beneficial to people working in short-staple spinning environments. This assumption is based on the popularity of the program across the textile industry. Second, we assume that having a good attitude about the information will influence how likely it is to be used on the job. Associates that believe that the training will help them save money in their jobs will likely look for ways to put the training to use. We encourage that type of thinking among the participants. Third, whatever you measure, you will improve. Focusing attention on a subject has an amazing way of focusing action on that subject. In many ways, the training and its assessment are two ways to focus attention on the course material, which then stimulates actions which will impact the company. We want our assessment to be a tool to encourage positive impact on the bottom line.

Each exam is designed to focus attention on two areas of interest—the participants’ knowledge of short staple spinning, and the participants’ attitude about the learning experience. Knowledge refers to facts and how they are remembered by participants. Attitude refers to how participants view the training experience. Attitude is a key measure for how likely participants will be to put the knowledge into action at the work site. Since such data is difficult to obtain, we will rely on participants’ self-reporting to explain how they are using their training to impact XYZ’s bottom line.

In looking at our data from the first two exams, we will first analyze the participants’ demographics before turning to the knowledge and attitude portions of the test.

Demographics

The first several questions on the Preview exam were designed to elicit basic personal data and demographics. Participants in the class come from a wide variety of backgrounds within the plant ranging from drawing, spinning, and carding, to front office staff. In addition, the assembled class of 42 participants represents 117 years of collected experience at XYZ Company (averaging 2.8 years each), and 66 years of collected experience in their current positions (averaging 1.6 years each). Two of the participants have also worked 20 and 30 years respectively with other textile firms. Collectively, this represents a
wealth of experience. The group of 31 participants that took both the Preview and Review represented over 87 years of XYZ Company experience. We will compare only their answers for the knowledge and attitude sections of the exam to insure statistical accuracy.

Knowledge Scores

The questions in the knowledge section of the exam were chosen by Wade Carter based on his expectations for which knowledge he felt participants should have mastered after having taken the course. These questions were made to be challenging. In all, 40 questions were created- 30 multiple choice and 10 true/false. The same questions were used for both the Preview and Review.

For the knowledge section of the exams, all test answers were worth 1 full point and could receive partial credit. Participants were also penalized for wrong answers. For example, in a multiple choice question which had two correct answers out of four possible answers, a participant could get full credit for choosing the two correct answers, but would be penalized 1/3 point if they also choose one of the wrong answers and 1/2 point if they choose both wrong answers in addition to the correct answers. If in this example, I had chosen all four answers, I would receive 1/2 point (1/2 point for each correct answer minus 1/4 point for each incorrect answer for a total score of 1/2 point).

Before getting to the actual scores on the Review, it is interesting to note two tendencies that were discovered. First, there was no significant difference in average test scores between new and older XYZ employees. In fact, the fifteen employees who had only been with the firm less than 15 months performed slightly better on the Review exam than did the sixteen employees with 5 to 10 years of experience. This is at least partially explained by the fact that XYZ has attracted a handful of experienced associates from other textile mills. Therefore, while those employees are new to XYZ, they are not new to textiles and could therefore have learned a great deal with other firms. However, one could also safely conclude that the participants' work experience on the whole had limited impact on its ability to succeed with the Preview material. This was new material for many. Second, with the Preview exam, there was also no difference in final scores between those who reported that they had "volunteered" for the course, versus those who had been "required" to take the course. We generally expect to see that those forced to attend training (often called "prisoners") are less interested in the training. This was not the case. Therefore, neither having worked at XYZ, nor having volunteered to take the course seemed to have any bearing on how well a participant performed.

The Test Scores

The average overall test score on the Preview was 37 (see Figure 1 below). When the Review was given, the average score had jumped to 64. Participants had improved their scores by 100%. If we look at these results a bit closer, we can determine where these gains occurred.

In Figure 2, we see how much each participant improved from the Preview to the Review. (One participant's percentage improvement has been deleted as an outlying point since it represented a 2485% increase from a score of 2.5% to a score of 64.6%). Several participants increased their scores significantly. In all, seventeen people improved their scores by at least 50%. For this group of 17, the average score went from 33 on the Preview to 69 on the Review- a 141% increase. From this measure alone, the training has been successful in imparting new knowledge.
Figure 1. Comparison of Preview and Review Test Scores
(%Improvement from Preview to Review)
Spun yarn Manufacturing Program
XYZ Company, N.C.

Figure 2. Average Test Score Improvement
From Preview to Review (%)
Review: Spun yarn Manufacturing Program
XYZ Company, N.C.

17 Participants improved their scores by 50% or greater and saw their average scores go from 33% to 70%.
The Questions

On the Preview, the class failed ⅓ of the questions. Figure 3 below shows the range of scores for individual questions. (One note: the test scores on the Figure have been sorted from highest to lowest. Therefore, the numbers shown do not refer to the actual numbers of the questions). The results of this exam indicated a rich opportunity for improvements in all subject areas. In fact, by seeing these results before the second day of the training, the presenters were able to focus on subject areas which had given participants the most trouble.

By the time of the Review exam on Day 2 of the training, the participants had learned a great deal (see Figure 4). The majority of the class managed to score very highly on ⅗ of the questions, reversing their poor performance from the Preview. Of the questions which still drew poor responses, drafting calculations, yarn twist multiple, and open end yarn strength gave the most difficulty. See Appendix 3 for a full listing of class scores on each question.

In Figure 5, we have a graphical comparison of the individual test scores between the Preview and Review. This three-dimensional graphical depiction of Preview answers (in the foreground) versus Review answers (in the background) shows how the Review scores loom over the Preview scores in all but a handful of cases. We also see areas of weakness clearly displayed. For example, questions 18-33 display particularly low valleys in the data. Instructors can therefore easily see how well the class has performed at a glance.

Figure 6 reveals interesting phenomena. This Figure shows the magnitude of the improvement made between the Preview and the Review, for each question. For example, since the class scored high on Preview question 1, they could not improve the score too much for the Review. They therefore showed a minor improvement (in this case, a 3% increase from 85% to 87%). For the majority of the other questions however, the increase is very large.

Interestingly, for several of the “true or false” questions at the end of the exams, participants actually fared worse on the Review than they had earlier on the Preview. The obvious explanation is that many of the participants likely guessed correctly on the Preview, but could not repeat a successful guess on the Review. Question 23 is another example of guessing that failed to work. The actual answer to this drafting question is not listed. During the Preview exam many participants got the right answer (i.e. no answer listed) because they could not determine how to work the problem. This made the “corrects” deceptively high. Then during the Review, they were unable to solve the problem correctly.
Figure 3. Correct Preview Answers Distribution
Preview: Spun yarn Manufacturing Program
XYZ Company N.C.
December 2, 1997

The class failed 3/4 of the questions.
Average Test Score = 37

Figure 4. Correct Review Answers Distribution
Review: Spun yarn Manufacturing Program
XYZ Company N.C.
December 11, 1997

The class passed 3/4 of the questions.
Average Test Score = 64
Figure 5. Improvement on Individual Questions
Scores for each question for the Preview and Review Exams

Figure 6. Improvement on Individual Questions
(\% Improvement from Preview to Review)
Attitude Questions

For both the Preview and the Review exam, the first page of questions was designed to gather basic demographic data and to gauge Attitudes among the participants. In measuring fuzzy or difficult-to-define areas like "impact of training," attitude is a key indicator of how likely it is that the training will achieve its goals for impacting the company. Among the first nine questions of the Review (A-I), B-F were designed to assess the likelihood that the training will be used and to gauge the needs for additional training. The results were very interesting.

Question B, "I will use this training in the next: Week, Month, Year, Not Applicable" determined that 71% of the participants expected to use the training in the next week. This suggests that the training will certainly beginning having an impact immediately. From this perspective, we can conclude that the training was well-chosen, targeted, and delivered. It is further encouraging that 84% said that they expect this training to save the firm money. Only 71% had agreed with this conclusion on the Preview. Taken together, we can conclude that the vast majority expect that they will both use this training, and that its use will save the company money. Those who took the training therefore believe that this training will impact the Eden's bottom line.

By the time that they took the Review, virtually every single participant also agreed that this training will help them do their job better (97% versus only 86% in the Preview). About 50% of the participants expressed the desire to receive additional spinning training. Further, 81% of the participants believed that this class will help them directly in their own career development, the same as in the Preview. This hunger for training in the textile sciences reflects a very positive attitude about training among employees which fits well with the desire of management to improve and invest in its workforce. An amazing 93% of the participants said that they would personally recommend this particular course to their colleagues. This level of customer satisfaction suggests that the training was very well received, and therefore all the more likely to make an impact on the firm.

When asked what type of training their supervisors could use, participants had a variety of interesting responses. Among those mentioned were: Management, Supervision and People Skills (3), (also mentioned: "personality," "teamwork") "All," Spinning (4), Opening (2) and Carding. It appears that additional management and training offerings would be useful for the XYZ management group. When asked what type of training they would like to receive themselves, participants responded with answers like: accounting, business, management, textiles, plant management, computer training (4), technician (2), technical training (2), civil engineering, and on the creative side, drawing and snow skiing. It was interesting to note the interest in computers and technical subjects.

Conclusions

The Review exam results demonstrated that the class was able to learn enough of the coursework to double their scores. This fact was due in no small part to the skill and technique of the veteran College of Textiles staff. It was also helpful to let the class know that they would be tested on the material three times. By making the participants responsible for the material in a very real way, it was possible to encourage learning naturally.

One of the best results was how positively the participants viewed the training experience in its ability to both impact the company and impact their own careers. By the end of the course, 97% of the class recognized how it could help them in their jobs. A striking 81% believed that it would help the company reduce costs. No wonder they recommended the course to their colleagues so highly (93%). The
measures of attitude improved from the Preview to the Review. This indicates that the participants see the value of the training and will begin putting it to good use. This is the goal of any training program, but particularly so in the case of training conducted by a State-supported university.

The next step will be to administer the Follow-up exam to determine long-term effects of the training material. Attitude questions to be used are located in Appendix 4. This exam can be given as an open-book exam to encourage participants to use their manuals, as they would on the job, or it can be given without access to the handouts to see how much of this knowledge has become part of the participants' long-term memory. The choice should be made based on how often the workbook is expected to be used. The Follow-up will represent the final stage of this assessment program.
Appendix 1
College of Textiles Training Assessment

Today, more and more firms are investing in training to better prepare themselves for the global marketplace. In the United States alone, firms spend over $45 Billion on formal training annually to educate upwards of 40 million workers across the nation. With all these training dollars being spent, companies are now beginning to look for new ways to measure and justify training investments. World-class organizations are all asking the same questions:

- How can I evaluate training?
- How can I make certain it is results-oriented?
- How can I measure its impact on the bottom line?

In order to begin answering these questions, the College of Textiles is including a training evaluation program with the Short Staple Spinning In-Plant course. The goals of this assessment program are to provide participants and management with the data they need to make future training decisions, and to insure that the College continues to provide the training that the industry demands.

The process is fairly simple (see Fig 1). We begin with a short quiz given out before the training class called the “Preview.” The Preview will help us gauge how much participants already know. In this way, we can target our classroom teaching toward the areas about which participants know the least. Then when the training is complete, we will give another quiz, called the “Review.” The Review will help to reinforce the main points of the training to insure that all participants are up to speed. We will then send out a follow-up in two to six months with a questionnaire to see on how much the class has remembered, and which areas they may have forgotten.

![Fig 1. The assessment method](image)

All assessments will remain anonymous to insure honest feedback. It is important that each quiz be filled out completely so that we can compare results over time. Thank you for your help. If you have any questions about this or other programs at the College of Textiles, please contact Wade Carter at (919) 515-6536.
Appendix 2
Results Summary Page
From the Preview to the Review
XYZ Company, N.C.

- The average test score doubled from 37% on the Preview to 64% on the Review (Figure 1).
- Seventeen people improved their performance by 141% (Figure 2).
- Seniority appeared to have no relationship to the ability to learn the material.
- Improvement on individual questions was dramatic (Tables 3 and 4).
- The 3-D plot is a good way to visualize trends in question answers (Figure 5).
- The class improved by a large percentage on most of the Review questions (Figure 6).
- 71% of the participants expected to use the training in the next week.
- After taking the training 84% said that they expect this training to save the firm money.
- 97% agreed that this training will help them do their job better versus 86% for the Preview.
- 81% of the participants believed that this class will help them directly in their own career development.
- 93% would personally recommend this particular course to their colleagues.
- Over 50% of the participants expressed the desire to receive more spinning training.
- When asked for other training needs at XYZ, participants pointed to a need for management and supervisory training.
- A number of participants expressed personal interest in computer training.
# Appendix 3

Scores for Each Review Question

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Appendix 4
New Questions for the Follow-up Exam:

1. For identification purposes, what are the last four digits of your social security number?

2. What was the highest level of education that you completed?
   - High School
   - GED
   - Community College classes
   - 2-year degree
   - 4-year degree
   - other

3. Have you used the Spun Yarn training on the job (for example: to improve quality or productivity, to reduce defects, to help others on the job, etc.)?
   - No
   - Uncertain
   - Yes

4. Has this training helped save the company money?
   - No
   - Uncertain
   - Yes

5. Would an outside observer say that your behavior on the job has changed as a result of this training?
   - No
   - Uncertain
   - Yes

6. Has the Spun Yarn training helped in your career advancement?
   - No
   - Uncertain
   - Yes

7. Please describe a specific example of how you have used this training on the job (such as, "I caught a mistake that saved the company $1000" or "My supervisor says that my work has improved")

8. What were the results (money saved, quality improved, defects reduced, etc.)?

9. Please list other ways in which this training has been useful?