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ABSTRACT

A workplace literacy project was conducted at the Nabisco Richmond Facility for the following purposes: to determine what academic skills are necessary to perform 10 selected jobs, to develop a validated assessment to evaluate an employee's literacy skills, to develop a job-specific curriculum to improve skill deficits, and to provide an individualized education program so that each employee can gain the skills needed for personal and job goals. Approximately 100 employees volunteered for assessment and training. During the project, a listening learning module was developed and pilot tested and modules on reading and mathematics were developed. Because of delays in the project, however, employees did not complete the training at the time of project completion. The materials developed are continuing to be implemented at the plant, to an enthusiastic response from employees and a decrease in waste, defects, and absenteeism that can be partially attributed to the program. Outside evaluation also showed the program to be a success. (The report includes the external evaluation report, a validated assessment of job skills, and materials for the listening learning module.) (KC)

# REACH

## Richmond Enhanced Academics for Change

## Nabisco Richmond Model

# Skills Effectiveness Training for Workplace Literacy: The Non-Intrusive Determination of Workplace Literacy Skills Requirements in a Union Environment

## Final Reports

# SKILLS EFFECTIVENESS TRAINING FOR WORKPLACE LITERACY

THE NON-INTRUSIVE DETERMINATION OF WORKPLACE LITERACY SKILLS REQUIREMENTS IN A UNION ENVIRONMENT

PROJECT NAME:

# REACH

## *R*ICHMOND *E*NHANCED *A*CADEMICS FOR *CH*ANGE

## FINAL REPORT
## National Workplace Literacy Grant Program
## Award # 1131841519A1

## Program Narrative

The manufacturing environment at the Nabisco Richmond facility is rapidly changing. The value of the traditional skills of the workforce has been mitigated by a combination of extensive investment in equipment technology, a program of worker empowerment, or Total Quality Control, and a work redesign program. This Facility recognizes the need for lifelong learning to keep up with this ever-changing work environment.

In the past, the Richmond Facility utilized a decision making hierarchy typical of American industry. That structure placed decision making responsibility and authority in the hands of management. Management was entrusted with the responsibility to determine the cause and effect of manufacturing inefficiencies, and devise action plans for correction. Line workers executed these plans. Knowledge of the technology and equipment was prerequisite for a manager but not for the general plant employee. Managers needed to be able to comprehend equipment and technical manuals; general plant employees did not. Managers needed to be able to collect data and apply their knowledge of basic math to perform statistical analyses; the general plant employee did not. Managers, not the general plant employee, needed to be able to understand manufacturing reports and the calculations of standards on which performance measures are based.

This traditional approach of decision making in business is now obsolete. Facing challenging global and domestic markets, Nabisco must now utilize the collective intelligence of its entire workforce. The continued success of Nabisco is dependent on its ability to respond to this changing environment just as the continued productivity of Nabisco's workforce is also dependent on the enhancement and progression of employees' literacy skills.

Recognizing the need for improving the basic academic needs of employees, the Nabisco Richmond Facility has maintained an on-site Adult Education Program as part of the Training and Education Center since 1987. This center offers basic Adult Education courses, but until the onset of this project, the generic materials have informally correlated to the various jobs in the facility.

The collaborators in this project are Capital Area Training Consortium, Educational Partner, providing curriculum development and instruction, Hay Management Group, performing job/task analysis and developing a validated assessment tool, and third, the Nabisco Richmond Facility whose employees and Union members provide expertise, guidance, and enthusiastic participation in the project. Dr. Nancy Berger, Training for Performance, Inc., completed an external evaluation of the total project. Her report is attached.

The purpose of the project is to:

- determine specifically what academic skills are necessary to perform selected jobs efficiently, safely, and accurately.
- develop a validated assessment protocol to evaluate an employee's literacy skills
- develop a job-specific curriculum to improve skill deficits
- give employees the opportunity to self-direct job changes within Union agreements
- provide counseling to employees as to which jobs require the individual's existing literacy skills and
- provide an individualized educational program which provides each employee with the literacy skills needed and sought for personal and job goals.

Therefore this project includes the following:

- A job/task analysis of ten critical jobs of hourly employees
- A validated literacy skills assessment of these ten jobs
- A test / pilot of literacy skills assessment of hourly employees
- An adult learner involved curricula development
- A test / pilot of workplace literacy instruction
- An external evaluation of validated assessment instrument and curricula

The ultimate outcome of this project is to produce an educational program that will ensure that the total workforce, existing as well as future hires, will either possess the necessary functional literacy skills or will be encouraged to actively pursue these skills using materials that address pertinent job-related knowledge but with emphasis on literacy competence. The critical jobs identified for this project are Assembler, Mixer, Machine Captain, Baker, Processor, Machine Operator, Packing Tech, Utility, Sanitor, Electrician, and Mechanic

The Richmond Facility is a union environment and the REACH Project operated within all contractual agreements between the Company and the Union. Establishing a Project Advisory Committee (PAC) including representation from management, supervision, union, and REACH staff, ensured all decisions related to scheduling, volunteer participation, and confidentiality were within compliance guidelines.

All participation in the project was and continues to be on a voluntary basis. No names or existing identification numbers were used to identify each participant. A new number was assigned to each employee involved based simply on when they started their involvement; therefore the first volunteer was designated as 1, the fiftieth as 50, and so on. Only the Project Director and instructors have access to the identity of participants. All staff members signed confidentiality statements ensuring complete privacy No individual employee's personal data was shared with management or Personnel.

# Program Chronology

## Chronological Summary:

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|---|---|
| **Scheduled Start Date:** | **March 1, 1993** |
| **Actual Start Date:** | **March 30, 1994** |
| **End Date:** | **September 30, 1994** |
| **Extended End Date** | **November 30, 1994** |
| **Extended End Date:** | **August 30, 1995** |

**July 8, 1992**
Grant Proposal submitted to U.S. Dept. of Education

**February, 1993**
The HRD Manager for the Nabisco facility receives a phone call from the U.S. Dept. of Education with notification of tentative awarding of grant monies if budget and timeline can be negotiated.

**February - April, 1993**
Negotiations continue. Project Director provides detailed timeline per the DOE's request.

**April, 1993**
Project Director and Capital Area Training Consortium, the Education Partner, attend Project Directors' Opening Conference in Washington, DC, April 28-30, 1993. The official notification of the grant award, with a start date of March 1, 1993, received at the Richmond Facility on April 27, 1993.

**May, 1993**
Project Director meets with facility/Union Steering Committee May 13, to present full grant details and outline Union role. Project Advisory Committee (PAC) formed. PAC consists of two hourly Union members, Union Business Agent or designee, Project Director, one supervisor, and the HRD manager. Procedures for recruitment of participants are defined.

A video explaining the details of the project is planned. May 19, Union agrees to participate in video production. The PAC and Steering Committees meet May 26. The acronym **REACH**, **R**ichmond **E**nhanced **A**cademics for **Ch**ange, is selected for the project's title.
Election results for new local Union representatives are posted May 23. New Union reps are encouraged to support REACH.

**June, 1993**
International Union meets with facility management June 8. REACH project discussed. The consulting firm selected to perform the task analysis is disapproved by Union due to a conflict in a non-Nabisco facility. The consulting firm had been contracted to perform task analysis and assessment development for 10 facility jobs. Union members withdraw from video. Project Director and Management continue to produce video. Mass Meetings to kickoff the Project scheduled for June 9. The Facility notified June 8 that Union pulls all support for the project due to solidarity support of Union issues at another facility and disapproval of selected consulting firm.

**July, 1993**
Dept. of Educ. informed of Union concerns. Sarah Newcomb responded that the monies were allotted for 18 months and work out a settlement if possible.

**August, 1993**
First Quarterly Report of grant budget submitted to Dept. of Education. External Evaluator, Dr. Nancy Berger informed by phone of delay.

**September, 1993**
Project on hold

**October - November, 1993**
Solicitations go out to seek replacement firm for the consulting firm in contention. Union agrees to return support if another company is selected to complete job/academic task analysis and develop an assessment protocol.

**December, 1993**
Representatives from firms bidding for the REACH contract meet at the facility December 13. The purpose and expected outcomes of the project are outlined and questions addressed.

**January, 1994**
Project Director meets with representatives of bidding firms separately and answers additional questions. Hay Management Group selected to replace original consulting firm. International Representative for BCT dies and his replacement has to be brought up to date on all aspects of the project. His approval must be won.

**February, 1994**
Hay Management Group meets with International Union in Pennsylvania, February 17, to discuss Hay's understanding of the project and address any Union concerns on job elimination associated with this project. There is and never was an issue of job elimination. All aspects of adverse impact are

considered in all phases of the project development. ADA concerns are also addressed. Union approves of the Hay Group and notifies facility of its support.

**March, 1994**
Fliers are distributed explaining the REACH Project. Mass Meetings held March 30. A statement of support, signed by both International Union and Nabisco Corporate, is distributed to facility employees. The Bakery Confectionery and Tobacco Workers' Union (BCTW) Local 358 Business Agent reads the letter of support at the Mass Meetings.

**April - May, 1994**
Volunteer participants are vigorously recruited by posting fliers and holding Q & A sessions about the purpose and expected outcomes of the project. Shop Stewards attend Q & A sessions and report back to constituents their support of the program. Capital Area Training Consortium interviews and hires for positions of Curriculum Developer and Lead Instructor. Hay Group sent samples of all written materials used throughout the facility. The first REACH Newsletter is distributed.

**June, 1994**
Volunteer Internal Consultants, also referred to as SME's or Subject Matter Experts, meet with the Hay Group and begin the task analysis process. Subject Matter Experts from the jobs of Assembler, Mixer, Machine Captain, Baker, Processor, Machine Operator, Packing Tech, Utility, Sanitor, Electrician, and Mechanic escort Hay Group reps through their respective jobs, providing detailed task analysis with emphasis on what **reading, math, graph comprehension, problem solving, and listening comprehension skills** are necessary for each task.
The Internal Consultants prioritize the tasks by level of difficulty and frequency of use.
It is determined that to avoid any references to grade equivalents, the levels of **Minimum, Moderate, and Maximum** will be used to categorize skill requirements.
Each group of Internal Consultants establishes benchmarks as references for the **Min, Mod, Max skill levels.**
All jobs are then cross referenced so the ratings of Min, Mod, and Max are consistent and indicative of the level of difficulty for all tasks for all jobs. So if a Packing Tech scored Moderate in Reading and a Baker scored Moderate in Reading, they are functioning on the same level of reading comprehension.

Internal Consultants meet with CATC to provide information for curriculum development. Different learning styles and teaching modalities are identified. Samples of materials requiring the identified academic skills are gathered and

the uses of these materials are demonstrated by the internal consultants on their respective jobs.

**July, 1994**
The Hay Group develops the assessment protocol to assess the Reading Comprehension, Applied Math, Graph Comprehension, Listening Comprehension, and Problem Solving skills necessary for all jobs/tasks identified.

Using the task analysis material developed by the Hay Group, CATC begins the development of curriculum to teach the academic skills for each task. It is decided to cluster the skill levels so curriculum to teach to each level covers all jobs. So for example, someone wishing to increase academic skills for a particular job may be taught with information specific to another job in the facility, but the academic skill is the same. This grouping decreases the time and cost of developing curriculum for five academic areas, three levels each, for ten different job classifications, or 150 different curriculums. Since the academic analysis demonstrated much overlapping of skills, to develop 150 curriculums would result in redundancy; therefore five major curriculums, each with components teaching to all three levels, utilizing diverse job related materials resulted. With technical cross training becoming a possibility in the near future, using diverse teaching material and resources will expose students to the varied materials they may be expected to use in the near future.

The second REACH Newsletter is distributed.

**August, 1994**
Internal Consultants pilot test the assessment battery. Sessions are timed and compared to the estimated amount of time necessary to complete each test. Adjustments are made based on the groups' average completion times. Individual test questions are discussed and some rewritten for clarity, face validity, and technical accuracy.
CATC continues curriculum development.

**September, 1994**
International Union Representative meets with the local Union, Management, and Project Director for project update. Task analysis and drafts of the assessment tool are reviewed. Hourly employees speak of their experiences with and support of the project. The International Union Representative reiterated the International's total support of this program designed to keep employees job ready.

CATC continues curriculum development.

**October, 1994**
REACH Newsletter #3 distributed. Project Director rigorously recruits additional volunteers necessary to validate the final assessment tool. She advertises the project by posting fliers, meeting employees in informal Q &A sessions in locker rooms, walking the production lines, and speaking to the various training classes being held in the facility's Training and Education Center.

The facility holds a health fair and REACH is represented. A "How is Your Academic Health?" quiz is distributed with emphasis on the skills identified as necessary for future job needs. Regardless of how well one completes the 10 questions, the final scoring scale recommends a "dose of REACH" to prevent future "discomfort on the job."

Project Director works with the labor scheduler and supervisors to develop a complicated labor schedule which accommodates production mandates, vacations, lay-offs, and REACH assessment validation participation.

CATC continues curriculum development.

**November, 1994**
The first group of employees complete the full assessment battery. Eighty employees from all departments except Maintenance and Repair, are relieved from regular job responsibilities for the period of testing. Several scenarios for testing are tried. Some employees are relieved in two hour increments for four to five days, completing one section of the battery daily. Some employees are relieved for two half days, while other employees are relieved for one full 8-hour shift. How employees were scheduled is dictated by their job classification and the ability of providing adequate job coverage in their absence. The employees are surveyed as to their preference and the full 8-hour shift, away from all job distractions, proves to be the most convenient and accommodating. However, production schedules always take priority.
Each participant critiques assessment battery for clarity, overall job relevance, clearness of directions, and allotted completion times.

All participation is confidential. Each participant is assigned a number, 1 - 102, as each enters the testing center. Thereafter, they sign all documentation with their assigned numbers rather than a name or payroll clock number. If they wish to receive the results of the testing, they provide an address to which the results are mailed. The letter explaining the results is mailed to "Confidential to Assessee # ?" at the address provided. Only the Project Director has access to whom each number is assigned.

Each participant fills out a demographics profile as to gender, race, years on current job, and total years employed at this facility. This data, matched with the

appropriate identification number is compiled by the Hay Group for Adverse Impact and applicable validation analysis.

CATC continues curriculum development.

**December, 1994**
CATC curriculum developer shadows employees and collect data samples. Project Director scores assessments. Each of the five sections of the battery is approximately 10 pages. All questions are fill in the blank or essay and therefore is tedious and laborious to score. Recruitment for additional volunteers continues.

**January, 1995**
Twenty-five new volunteers, half of which are from Maintenance and Repair, are recruited to complete assessment for validation purposes. Due to scheduling conflicts, only 22 are available to complete testing, bringing the validation total to 102 employees. Project Director continues the scoring process of the assessment batteries.

**February, 1995**
Validation testing is complete. All assessments are scored and the resulting data is entered into a computer database. Final test results are mailed. Individuals call for appointments to discuss test results and are advised as to how to enroll in classes where appropriate.
Hay starts the validation analysis to use the assessment INTERNALLY. To use this protocol for new-hire selection or at other Nabisco Bakeries will require a separate ongoing validation.

REACH Newsletter # 4 is under development.
CATC continues curriculum development. Slides and videos of job tasks, materials, and equipment corresponding to lesson activities are developed.

**March, 1995**
Class schedules are being developed. Registration for classes scheduled for week of March 27 - 31. Classes start within two weeks of registration. Students' enrollment will be staggered based on starting levels and length of time estimated for completion of curriculum per subject area. The Reading Comprehension Curriculum is scheduled to be completed by March 31, and therefore the first students will be enrolled in Reading only. Students will be enrolled in the remaining 4 subject areas as those curricula are completed.
The curriculum will be critiqued by the students, just as the assessment tool was reviewed. Comments on clarity, job relevance, level of difficulty, and overall presentation will be acknowledged and the curriculum will be fine-tuned or revised when appropriate.

CATC agrees to start recruitment procedures for instructors.

**April - May, 1995**
CATC and Project Director adjust timeline for curriculum completion. New timeline dictates Listening Module will be taught first followed by Applied Math. Change made in response to greater need as determined by assessment results. Curriculum development continues.

**June, 1995**
Listening Module taught in two-week segments of time. Due to scheduling constraints and available curriculum, Curriculum Coordinator and Project Director discuss dedicating June and July to pilot group instruction of Listening and Problem Solving and August to individualized instruction for Applied Math, Graph Comprehension, and Reading.

**July, 1995**
Problem Solving Module taught.

**August, 1995**
Reading, Math, and Graph curriculum shared with pilot group.

**September- December, 1995**
Final reports developed. External Evaluator interviews REACH participants and submits report. Curriculum inspected to remove proprietary information. Curriculum refined and issues in external evaluation addressed and corrected where possible.

## Program Findings

Included in this final report are reports from Hay Management Group and Capital Area Training Consortium defining how the task analysis was completed, how the assessment tool was developed and validated, and how the curriculum was developed. This was an eighteen month project and the majority of the time was spent in task analysis and assessment validation followed by curriculum development. The curriculum addresses all academic requirements as defined during the correlation of job tasks and required literacy skills but insufficient time was available to fully implement the curriculum during the grant period. However, pilot groups participated in curriculum sessions for all five subject areas and their feedback is denoted in the attached final curriculum report. The curriculum should not be considered complete, since it will continue to grow and adapt as technology mandates change. The REACH curriculum has replaced the generic material being taught in the Training and Education Center. Employee involvement in curriculum development is ongoing.

As part of the grant proposal, correlations between literacy skills and job performance would be tracked. Many factors come into play at this point. Employees are not assigned exclusively to one job so job tasks change frequently. Having supervisors evaluate how academic skill deficits affect job performance conflicts with the employee's confidentiality. Also, supervisors are inclined to evaluate an employee on IF a job is completed, not HOW the job is completed. Employees with deficits are masters at hiding these deficiencies and often receive assistance from co-workers. The supervisor is unaware of the "behind the scenes" activity and relates only that the employee reports to work on time and completes jobs as assigned. Separate from this grant, the Richmond Facility has investigated the possibility of training supervisors to recognize academic skill deficits nonintrusively and confidentially.

As in any workplace education program the question of how does such a program affect the bottom line of the company is considered. Can one prove with tangible results that improving basic literacy skills has direct correlation to job performance and productivity? Logic dictates that a better informed, better educated employee possessing critical thinking skills is better equipped to work in an environment now requiring higher levels of academic skills. In an attempt to track tangible outcomes, data on the following attributes affecting the "bottom line" were collected: waste, rejects, attendance, product quality, safety, efficiency and yield.

When correlating the impact of literacy skills to these measures many factors must be considered. Although surveys of employees' attitudes about feeling more competent on the job after instruction corroborate the assumed logical impact of enhanced academic skills training, still other factors must be examined.

This facility is experiencing a metamorphosis with many conditions interacting. To say that literacy skills enhancement alone affects the improvement of these measurements may be deemed arbitrary; however the enhancement of these skills DOES play a major role. The foundation of all production processes can be summarized in one acronym, POG, or Process Operating Guidelines. Employees must possess math skills to accurately take required measurements, perform basic statistical computations, and record results in graph format. They must possess critical thinking skills to analyze the results and make informed decisions when necessary to adjust the process. Further, they must possess communication and reading skills to relay this information to and from co-workers during the process as well as in summary meetings to discuss progress over a period of time. As basic skills are improved, the data collected is more accurate and reliable. This synopsis is proven as improvement occurs in each

of the areas listed above. The best example of this phenomenon is the measurement procedure for tracking Product Quality.

Product Quality is measured statistically. For each product produced, various attributes throughout the production process are identified and measurable targets for each attribute are established. For instance, the target for the weight of a sample of cookies may be 16 ounces. Some variation from this target is acceptable and upper and lower control limits allow for this variation. However, too much variation is not acceptable and the employee must determine the cause of the variation, make a decision on how to correct the situation, and report this action appropriately, either verbally, in written format, or by computer data input. This data is ultimately analyzed and a final measurement, or Cpk, results.

The Cpk measurement reports that not only is the process under control, but how well the process is running to target. Cpk is a comparison of how the process is running to how the process is expected to run. A Cpk value of 1 or higher is desirable. For 1994, the Cpk value for overall Product Quality at the Richmond Facility was 1.03. This value increased to 1.1 for 1995, entitling this Facility to earn Nabisco's President's Cup, an award to the Facility demonstrating the highest levels of Quality as compared with other Nabisco Facilities.

One must consider that to maintain the control as explained above, other influencing factors must be taken into account. For example machinery must be in good working order, ingredients received must be of highest quality, and no abrupt seasonal temperature deviation occurs causing an adverse impact on the desired outcome. However, without the employee's accurate data collection, analysis, and decision making, this improvement in quality would not occur. The skills critical for these tasks are found throughout the REACH curriculum.

Annual records track the Facility's overall efficiency rate. Driven by accurate data collection and appropriate monitoring and action taking, the POG process is the foundation upon which continuous improvement depends. A formula called Theoretical Max is used to determine how well the Facility uses all incoming ingredients to produce an expected amount of product. After determining how many units of product can be produced by this facility, actual production numbers are compared. The 1994 efficiency rate was 84.5% whereas 1995's rate improved to 88.4%.

Some product, for various reasons, does not meet Nabisco's high quality standards and is rejected. By monitoring the process, utilizing Process Operating Guidelines, less product is rejected and production efficiency improves. The Richmond Facility improved its reject rate in 1995 by 40.8% over 1994's rate.

Another example is the improvement in waste management. Starting simultaneously with the REACH Project was the War on Waste in the Richmond Facility. All employees were "recruited" to analyze where they could reduce waste in their own areas as well as the entire facility. Employees were encouraged to submit their ideas for improvement in written format to the WOW committee. Employees were made more aware of how to save and recycle. Also initiated were production line task forces for employees to identify causes of waste and devise ways to decrease it. Employees also participate on Vendor Partnership teams. Much of the waste incurred is the result of faulty packaging and handling of incoming ingredients. These teams monitor the quality of vendors' products to ensure quality in Nabisco products. Strong reading, listening, critical thinking, and communication skills are necessary to function as a team member. As a result, suggestions were followed and the 1995 waste report showed a .9% improvement over 1994.

Another factor affecting job performance is an employee's attendance rate. An employee that feels competent in the job at hand has one less reason to avoid work. In early 1994, a dramatic change occurred in how absenteeism is monitored and disciplined at the Richmond Facility. The REACH curriculum was still in development at the that time and therefore any impact on improvement in attendance rates must be accredited to the new absenteeism program. However, the 2.55% absenteeism rate for 1994 was reduced significantly to 1.21% in 1995.

Safety is another area greatly affected by an employee's ability to listen, read, compute, think critically, and follow directions. The Reading Module of the REACH Curriculum contains many references to safety guidelines in this facility. As a direct result of one employee's participation in the Reading Module, she broadened her vocabulary and better understood the jeopardy she was placing herself in by misreading Good Manufacturing Procedures. Overall, the Facility showed improvement in the number of accidents per 100 employees over 1994. The lost-time accident rate also showed improvement. However, the severity rate of the accidents in 1995 was higher than 1994. Of note, one of these accidents was directly caused by poor literacy skills, the inability to fully read and comprehend a set of instructions. Of interest, this employee was scheduled for a Reading class on this very topic the week following the accident.

In summary, many factors attributed to the overall improvement in the areas discussed above. Publicizing the concept of "REACH for your future" and stressing Nabisco as an Education Company imprinted the value of lifelong learning on the minds of all employees. Providing a program, developed under the guidance of co-workers, enabled employees to start the process of seeking to improve literacy skills. If the project had a longer time period to continue to

develop curriculum, test the curriculum, and to document REACH participants' job performance, more evidence would be available to prove direct correlation.

As the project continues, data will continue to be collected and further correlations to job performance documented. Curriculum will continue to be developed with an increase in employee input in its development. Outside of the Richmond Facility, others will benefit from this project. The curriculum and the process followed for this project is being made available to the Virginia Adult Basic Education Resource Center as well as to the Centers identified in the original grant. Presentations have been made throughout the duration of this grant period addressing the purpose and expected outcomes of the project.

Workshops were facilitated at both the American Association for Adult and Continuing Education and the Virginia Association for Adult and Continuing Education explaining the task analysis and literacy correlation process. One round table discussion was dedicated to the possible problems a company / union / grant partnership may incur and ways to develop amicable, win-win solutions.

In summary, the outcome of this project is successful. Overcoming numerous obstacles as explained in the Program Chronology, the project persevered. A thorough task analysis was completed. Correlating literacy skills were identified. A validated assessment tool was developed and a comprehensive curriculum addressing job-specific literacy skills was developed and implemented. Pilot groups tested and evaluated both the assessment tool and the curriculum making recommendations. Over 100 employees volunteered and additional employees continue to enroll.

This project is the collaborative effort of many people, most importantly, the employees of the Richmond Facility. Without their continued support and enthusiasm a less comprehensive project would have resulted. The success of this project ensures that employees at the Nabisco Richmond Facility will continue to REACH into the future better prepared than ever before.

This report has been provided by Dr. Nancy O. Berger, Training for Performance Plus.

# NABISCO BISCUIT COMPANY
# REACH Project
# Summative Evaluation Report

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# SUMMATIVE EVALUATION REPORT
## Nabisco Biscuit Company
## Richmond, Virginia Bakery
## REACH Project

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# SUMMATIVE EVALUATION REPORT
## Nabisco Biscuit Company
## Richmond, Virginia Bakery
## REACH Project

## I. Introduction

Since its inception, the REACH project has incorporated a plan for evaluation of the project's results. After my selection as the project evaluator, I was invited to meet members of the Hay Group and Capitol Area Training Consultants (CATC) and sit in on early project meetings held by the Hay. Since then I have followed the progress of the project through periodic updates. The following evaluation report summarizes my observations concerning: the processes used, the content of the final project, and the results of the project.

## II. Qualifications of Evaluator

Dr. Nancy O. Berger is a member of the graduate faculty of the George Washington University Department of Education and Human Services. She teaches primarily for the Masters in Human Resource Development program and is the director of the off-campus masters program in Hampton and Richmond, Virginia.

With sixteen years of experience in technical training design, development, implementation and evaluation, as well as organizational development and management, Dr. Berger is also the president of Training for Performance, Inc. Her clients have included Delmarva Power, Virginia Power, Los Alamos National Labs, New England Power Services, Lawyers Title Insurance, the United Nations Industrial Development Organization (Vienna, Austria), and a variety of Federal, state and local government agencies.

## III. Methodology

A. The main questions to be answered by this evaluation report are:

- Did the project produce results?
- What were those results?
- What were the most successful parts of this project?
- What might be some areas for improvement in the future?

B. The research methods used include:

- interviews,
- observation,
- focus group,
- professional review of materials.

The questions for the focus group are included in Appendix A.

## IV. Analysis of the Specific Phases of the Project

A. Job/Task Analysis - the Hay Group

**Description**

The Hay Group undertook a detailed job and task analysis through observation and discussion with volunteer employees (internal consultants) in the specific jobs. A team of experienced Hay professionals carried out this analysis, primarily in June, 1994. The intent of this procedure was to determine the main tasks involved in performing various bakery jobs, and to determine the underlying academic skills (math, reading, listening, and so on) needed to perform those tasks. The job classifications analyzed included Assembler, Mixer, Machine Captain, Baker, Processor, Machine Operator, Packing Tech, Utility, Sanitor, Electrician and Mechanic.

After completing the task listing, Hay Group and the internal consultants ranked each task according to the following criteria: time spent, task difficulty, consequences of error, and importance. Basic skill levels were rated by Minimum, Moderate, and Maximum. No grade level equivalents were used. All jobs were then cross-referenced so that the skill ratings (minimum, moderate, maximum) would be consistent for all jobs.

**Evaluator's Analysis**

The job/task analysis was thorough and professional. The level of detail of the task analysis was sufficiently specific for the purposes of the project, but not overly detailed. The use of Internal Consultants at all stages of the job/task analysis insured a realistic portrayal of the jobs as analyzed and interpreted by the Hay Group.

The Internal Consultants validated the results and, in a later focus group, commented very positively about the process and the results. They described the process as one of brainstorming the <u>important</u> things that employees do, without getting sidetracked by less relevant details. The employees clearly expressed respect for the goal orientation of the

consultants and their professionalism. They felt that the process was efficient, and that time was seldom wasted. They noted that all of the Hay consultants knew the process to use and where they were headed, and followed through. Comments included: "Pretty thorough." "Knew what they [Hay Group] needed to do."

The use of rating levels without reference to grade levels was an excellent decision. The terms minimum, moderate and maximum accurately reflect skill levels without the negative connotations that grade levels might contribute. These levels were clearly defined and differentiated.

B. Development of Assessments

**Description**

Using the information provided by the job/task analysis, the Hay Group developed an assessment protocol to measure Reading Comprehension, Applied Math, Graph Comprehension, Listening Comprehension, and Problem Solving skills needed to perform the tasks.

The Hay Group and Internal Consultants pilot tested the assessments. They measured and adjusted completion times and gathered information about specific questions. The Hay Group used statistical analysis to identify items that were too easy or too hard and items that showed bias by gender or race. As a result, a number of items were eliminated or revised.. The adjustments and clarifications can be seen when comparing pilot assessments and current forms.

**Evaluator's Analysis**

The assessments are clearly based on the job/task analysis data. Valid statistical processes were used, and these were thoroughly explained so that it was easy to see what had been done -- this documentation will also be helpful for future reference and use.

The focus group participants mentioned the tapes used in the listening portion as an example of portions of the assessment that needed improvement. However, they also noted that the REACH project team was very responsive to their feedback and adjusted the assessment accordingly. The content of the revised assessments includes a fair amount of bakery-related material. The partnership of experienced professionals from the Hay group and Internal Consultants from the bakery provided a balance of expertise which is reflected in the job/task analysis and assessment development and revision. Employees expressed a strong sense of being a

part of the development of the program, a critical element in a project of this type. This employee "buy-in" should help insure continued interest in the program.

## C. Curriculum Development - General

**Description**

Based on the data gathered by the Hay Group, the Capital Area Training Consortium developed clusters to streamline and simplify the development of the curriculum. The color coded mapping of skills and min/mod/max levels helps illustrate and clarify the clusters. This method provides a good visual overview of the scope of project and a good reference document.

## D. Program Content - Listening Skills

**Evaluator's Analysis**

The Listening Skills portion of the program involves a rich variety of exercises. These encourage learner involvement and active listening skills. Beyond listening skills, this section also includes more general communication skills. For example, the learner participates in following directions, but also in giving directions. The section also addresses issues such as workplace cultures, group dynamics, and group decision-making. While this content may be helpful, the section title, "Listening Skills," is somewhat misleading. It is, more accurately, a section devoted to communication and group interaction skills, as well as listening.

The focus group stated that they did not like some of the subjects on the tapes, which made listening more difficult. They suggested that the tapes would be better if more directly related to job issues or to the bakery. They also found the tapes confusing at times. Beyond the tapes, however, they emphasized the value to them of working in groups, sharing job information and discussing job-related items. They enjoyed learning about other jobs and issues in the plant. While this may not have been the intended learning, it would certainly seem to be a beneficial by-product.

According to participants, the main benefit of this section was developing an awareness of the need to listen and of different perceptions when people "hear" things differently. They mentioned that they found themselves listening more closely outside of work, as well, such as at church and at home.

## E. Program Content: Reading

The focus group indicated that the reading comprehension section met their expectations for that section. They commented that seeing other points of view, and realizing that there were no right or wrong answers, was the best part. Their main criticism involved items not related to work. As one individual stated, "If you can't get into the reading, you don't care." For example, they liked the reading about Oreos, but were not interested in the article about donuts. They emphasized that it would be better if all the readings were job/bakery-related.

The portion dealing with words was "great". The focus group spoke enthusiastically about learning about other parts of the plant and what other employees do. They noted in particular that they more readily understand what others are talking about as a result of learning new vocabulary. This portion of the learning was clearly helpful to them.

## F. Program Content: Applied Math

Despite the perception that many people dislike math, the focus group expressed satisfaction with this portion of the learning. They mentioned that there was a good variety of problems, from easy to hard. The math was a good review, "especially of things you knew but don't use much" and may have forgotten. They noted that this section was "very thorough," and found it very relevant to the job. They particularly appreciated the review of decimals, especially dividing decimals, and of percentages. In some cases the computer does the math for them, but they like knowing the math steps. As a side benefit, several noted that they are now more able to help their children with their homework.

The group felt that they could have used more time in this section, and would have liked more explanation of how to do problems in some cases. They found that instructors were very helpful and gave good directions. They seemed to take special pride in having learned and "conquered" the math section.

## G. Program Content: Graphs

According to the focus group the most valuable result of this section was recognizing different types of graphs and better understanding what they show. They noted that they feel more comfortable in meetings now, because they understand more about the visual graphs used. This section

served as a good refresher, since the computer does much of the work that used to be done manually. The participants enjoyed the group discussion, and mentioned the value of one-on-one assistance from the instructor. They also noted the side benefit of better understanding graphs in the newspaper, magazines, on television, and so on.

### H. Program Content: Problem-Solving

The entire group expressed their enjoyment of this segment. They learned about how hard it is to come up with one "right" answer, and found it interesting to see different approaches and ideas. It was a "great learning experience." They learned to listen to everyone's ideas and recognize that there may be different ways to reach the same valid result. They found that it has helped them in their work with others on the job.

## V. General Comments on the Curriculum and the Project - Participant Viewpoint

From the participants' point of view the program is valuable to them both at work and off the job. When speaking of the program as a whole, they mentioned:

- Made them realize how much they had forgotten.
- Just felt good about the whole thing. Better self-esteem, felt that it made him or her a "better person."
- Wonderful instructors. Knew their material, were down to earth, explained well, took time to work with individuals, patient, attitude made you want to attend and participate.
- Never lost interest throughout the project.
- Felt involved throughout the project.
- One individual said that the program itself brought him/her out, speaks out more, and more comfortable doing so.
- Got to know other people in other departments and appreciate their jobs and viewpoints -- You don't tend to blame other people so much if you understand their side.
- Learned a lot and "just enjoyed the program."
- Need to change with the times, and programs like this help.
- The project newsletter was a good way to keep people informed. Communications are essential in a project of this type so that everyone knows what is happening, and why. Good communications also help prevent misunderstandings, and feelings of "what are they trying to hide?"

The group expressed few criticisms. They did point out that it is hard to do the program on overtime, because of family schedules and other conflicts. It would be

easier to focus on learning and attend if done on company time. Several also felt that the program could be lengthened, and that they needed more time. They felt that a great deal was compressed into short times frames in some cases.

## VI. General Comments on the Curriculum and the Project - Evaluator Viewpoint

From a professional vantage point, I find that the project was very successful. A great deal of hard work went into producing a program that would be relevant, well-accepted, and valuable to participants. In any project of this scope, there are "ups" and "downs". The project team experienced union challenges, tight deadlines and other difficulties, but was able to keep the project moving.

From the beginning the project plan was clear and followed established steps for the creation of a program of this kind. The Hay Group provided efficient, professional support in developing the job/task analysis and assessment. CATC produced a solid curriculum built on the foundation laid by the Hay Group. The volunteers who served as Internal Consultants were highly motivated and enthusiastic throughout.

## VII. Recommendations for Improvements and for the Continuing Quality of the Program

The following are recommendations for maintaining and improving the quality of the REACH program.

A. Upgrade the quality of the curriculum materials.

1. The materials are adequate, but could be more appealing. With simple desktop publishing additions, the materials would appear more professional. Add page numbers and some illustrations. Use graphics to enhance the appearance and readability. Some minor improvements would turn good materials into great materials. A professional format sends a signal to the employee that he or she is important to the organization and deserves the best materials. The current version is a good final "draft".

2. Improve the quality of articles, clippings and other "paste-ups". Some of these look somewhat "thrown together". Also improve copy quality. Some of the pages I received were not clear. If necessary, retype articles and other items so that they can be read more easily -- some older individuals need more accessible text.

3. Try to incorporate even more Nabisco-related examples, problems, and exercises. In comparison to many basic education programs, the current curriculum is somewhat customized for the bakery. However, the focus group voiced a strong desire for even more of this customization.

4. Avoid whole, monotonous pages of math problems. These look downright forbidding, and are overly reminiscent of school. From my research in adult learning with similar participants, I found that it is crucial to avoid reminding participants of earlier school experiences, which may not have always been pleasant. Break problems up, come up with more word problems, or otherwise change these sections.

B. Support the continuation of this project.

Several individuals expressed concern that the company would not be willing to continue support for a project of this kind. With the level of enthusiasm and interest in the program as evidenced by many of the participants, discontinuing the project would cause a loss of morale.

C. Recognize employee concerns about other uses of the program.

Several employees voiced concern that the company would eventually expand the use of this program to qualify or disqualify individuals for jobs and promotions. They also seem unsure about the future confidentiality of the program. From their perspective the company has made promises in the past that it has not kept, and they do not totally trust the organization's motivations. Whether accurate or not, this perception indicates a lack of trust. It is crucial for future dealings with employees that they see a more positive support and confirmation from the organization.

## VIII. Constraints to the Evaluation

The individuals involved in the project from Nabisco and Hay were very open and cooperative in the evaluation of this project. The main constraint to the research was the unavailability of the actual participant evaluation forms. These would have provided valuable insight into the participants' reactions to the program at the time they participated. However, their comments in the focus group did provide their evaluation of the project with the added value of distance from the experience. This distance helped them weigh the value of their learning as it actually applies to work and home experiences.

## IX. Summary

Overall, the project was well-planned, well-managed, and professionally executed. The Project Leader, Internal Consultants, External Consultants and others involved in the project should be congratulated for hard work that has resulted in important benefits to the individual learners and to Nabisco's operations. With some fine-tuning a very good program will be excellent.

Appendix A

Focus Group Question Outline
September 20, 1995

1. Welcome and Introductions
   * Who I am
   * Confidentiality
   * Who are you - Name, involvement with Reach
   * How we will proceed
   * What I will do with the results

2. Job Analysis - (June/July 1994)
   * How was the job analysis done?
   * What was your perception of the process?
   * Did the consultants accurately and completely analyze the main tasks of the jobs?
   * Did the job analysis provide a clear picture of the jobs?
   * How did the consultants rate the tasks as minimum, moderate, maximum skill requirements? Did you agree with their ratings?

3. Assessment Pilot - (Aug. 1994)
   * Were you involved in the pilot of the assessments?
   * How was that conducted?
   * Did you recommend changes? Do you know if those changes were made?

4. Final Assessment - (Nov. 1994)
   * Did you take the final assessment?
   * Did your assessment results fit your perceptions of your abilities?
   * Were you confident that the results were kept confidential?

5. Actual Materials

   Who participated in each of the following parts of the program?

   Reading Comprehension
   Listening
   Applied Math
   Graph Comprehension

Problem Solving

* What were your expectations of what you would learn from this part of the program?
* Did this part of the program meet your expectations?
* What was the best thing about this part of the program?
* How was the information taught?
* Could you easily see the link between the learning exercises and skills you use on your job? Were the materials job-related?
* What difficulties did you have going through the exercises, materials?
* What suggestions would you have for improving the exercises, materials?
* Have you seen any improvement in your job performance as a result of the learning activities?

6. Overall Program Comments

* What did you get out of the project personally?
  -- Has the program helped you at work?
  -- Has the program helped you outside of work?
* What do you see as the value of this program to Nabisco?
* Do you have an overall sense of confidentiality about your participation and results?
* How do you feel about the program overall? Would you recommend it to a co-worker? Was it a positive experience?
* What suggestions do you have for improvements?

# Development of the Nabisco Basic Skills Curriculum

# Nabisco Biscuit Company

by

Capital Area Training Consortium
5410 E. Williamsburg Road
Sandston, Virginia 23150

September 1995

# *Development of the Nabisco Basic Skills Curriculum*

## Purpose

The purpose of this report is to document the approach to the development of the curriculum and to report the results of the limited instructional activities that were designed to evaluate the effectiveness of what had been developed. The report also addresses the challenges and opportunities associated with the effort given the abbreviated time line for the work to be done, and provides recommendations for continuation and further development of the instructional program.

## Development of the Curriculum

The basic skills curriculum was based on the work of HayGroup in conjunction with subject matter experts from the Nabisco Bakery, Richmond, Virginia. The HayGroup was responsible for completing a task analysis on the ten job types found in the Richmond Bakery. The analysis produced a task list of 750 tasks that were then analyzed according to the basic skills required to complete the tasks. The required performance level of each of the task was also indicated for each task.

The HayGroup also established benchmarks for each job type that reflected the complexity of the basic skills required to perform each task. Skill level requirements were defined as ***none, minimal, moderate, and maximal.***

Based on the job analysis information, the HayGroup developed assessments for five types of basic literacy skills: ***Reading Comprehension, Listening, Applied Math, Graph Comprehension, and Problem-Solving.***

The HayGroup completed the task analysis in June of 1994 and the draft assessment tool in September of 1994. Curriculum development planning began in May of 1994 without the final task analysis and without any validation of the assessment tool that would ultimately direct individual workers into appropriate basic literacy skills training designed to meet their individual objectives with respect to their current job or the job or jobs they aspire to secure in the future.

The Capital Area Training Consortium was contracted with to develop a set of instructional modules that would facilitate an individualized basic skills development plan and instruction in the areas identified by the assessment process as not meeting expected performance levels for the job type selected by the worker.

The initial work involved exploration of the best approach to consider given the individualized nature of the training and the restriction imposed by the project of not teaching any job specific skills that were non-literacy in nature. We decided to examine the 750 tasks and chose to create clusters of related tasks. This resulted in the creation of 51 clusters of related tasks.

We then examined the skills and skill levels contained in each of the 51 clusters. The HayGroup facilitated our efforts in this regard by providing us with a run on the 51 clusters we identified incorporating the 750 tasks. From this analysis, we were able to gen rate a grid that reflected basic skills across job types, the highest skill level needs for each skill in the 51 clusters (See Attachment A). We color coded the desired skill levels for successful job performance. We applied the HayGroup definition of minimal, moderate, and maximal to the color coding. We also used the HayGroup's benchmarks developed for each skill level and researched the various strategies that we might employ to move into the design of the modules.

We then developed flexible, topical outlines for the five skill areas that would be used to develop the curriculum content by skill level. The outlines we designed to be used like a menu in that they were comprehensive for each skill type across job types and applicable to any skill cluster.

This approach was compatible with the assessment instrument that was under development and resulted in the five modules reflecting the five literacy skills identified and analyzed by the HayGroup. It reflected the observable behaviors and activities required to demonstrate successful job performance at each of the three skill levels, minimal, moderate, and maximal, and included inclusion of the thinking skills required to perform at each of the three skill levels.

Although the original objective was to create individualized instruction for each basic literacy skill, observation of the workplace, input from the subject matter experts and a recognition that the workplace required interaction among and between various workers in getting and giving information and in solving work related problems as part of a team, we opted to develop the ***Listening and Problem-Solving*** modules as group activities. The remaining three modules, Applied Math, Graph Comprehension and Reading Comprehension were developed to be individual self-paced instruction.

**Curriculum Development Challenges**

*Inadequate Development Time Allotted*

Prior to the completion of the assessment battery or a draft of the assessment tool and prior to its administration and reporting of results, the decision was made by the Nabisco Project Coordinator to develop curriculum based on the demographics contained in the proposal accepted by the U.S. Department of Education who funded the project. The proposal indicates that the majority of the workers were functioning on a 6th grade reading level and that they lacked the math skills needed to perform the required work task at the very basic lowest level. This is where we began our work.

On May 26, 1995, we received the results of the assessment administered by the Nabisco REACH Program Coordinator. The assessment revealed that the initial demographics did not align with the skills reflected by the volunteers who were a part of the validation study. The majority of those tested fell into the "minimal" level in Listening and Problem-Solving, not Math and Reading as anticipated. In fact, reading and math were moderate and above. Armed with this new information, we approached the REACH Coordinator and agreed to alter the order of curriculum development.

This allowed us thirty days in which to develop the curriculum and to begin instruction as required by the REACH Coordinator. This also provided the same thirty days to hire instructors that were to become familiar with the curriculum and prepared to provide instruction by June 26, 1995.

**One of the most difficult aspects of the curriculum development process was the lack of adequate time to fully develop each module to its most desirable level prior to beginning the instruction or adequately preparing the teaching staff prior to its implementation. The curriculum development process and the implementation of the instructional were originally contracted as an 18 month effort that was limited to 13 months as the beginning stages of the project bogged down.**

*Gathering of Workplace Materials*

The materials encountered and used by workers on the job in the performance of the ten job categories was not assembled prior to the beginning of the curriculum development process. It would have been efficient and more useful to have the materials available by job type for use in developing curriculum. Having the materials available, assembled, labeled, organized and inventoried (to ensure that proprietary and confidential materials remain so) would have greatly facilitated a smoother transition from the task analysis to the curriculum development process. This preparation and planning would have allowed the company and its training staff to weed out materials that were out of date, irrelevant, proprietary, or confidential, as well as having permitted a better assessment of the readability level of the materials.

Not having materials readily available and organized in advance by the company greatly hampered and delayed curriculum development efforts.

*Manpower Shortage*

Once the project timeline became abbreviated, additional curriculum developers would have made the process and the product better. Initially, a full time developer and a half time instructor were assigned to the project in anticipation of an 18 month development and instructional cycle. This proved to be inadequate as the project loss five months of development time. More emphasis and manpower devoted to curriculum development that was not separate and distinctly removed from the instructional activities would have produced a more comprehensive package and allowed more thorough development.

We also suffered from an inability to attract and retain instructors for the three shifts required to meet the grant requirements. Losing instructors meant taking time away from the curriculum development to cover classes and to retrain new staff on the curriculum to be taught.

*Administrative Concerns*

As the project moved forward, it became clear that more formal communications would have aided in the clarification of the concerns and needs of the company with respect to managing the participants. Marketing of the REACH program, communication with supervisors of the workers who volunteered for the program, and the soliciting and selection of volunteers were all done by the REACH Coordinator. Sharing of the information in writing that was provided to supervisors, and the rules established by the company for volunteer participation, and clarification of the role of the REACH Coordinator, with respect to ensuring adherence to any requirements imposed by the company, would have lessened the involvement of the Instructional staff and the Curriculum Developer in such matters. Instructors, for example, were asked to be responsible for passing out paychecks, but were given no instructions on how to handle checks for workers who did not attend the class that day. Monitoring attendance and other matters that were administrative were incorporated in the day to day activities.

Problems ranged from participants not being informed about their schedule for attending to a participant's check not being available when other participants received theirs in class. These matters eroded time that could have been spent on instruction.

**Instructional Challenges**

The purpose of the assessment battery was to measure an individual's skill level. Based on the worker's individual skill level, appropriate recommendations were to be made regarding refresher or academic training and education. For example, if an individual was assessed as having a minimum level of applied math skills and a moderate or maximum level of applied math skills is required for the existing or desired job, the individual could choose to: take no action to develop his or her skills, pursue math education in the community, or enroll in a Math course offered by Nabisco at the bakery. This purpose statement was extracted from the HayGroup's report on the development and validation of the assessment battery.

Given this purpose for the assessment, the purpose of the curriculum developed by the Capital Area Training Consortium was to provide the on-site ability to improve in those areas that failed to meet desired skill levels.

As the instruction began, individuals were included in curricula that may not have been appropriate because their assessment results may not have warranted participation. For example, individuals who achieved a maximum skill level of achievement on the listening assessment may have been assigned to the listening module by the REACH Coordinator. The challenge was ensuring that the time for the individual was not wasted nor considered none valuable.

Scheduling of employees was also a real challenge. Forty hour blocks of time were set aside for various groups of employees to participate in instruction across three shifts. Vacations, leave and other interruptions caused some individuals to not receive the full forty hours of instruction. Erratic attendance was a challenge that may or may not be overcome. Such attendance detracted from the ability to secure adequate evaluation and feed back on the curriculum.

**Participant Evaluations of the Curriculum**

REACH Volunteers who completed the Listening Module and those who completed the Problem-Solving Modules were the only groups that were able to provide feedback that should be used to alter the curriculum. The Curriculum as presented to Nabisco on August 31, 1995 does not reflect the many revisions that should be made in response to the evaluations, nor does it reflect the many alterations and revisions the curriculum developer would like to see made. The inadequate time frame for completion of the effort means that the Company will need to build on the curriculum delivered on August 31, 1995 to reach the ultimate objectives stated in the proposal to the U. S. Department of Education.

The participants evaluations of the Listening and Problem- Solving curriculum were positive. They also offered excellent recommendations for change and noted concerns that should be addressed in the activities and time allotted for instruction. A copy of their evaluations and the summaries prepared by the instructors may be found in Attachment B.

**Recommendations and Conclusions**

*Recommendation # 1 Continue the Instruction to Allow Adequate Evaluation of the Curriculum*

Given that the REACH Project did not develop as outlined in the proposal submitted to the U. S. Department of Education. The opportunity to develop curricula and the opportunity to test curricula via instruction and the opportunity to evaluate skills transferred is a significant problem.

In the grant, it is stated that the partners will evaluate the effectiveness of the assessment and subsequent customized curricula by three methods. First, the partners were to track the qualification rate of the job applicants (job bidders) post program implementation verses pre-program implementation. The enhanced ability of the employee to qualify for career advancement would reflect success in the project. The second evaluation method was to be a statistical evaluation of the correlation between enhanced literacy skills and the key manufacturing indicators of waste, rework, rejects, down time, yield, and labor efficiency. Comparative date for individuals, work teams, departments and the overall plant in general were to be used. The third method was to depend on input from the adult learner him/herself. Using a questionnaire and interviews, the responses would then be evaluated.

Obviously the evaluation plan will be altered to correspond to the work that can be evaluated given the loss of five months of project time. Absent the time to use the evaluation information, no changes have been made to the first issue of the curriculum.

**In recognition of the need to fully test and evaluate the curriculum, the Capital Area Training Consortium began work with the company through Tom Currin before his departure to locate additional funds to permit the in-house REACH Coordinator to continue instruction. A $10,000 request was made to the Henrico IDA for funding through June 30, 1996 for three shifts of instruction. No final decision has been made by the company.**

*Recommendation #2 Continued Development and Use of Individual Educational Plans*

The Capital Area Training Consortium developed the Individual Educational Plan (IEP) as a vehicle for trainee and instructor to keep focus on the objectives for participation (Attachment C). The IEP should reflect the assessment results and allow the trainee to establish the skill levels they would like to achieve, given their desire to improve current job performance or to qualify for other job opportunities within the bakery. The final format and the need for continued confidentiality should be finalized to be a grid that reflects the assessment results and the objectives established in each of the five basic skill areas. As with the one tested during the project, the time and attendance should be recorded on the back as a way to establish the number of hours invested for the success experienced. This can be a very valuable piece of data for on going evaluation of the curriculum and the instruction.

*Recommendation #3 Scheduling*

Although the Capital Area Training Consortium was not involved in scheduling employees for participation, the scheduling during work hours was very problematic given the essential nature of production and needed manpower. We strongly suggest that consideration be given to having the program available, but during the non-scheduled work hours of employees. This would prevent sporadic attendance caused by shifting work schedules.

The curriculum was required to be delivered in forty hour blocks with each participant being given 5 consecutive 8 hour days off the work floor for all instruction. This is not the most effective instructional method. While this approach works for the group activities, it may prove too intense for all participants given the subject and the skills development involved. If the program truly intends to be an individualized self-paced activity, then individuals should be able to schedule themselves into the hours and times that they are able to commit to. If the program were held during non-work hours, then this would be more realistic.

*Recommendation #4 Expand Curriculum Content*

Although the project restricted our ability to teach any of the job specific functions not specifically related to the literacy needs, adults learn best by having the ability to transfer learning immediately while doing. The disadvantage that an isolated literacy training activity has is its apparent disconnect from the other activities of the workplace. In this project, the REACH program would have significantly benefited from being a part of a larger organizational effort to retool its workforce. It was unclear to the participants, if not the project designer, that it was in fact valued by the company and its employees. It may have been helpful to have the literacy skills development incorporate some aspect of the technical skills required for the jobs held or being sought. There is a whole body of knowledge that supports this approach. The Capital Area Training Consortium was prohibited from pursuing any inclusion of the technical skills.

*Conclusions*

We believe that our approach to the curriculum is a sound one given the task analysis and the subsequent development and validation of the assessment battery. What is needed is a review of the assessment battery to ensure that any alterations made as a result of the validation process and that any changes in the skill levels and associated activities are captured in the curriculum properly. The curriculum package is only the first step in the need to now refine and revise, based on participant feedback and on the instructors experience with delivering instruction. More activities and varied practice opportunities need to be developed, as well as feed back from the subject matter experts who contributed to the process as it was developing to refine the activities.

The curriculum is in its infancy and can be grown to meet the needs of the individual workers and the workplace as the evaluation process takes place.

# ATTACHMENT A

# CLUSTERS

# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Assembler | Listening | Minimal | When the line goes down, request for lot # and cream-up and listen to response. |
| Assembler | Listening | Moderate | Listening to instructions when recipes are changed, such as when "running samples" of new products. |
| Assembler | Listening | Maximal | Not required. |
| Assembler | Reading | Minimal | 1) Read recipe cards. 2) Read dump cards. 3) Read weekly schedule. |
| Assembler | Reading | Moderate | Read safety handouts received at monthly safety meetings. |
| Assembler | Reading | Maximal | Not required. |
| Assembler | Graph Comprehension | Minimal | Not required. |
| Assembler | Graph Comprehension | Moderate | Not required. |
| Assembler | Graph Comprehension | Maximal | Not required. |
| Assembler | Applied Math | Minimal | Counting buckets and subtracting number left at end of day. |
| Assembler | Applied Math | Moderate | Adding weights of two ingredients in one bucket (involves adding numbers with |
| Assembler | Applied Math | Maximal | Not required. |
| Assembler | Problem Identification | Minimal | Noticing that an empty holster indicates a knife is missing. |
| Assembler | Problem Identification | Moderate | Determining if the wrong ingredients have been dumped before pushing button to notify mixer to "take" ingredients. |
| Assembler | Problem Identification | Maximal | Not required. |
| Assembler | Problem Solving | Minimal | 1) If problems occur, notify supervisor. 2) If light comes on, dump ingredients. |
| Assembler | Problem Solving | Moderate | Not required. |
| Assembler | Problem Solving | Maximal | Not required. |
| Assembler | Comparison Speed | Minimal | Comparing worksheet to dump sheet to record lot numbers. |
| Assembler | Comparison Speed | Moderate | Not required. |
| Assembler | Comparison Speed | Maximal | Not required. |
| Assembler | Information Ordering | Minimal | Activities performed at the beginning of each shift. |
| Assembler | Information Ordering | Moderate | Read dump sheet and dump ingredients according to group. (Group 1 gets dumped before Group 2, etc.) |
| Assembler | Information Ordering | Maximal | Not required. |

# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Mixer | Listening | Minimal | ~~Transporter (Utility Person)~~ informs Mixer of dough temperature. Utility person reports the number of doughs in proof room. |
| Mixer | Listening | Moderate | Listening to instructions for changing the batteries in the transporter. |
| Mixer | Listening | Maximal | Not required. |
| Mixer | Reading | Minimal | Reading ingredient labels on computers. Reading buttons on DEMACS computers. |
| Mixer | Reading | Moderate | Reading articles on bulletin board. Reading the disciplinary action form (101). |
| Mixer | Reading | Maximal | Not required. |
| Mixer | Graph Comprehension | Minimal | Understanding a control chart with LFRA readings, temperature, dough lay time. |
| Mixer | Graph Comprehension | Moderate | Understanding a chart from the potentiometer. |
| Mixer | Graph Comprehension | Maximal | Understanding a line product chart or POG chart (hung up in cafeteria). |
| Mixer | Applied Math | Minimal | Adding or subtracting minor ingredients to ensure proper amount of ingredients is added to mixer. |
| Mixer | Applied Math | Moderate | Determining the number of doughs needed to be processed each hour to satisfy line production quota. |
| Mixer | Applied Math | Maximal | Not required. |
| Mixer | Problem Identification | Minimal | Recognizing that a dough isn't right because one of the ingredients has not been added to mixer. |
| Mixer | Problem Identification | Moderate | Recognizing that when you get a storm warning, you need to pay close attention to the mixing process. |
| Mixer | Problem Identification | Maximal | Hearing sounds that indicate a piece of machinery is going to break down. Recognizing from the smell and feel of the dough that something is not right. |
| Mixer | Problem Solving | Minimal | If you do not put yeast into the sponge, the dough will not rise. |
| Mixer | Problem Solving | Moderate | Deciding which option to choose when the temperature or lay time is outside of the specified upper and lower control limits on the control chart. |
| Mixer | Problem Solving | Maximal | Not required. |
| Mixer | Comparison Speed | Minimal | Comparing recipe weights on the 207 form with minor ingredient weights on the cart ticket. |
| Mixer | Comparison Speed | Moderate | Not required. |
| Mixer | Comparison Speed | Maximal | Not required. |

# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Mixer | Information Ordering | Minimal | Recording the dough temperature and mix time according to when each dough is finished mixing. |
| Mixer | Information Ordering | Moderate | Mixing a buffer solution for sponges which requires adding the ingredients in a specific sequence. |
| Mixer | Information Ordering | Maximal | Not required. |

CLUSTERS 4-10

# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Machine Capt. | Listening | Minimal | Understand Baker's telephone report that the dough weights are too high or too low, or that the cut is off. |
| Machine Capt. | Listening | Moderate | Understand a supervisor's series of instructions for cleaning a piece of machinery. |
| Machine Capt. | Listening | Maximal | Not required. |
| Machine Capt. | Reading | Minimal | Read quality control charts. Read NABPOGS/DEMACS screens. |
| Machine Capt. | Reading | Moderate | Understanding job aids for changes on line (explanations, instructions). |
| Machine Capt. | Reading | Maximal | Not required. |
| Machine Capt. | Graph Comprehension | Minimal | Understanding a control chart. |
| Machine Capt. | Graph Comprehension | Moderate | Understanding Line #7 trend screen on the DEMACS (4 graphs on 1 screen). |
| Machine Capt. | Graph Comprehension | Maximal | Understanding a POG chart for a week's production (hung in cafeteria). |
| Machine Capt. | Applied Math | Minimal | No example. |
| Machine Capt. | Applied Math | Moderate | Adding dough weights (in decimals). |
| Machine Capt. | Applied Math | Maximal | Computing the average dough weight (in decimals). |
| Machine Capt. | Problem Identification | Minimal | Recognizing that the salter isn't working because you forgot to cut it back on. Recognizing that the scrap is going into the oven. |
| Machine Capt. | Problem Identification | Moderate | Recognizing that the lap behind rollers will produce heavyweights. Recognizing that change in the thickness of dough will throw off the weights. |
| Machine Capt. | Problem Identification | Maximal | Recognizing a visible dough change before it gets to the machine. Recognizing a problem with machinery before it breaks down. |
| Machine Capt. | Problem Solving | Minimal | Knowing that if you don't fill the flour pots, the dough will jam. |
| Machine Capt. | Problem Solving | Moderate | Deciding whether to speed up or slow down machinery when making an adjustment. |
| Machine Capt. | Problem Solving | Maximal | Considering whether to dump dough after a space. |
| Machine Capt. | Comparison Speed | Minimal | Spot check weights of dough (in head, fast, compare 3 weights to a standard). |
| Machine Capt. | Comparison Speed | Moderate | Compare conveyor speeds and dough speeds to a standard while dough sits on belt. |
| Machine Capt. | Comparison Speed | Maximal | At start-up, compare tachometer and belt speeds along with flowing dough, looking for foreign substances, appropriate width and thickness. |
| Machine Capt. | Information Ordering | Minimal | Complete control charts (appropriately matched with times and dough weights). |
| Machine Capt. | Information Ordering | Moderate | Adding or lowering dough weights. |
| Machine Capt. | Information Ordering | Maximal | Start-up and shut-down of machinery. |

# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Baker | Listening | Minimal | Understand when the QC lab calls with a moisture reading. Communicating with the Machine Captain and Packing. |
| Baker | Listening | Moderate | Understand a supervisor's series of instructions for cleaning machinery. |
| Baker | Listening | Maximal | Not required. |
| Baker | Reading | Minimal | Read instructions for the Hunter lab unit. Read quality control charts. Read the NABPOGS/DEMACS screen with pre-start checks (sentences on sign-in screen). |
| Baker | Reading | Moderate | Read instructions or notices on the bulletin board. |
| Baker | Reading | Maximal | Understand POG manuals, mini-lab and oven manuals. |
| Baker | Graph Comprehension | Minimal | Understand a control chart. Understand the oil trend screen (line graph). |
| Baker | Graph Comprehension | Moderate | Understand a Scorpion line graph that shows oven zones and temperatures. |
| Baker | Graph Comprehension | Maximal | Understand a POG chart for weekly line production. |
| Baker | Applied Math | Minimal | Compute oil usage (write down last oil reading, subtract reading for next hour in whole numbers). |
| Baker | Applied Math | Moderate | Compute product weights (requires addition of decimals). |
| Baker | Applied Math | Maximal | Compute oil percentage for product [(wet weight-dry weight) / dry weight] in decimals. |
| Baker | Problem Identification | Minimal | Recognize that oil spray screen or reservoir filter screen is clogged when you see bubbles. Recognize a problem with a product because of its color. |
| Baker | Problem Identification | Moderate | Recognize that a lighter color could indicate a moisture or weight problem (anticipate about what's coming down the line). |
| Baker | Problem Identification | Maximal | Not required. |
| Baker | Problem Solving | Minimal | If there is a space, reduce oven heat. If there is no salt on the product, contact the Machine Captain. |
| Baker | Problem Solving | Moderate | If one factor (e.g., color, moisture, thickness) is out of range, adjust oven conditions. |
| Baker | Problem Solving | Maximal | Not required. |
| Baker | Comparison Speed | Minimal | Spot check weights of dough (same as for Machine Captain). |
| Baker | Comparison Speed | Moderate | Compare the strip breaker, stray field (microwave), and oil unit speeds for transference on belts. |
| Baker | Comparison Speed | Maximal | Inspect products for defects as they flow by for color, shape, doubles, cripples, etc. |

# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Baker | Information Ordering | Minimal | Complete control charts for appropriate product specifications matched with appropriate times. |
| Baker | Information Ordering | Moderate | Use the Scorpion (requires a series of steps). Taken oven weights (dry weight/wet weight). |
| Baker | Information Ordering | Maximal | Start-up and shut-down of oven. |

CLUSTER 15

# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Machine Op | Listening | Minimal | Supervisor says line will start-up in 10 minutes. |
| Machine Op | Listening | Moderate | Not required. |
| Machine Op | Listening | Maximal | Not required. |
| Machine Op | Reading | Minimal | Reading the sensory form. |
| Machine Op | Reading | Moderate | Reading the safety newsletter. |
| Machine Op | Reading | Maximal | Reading the instruction manual on how to calibrate scales. |
| Machine Op | Graph Comprehension | Minimal | The R-chart (lowest part of the control chart). |
| Machine Op | Graph Comprehension | Moderate | A decision rule job aid. |
| Machine Op | Graph Comprehension | Maximal | QA weekly/monthly charts. |
| Machine Op | Applied Math | Minimal | Calculating the range (subtracting the lowest from the highest weight). |
| Machine Op | Applied Math | Moderate | Calculating breakage (weighing and dividing). |
| Machine Op | Applied Math | Maximal | Not required. |
| Machine Op | Problem Identification | Minimal | If a slug is crooked, knowing the machine will stop. |
| Machine Op | Problem Identification | Moderate | Recognizing problems that might indicate a missing or broken machine component. |
| Machine Op | Problem Identification | Maximal | Not required. |
| Machine Op | Problem Solving | Minimal | If you don't turn the machine on, it won't run. |
| Machine Op | Problem Solving | Moderate | Deciding whether to switch to manual or automatic. |
| Machine Op | Problem Solving | Maximal | Evaluating product when deciding whether to dump. |
| Machine Op | Comparison Speed | Minimal | Reviewing a series of sensory ratings to determine changes over time. |
| Machine Op | Comparison Speed | Moderate | Continuously monitoring belt speeds displayed (they fluctuate). |
| Machine Op | Comparison Speed | Maximal | Inspecting product for irregularities (e.g., uncut or doubled) as they flow by. |
| Machine Op | Information Ordering | Minimal | Recording bag/box weights by hand on control charts. |
| Machine Op | Information Ordering | Moderate | Setting up paper for automatic splicing. |
| Machine Op | Information Ordering | Maximal | Fixing a jam (e.g., pump-up) on the DELKOR machine (requires backtracking and detailed series of steps). |

# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Packing Tech | Listening | Minimal | Receive call from Bakery saying product that is coming is burned or scrap. |
| Packing Tech | Listening | Moderate | Cartoner tells Bagger that bags are too long, or count per pound is out. |
| Packing Tech | Listening | Maximal | Not required. |
| Packing Tech | Reading | Minimal | Reading the sensory updates. Also, reading the weekly schedule. |
| Packing Tech | Reading | Moderate | Reading the product specifications notebook ("guidelines"). |
| Packing Tech | Reading | Maximal | Not required. |
| Packing Tech | Graph Comprehension | Minimal | R-chart (lowest portion of a control chart). |
| Packing Tech | Graph Comprehension | Moderate | X-bar chart (middle portion of a control chart). |
| Packing Tech | Graph Comprehension | Maximal | POG charts. |
| Packing Tech | Applied Math | Minimal | Calculating the range (subtracting the lowest from the highest weight). |
| Packing Tech | Applied Math | Moderate | Calculating average bag weights by adding and dividing (including moving decimals mentally or by multiplying by 100). |
| Packing Tech | Applied Math | Maximal | Not required. |
| Packing Tech | Problem Identification | Minimal | Cartoner will not run because magazine is empty. |
| Packing Tech | Problem Identification | Moderate | When the line is down, knowing that the Accumulator will fill and dump if "space" is not requested. |
| Packing Tech | Problem Identification | Maximal | Knowing when to adjust the pressure on the bundler paper before it breaks. Also, recognizing when noises are unusual and may indicate trouble. |
| Packing Tech | Problem Solving | Minimal | Knowing that when the blue light comes on, something (material or product) is low. |
| Packing Tech | Problem Solving | Moderate | Deciding whether the machine should be on-line (automatic) or off-line (manual). |
| Packing Tech | Problem Solving | Maximal | Knowing when to call for a "space", and for how long. |
| Packing Tech | Comparison Speed | Minimal | Comparing production or B&R amounts across shifts. |
| Packing Tech | Comparison Speed | Moderate | When a bagger is down, comparing set points across baggers to determine what adjustments need to be made. |
| Packing Tech | Comparison Speed | Maximal | Not required. |
| Packing Tech | Information Ordering | Minimal | Listing bag weights in the proper places on control chart data collection area. |
| Packing Tech | Information Ordering | Moderate | Following a diagram for threading paper into bundler and baggers. Also, recording bag weights before computing and recording range. |
| Packing Tech | Information Ordering | Maximal | Downloading recipes at the DEMACS computer. |

# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Sanitor | Listening | Minimal | Verbal additions to work orders. |
| Sanitor | Listening | Moderate | Specific instructions on which supplies to use for cleaning. |
| Sanitor | Listening | Maximal | Union meetings where they discuss union rules versus company policy. |
| Sanitor | Reading | Minimal | Reading work orders. |
| Sanitor | Reading | Moderate | Reading MSDS sheets on hazardous materials. |
| Sanitor | Reading | Maximal | Reading instructions in the hazardous material and blood clean-up kits |
| Sanitor | Graph Comprehension | Minimal | Not required. |
| Sanitor | Graph Comprehension | Moderate | Not required. |
| Sanitor | Graph Comprehension | Maximal | Not required. |
| Sanitor | Applied Math | Minimal | Computing time on timecards. |
| Sanitor | Applied Math | Moderate | Not required. |
| Sanitor | Applied Math | Maximal | Not required. |
| Sanitor | Problem Identification | Minimal | Recognizing an unplugged lift will not work. |
| Sanitor | Problem Identification | Moderate | Recognizing bugs in flour when cleaning bins. |
| Sanitor | Problem Identification | Maximal | Recognizing problems with machinery (e.g., frayed belts) when cleaning. |
| Sanitor | Problem Solving | Minimal | Notify supervisor if problems with machinery. |
| Sanitor | Problem Solving | Moderate | Fixing a clogged sink. |
| Sanitor | Problem Solving | Maximal | Cleaning up hazardous spills. |
| Sanitor | Comparison Speed | Minimal | Not required. |
| Sanitor | Comparison Speed | Moderate | Not required. |
| Sanitor | Comparison Speed | Maximal | Not required. |
| Sanitor | Information Ordering | Minimal | Not required. |
| Sanitor | Information Ordering | Moderate | Using blood clean-up kit to clean up blood spills. |
| Sanitor | Information Ordering | Maximal | Not required. |

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# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Utility | Listening | Minimal | Verbal additions to work orders. |
| Utility | Listening | Moderate | Specific instructions on how to perform cleaning tasks. |
| Utility | Listening | Maximal | Seminars on Pesticide Certification (only some of the information is relevant to them). |
| Utility | Reading | Minimal | Reading work orders. |
| Utility | Reading | Moderate | Reading MSDS sheets on hazardous materials. |
| Utility | Reading | Maximal | Reading Pesticide certification manuals. |
| Utility | Graph Comprehension | Minimal | Not required. |
| Utility | Graph Comprehension | Moderate | Quality Control charts. |
| Utility | Graph Comprehension | Maximal | Graphs included in the Pesticide Certification Training |
| Utility | Applied Math | Minimal | Computing time on timecards. |
| Utility | Applied Math | Moderate | Sifter tailings (requires multiplying bugs x number of splits). |
| Utility | Applied Math | Maximal | Calculating the ~~square~~ cubic footage when fogging or using pesticides (involves decimals). |
| Utility | Problem Identification | Minimal | Recognizing a hose in the steam room is not in the correct place. |
| Utility | Problem Identification | Moderate | Recognizing that all the phostoxins have not been removed from the railcars. |
| Utility | Problem Identification | Maximal | Recognizing potential problems when using computerized entech system for fogging. |
| Utility | Problem Solving | Minimal | No example. what chemicals To use for cleaning |
| Utility | Problem Solving | Moderate | Solving problems when exhausting fumigated bins. |
| Utility | Problem Solving | Maximal | Solving problems when using entech system for fogging. |
| Utility | Comparison Speed | Minimal | Comparing pheremone ratings on a sheet of paper. |
| Utility | Comparison Speed | Moderate | Taking gastech readings. |
| Utility | Comparison Speed | Maximal | Not required. |
| Utility | Information Ordering | Minimal | Taking inventory. |
| Utility | Information Ordering | Moderate | Sifter tailings. |
| Utility | Information Ordering | Maximal | Fumigating the bins. |

CLUSTERS 38 - 45

# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Electrician | Listening | Minimal | Supervisor tells you to go check out a problem. |
| Electrician | Listening | Moderate | Oral instructions on calibrating a machine. |
| Electrician | Listening | Maximal | (1) Discussing technical data. (2) Listening to and deciphering a line worker's description of a problem. |
| Electrician | Reading | Minimal | PMs (~~Per monthly~~") and work orders. |
| Electrician | Reading | Moderate | Vendor literature (regarding machinery). operator's manual |
| Electrician | Reading | Maximal | Technical manuals. |
| Electrician | Graph Comprehension | Minimal | Safety bar charts. |
| Electrician | Graph Comprehension | Moderate | Amp. charts. |
| Electrician | Graph Comprehension | Maximal | POG charts. |
| Electrician | Applied Math | Minimal | Filling in time cards. |
| Electrician | Applied Math | Moderate | Checking paycheck for accuracy. |
| Electrician | Applied Math | Maximal | (1) Electrical computations (e.g., motor loads, percent of overcurrent protection, KVAs). (2) Converting decimal to binary or hexadecimal or octal. |
| Electrician | Problem Identification | Minimal | Line isn't running because operator hasn't pressed the start button. |
| Electrician | Problem Identification | Moderate | Observing machine operation to determine the problem. |
| Electrician | Problem Identification | Maximal | (1) Recognizing changes in machinery sounds. (2) Predicting problems from |
| Electrician | Problem Solving | Minimal | Change light bulb if warning or indicator light is not working (but you know it should be). |
| Electrician | Problem Solving | Moderate | Deciding which input is malfunctioning when the warning light fails to light (even when the bulb is good). |
| Electrician | Problem Solving | Maximal | Prioritizing multiple problems. |
| Electrician | Comparison Speed | Minimal | Comparing bagger temperatures on DEMACS screen. |
| Electrician | Comparison Speed | Moderate | (1) Comparing and adjusting belt speeds on Oreo line. (2) Observing stacker problem before stacker ties up. |
| Electrician | Comparison Speed | Maximal | Not required. |
| Electrician | Information Ordering | Minimal | Correcting tracking errors on full pallet conveyers (can choose which pallet to correct first, although actual correction must occur in a sequence). |
| Electrician | Information Ordering | Moderate | Following a PM work order. |

CLUSTERS 44 - 47

# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Electrician | Information Ordering | Maximal | (1) Following the appropriate sequence of actions to start up a complicated piece of machinery (e.g., the sheet laminator on line 7). (2) Writing a PLC program. |

CLUSTERS 44 - 47



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# JOB SPECIFIC SKILL LEVEL EXAMPLES

| Job | Skill | Level | Benchmark Description |
|---|---|---|---|
| Mechanic | Listening | Minimal | Equipment status notification. |
| Mechanic | Listening | Moderate | Shift change instructions. |
| Mechanic | Listening | Maximal | Troubleshooting discussion with supervisors and Machine Operator/Packing Tech. |
| Mechanic | Reading | Minimal | Reading work orders and job aids. |
| Mechanic | Reading | Moderate | Reading safety sheets. |
| Mechanic | Reading | Maximal | Read and understand tech. manuals. |
| Mechanic | Graph Comprehension | Minimal | Simple, one-way graph. |
| Mechanic | Graph Comprehension | Moderate | Understanding control charts. |
| Mechanic | Graph Comprehension | Maximal | Understanding POG charts. |
| Mechanic | Applied Math | Minimal | Adding hours for time card. |
| Mechanic | Applied Math | Moderate | Figuring cycles per minute. |
| Mechanic | Applied Math | Maximal | Fabricating parts. |
| Mechanic | Problem Identification | Minimal | Machine switch correction. |
| Mechanic | Problem Identification | Moderate | Replace slipping belts. |
| Mechanic | Problem Identification | Maximal | Monitor line equipment. |
| Mechanic | Problem Solving | Minimal | Unit on or off. |
| Mechanic | Problem Solving | Moderate | Product box/bags not opening/sealing. |
| Mechanic | Problem Solving | Maximal | Troubleshooting cartoner. |
| Mechanic | Comparison Speed | Minimal | Compare shift output production. |
| Mechanic | Comparison Speed | Moderate | Not required. |
| Mechanic | Comparison Speed | Maximal | Monitor machine production floor. |
| Mechanic | Information Ordering | Minimal | Individual equipment start-up. |
| Mechanic | Information Ordering | Moderate | Retiming machinery. |
| Mechanic | Information Ordering | Maximal | Line start-up. |

CLUSTERS 48 - 51

# ATTACHMENT B

# REACH Listening Skills Module Evaluation

## REACH Listening Skills Module Evaluation

Instruction for the Listening Skills Module began on June 27 and concluded on July 7. Thirty four (34) individuals participated in two-hour class sessions for eight days, resulting in 16 hours of instruction. See the Statistics and Comments Section for attrition details.

Facilitators guided the participants through group discussions, role playing, cassette tape listening, and workbook activities. Nineteen (19) activities of varying skill levels were completed. On the last day of instruction, the participants were asked to evaluate the course content and effectiveness by completing a questionnaire (see attached questionnaire). Overall, the participants rated the course as "excellent, well organized, and effective." The module objectives were clear, and many commented that they had improved in some areas and learned new listening techniques. The workbook activities were described as "good and relevant." Participants felt not enough time was devoted to some workbook activities. A weakness noted by a majority of the students is the module's inability to teach them how to handle situations when supervisors refuse to adhere to listening skills guidelines. However, the course was not structured to deal with management's skill level or personnel issues.

## Major Conclusions/Recommendations

*Strong Points Noted by Participants*

- The listening skills training was beneficial.
- The module was well organized.
- The objectives were made clear to participants.
- The workbook activities were relevant to jobs.

*Weak Points Noted by Participants*

- There was not enough time was allotted for some exercises.
- Some participants are not sure the listening skills guidelines can be used on a daily basis in the plant because manager's do not practice the guidelines.
- Some participants wanted more practice using active listening techniques in groups and with supervisors.

*Recommendations Noted by Participants*

- Require all plant personnel to take listening skills review courses, twice a year at least.
- Managers and supervisors should take REACH Listening Course.
- Allow more time for activities in the workbook.
- Do not give homework assignments. Provide a way to do telephone listening activity in class.
- Make adjustments to several of the activities or delete them.

*Recommendations Noted by Facilitators*

- Delete some activities that were not effective in encouraging interaction.
- Shorten some activities to allow adequate time for other activities.
- Revise several of the activity sheets in the notebook.
- Do not schedule students during their vacations or days-off.
- Remind students that the course cannot deal with personnel problems.
- Provide students with snacks (some were disgruntled due to lack of sodas, donuts etc.).

## Statistics and Comments

### *Listening Skills Module Participants*

| Session Time | Number Scheduled | Number Added | Number Deleted | No Shows | Actually Attended | Number Attritions | Number Transfers |
|---|---|---|---|---|---|---|---|
| 7:30 - 9:30 a.m. | 18 | 0 | 4 | 5 | 7 | 2 | 0 |
| 1:00 - 3:00 p.m. | 18 | 0 | 3 | 2 | 7 | 5 | 1 |
| 3:30 - 5:30 p.m. | 12 | 3 | 4 | 1 | 5 | 5 | 0 |
| 9:00 - 11:00 p.m. | 4 | 1 | 1 | 1 | 2 | 1 | 0 |
| **Totals** | **52** | **4** | **12** | **9** | **21** | **13** | **1** |

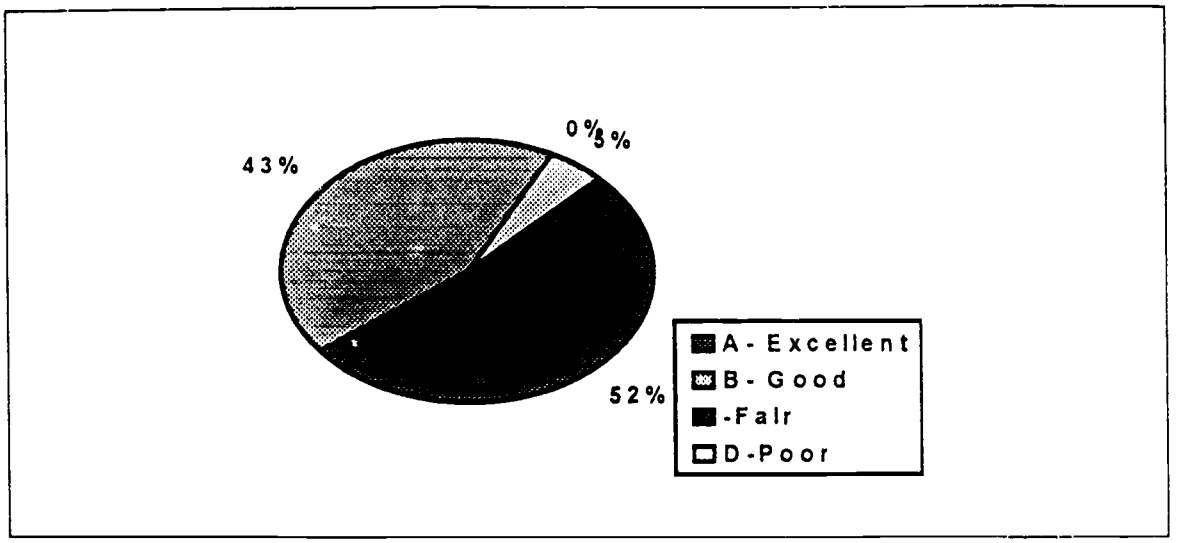
***Legend:***

**Attrition** = Those who began the class, but did not complete the class because of vacation, days-off, or personal circumstances.

**Transfers** = Those who transferred from one class to another.
**Actually Attended** = Those who attended all class sessions.

**Conclusion:** The attrition rate was very high due to scheduling and other reasons. A total of 34 (21 +13) individuals participated in the class.

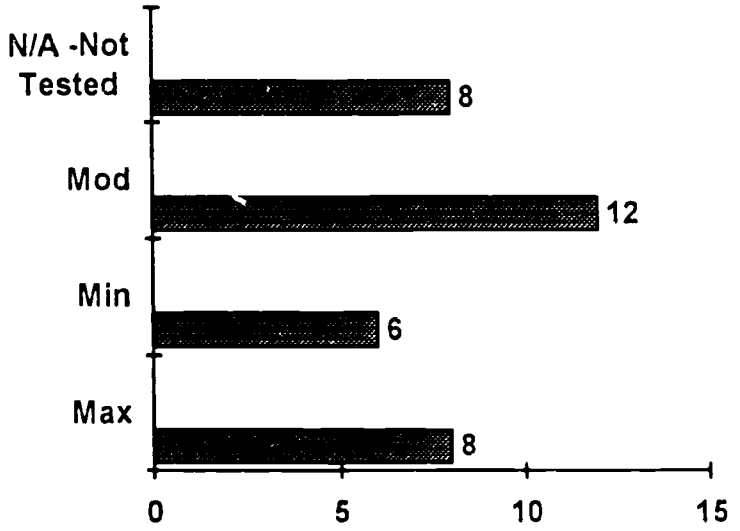
The chart below represents the percentage of students that rated the listening module excellent, good, fair, or poor overall.




Number of total students: N =21
(11 checked excellent; 9 good, 0 fair, and 1 poor)

**Conclusion**: Overall, the participants said the calss was excellent.

The chart below records the skill level of the students that attended the class.



## Comments

- The course help make better working environment better for all workers.
- The course helped them me evaluate myself to be more open-minded.
- Helped me understand how to better deal with co-workers.
- Personally motivated me to work on improving my listening skills on the job as well as outside of work.
- Group discussions were very helpful and attention getters.
- Should slow down the pace. Some activities went too fast.
- Should allow more time for group listening activities and more practice.
- Clarify directions of activities in the yellow section by numbering.
- I received some additional knowledge from the course that I can use at a later time.

## REACH Problem Solving/Critical Thinking Module Evaluation

Instruction for the Problem Solving/Critical Thinking Module was conducted during the weeks of July 17 through 28, 1995. Thirty (30) participants attended classes two hours per day for a total of 20 instructional hours. The participants represented several different job titles including mixers, machine captains, general helpers, packing technicians, machine operators, sanitors, and maintenance & repair technicians. All of the participants were assessed at the minimum skill level in problem solving.

They were guided through 19 activities. Many of the activities were group oriented and focused on the four basic steps of solving problems. The four steps are common to all problem-solving situations. A summary of the four step process follows:

- Identify the problem - Ask the question, "What's wrong with this situation?"
- Generate ideas to solve the problem - Ask the question, "What can I do about it?"
- Try out ideas to fix the problem - Ask the question, "Will this idea fix the problem?"
- Evaluate the resolution - Ask the question, Will this idea fix the problem?" If the problem is not fixed, the process is started again.

Participants were asked to troubleshoot workplace problems and apply the problem solving step process to those situations. In addition, figural analogies were introduced to encourage participant's to practice critical thinking and deductive reasoning. On the last day of instruction, 17 participants completed the course evaluation questionnaire. The results show that participants believed the course objectives were beneficial and the objectives were clear. Many of the students stated the troubleshooting process was reinforced by the course materials.

The materials presented in Part I - (mind map, common elements of problems) and Part III (practical application) were given the highest ratings of good and excellent (3=good, 4=excellent). Part II (analogies, deductive reasoning) received ratings of fair to good (2=fair, 3=good). Some participants mentioned that they did not clearly understand how figural analogies directly related to the workplace resolution process.

However, many of them commented that the analogies and deductive reasoning materials were good. They simply needed more time to get a better grasp of the analogy concept. Overall, the course delivery and content was rated as good.

### Conclusions and Recommendations

*Strong Points Noted by Participants*

**Course delivery and content were good.**

- The course makes me think of more positive solutions to problems and situations.
- Visual aids were helpful.

•Objectives were clear; an overall excellent class.
•The four-step process was very good and helpful.
•The deductive reasoning activities of addition (math) were good.
•Charts were neat and legible and always available.
•Good problem solving techniques.
•The numbers and analogies were the strongest features of the course.

*Weak Points Noted by Participants*

**Not enough time devoted to understanding the analogies section.**

•Not enough time for class to do some activities.
•Students from other countries would have problems understanding.
•The shapes and figures are not ones we come in contact with (quads, pentas).
•The analogies need to be explained and gone through more slowly.

*Recommendations Noted by Students*

•Provide more time for the analogies activities.
•Allow all employees to participants in the course.
•Group activities are productive. Have more of them.

*Recommendations Noted by Facilitator*

•Provide a mind map of a work related problem in conjunction with the mind map of the "Door Obstacle" problem.
•Change the wording in activity number seven to identify the types of problems as simple, complicated, and complex. Do not use the wording "rather complicated".
•Include more examples of problems that may occur in the Sanitation/Utility areas.
•Provide more information in the "You Need to Know" section about how figural analogies relate to problem solving and critical thinking.
•Activities seven and nine seem to be repetitious. Combine or rewrite the activities.
•Many students were not informed of the dates to report to classes. Better communication regarding class schedules is necessary. For example, one student noted that he did not report to class because he was not notified by his supervisor.

Statistics

Participants of the Problem Solving/Critical Thinking Module

| Class Time/ Section | Number Scheduled | Number Added | Number Deleted | Actually Attended | Number Attrition |
|---|---|---|---|---|---|
| 7:30-9:30AM Sec. A | 7 | 1 | 2 | 5 | 2 |
| 11-1PM Sec. B | 3 | 0 | 0 | 2 | 1 |
| 1-3PM Sec. C | 5 | 0 | 3 | 3 | 0 |
| 1-3PM Sec. D | 5 | 1 | 1 | 6 | 0 |
| 3:30-5:30PM Sec. E | 5 | 1 | 0 | 5 | 0 |
| 3:30-5:30 Sec. F* | 3 | 0 | 1 | 0 | 0 |
| 7-9PM Sec. G | 2 | 1 | 0 | 3 | 0 |
| 9-11PM Sec. H | 2 | 1 | 0 | 3 | 0 |
| 11-7AM Sec. I | 3 | 0 | 0 | 3 | 0 |
| **Totals** | 35 | 5 | 7 | 30 | 3 |

*Class section was canceled. Two students were transferred to other sections. The one remaining student was dropped from the class.

**Conclusion**: The majority of the students completed the course. However, many missed days due to vacation, and days-off. Others were not notified by supervisor when to report to class. For example, one participant in class Section C showed up for the last day of instruction. Approximately, eight students were tranferred between the class sections because due to scheduling conflicts and the cancellation of Section F. Four students never attended the class. The participants accounted for under the attrition column did not complete the module because of of vacation days or other personal reasons

Comments (taken from the evaluation questionnaire)

- The class was very helpful.
- The facilitators are excellent teachers.
- All Nabisco employees should be allowed to take this course.
- Mary Tanner is very informative.
- Longer time for classes and have the classes to continue weekly.
- Group study is good. This helps students, especially those from other countries, so they would not be intimidated. Group study will enhance these students' understanding.
- Ms. Walker is an exciting instructor with alot of zeal and part of the now generation group.
- It was surprising to see some of the things you knew, but were not using.
- This course helped me to improve my way of reasoning and taught me a new concept of problem solving.
- Good problem solving techniques and some of the math kept me on my toes.
- I learned that in problem solving, sometimes there are so many different answers.
- I liked the numbers sequence. We don't do math much anymore. People use calculators.
- Classroom set-up was not desirable for five people. Teacher was in front of the board.

Prepared by: Kim B. Walker, APR
July 1995

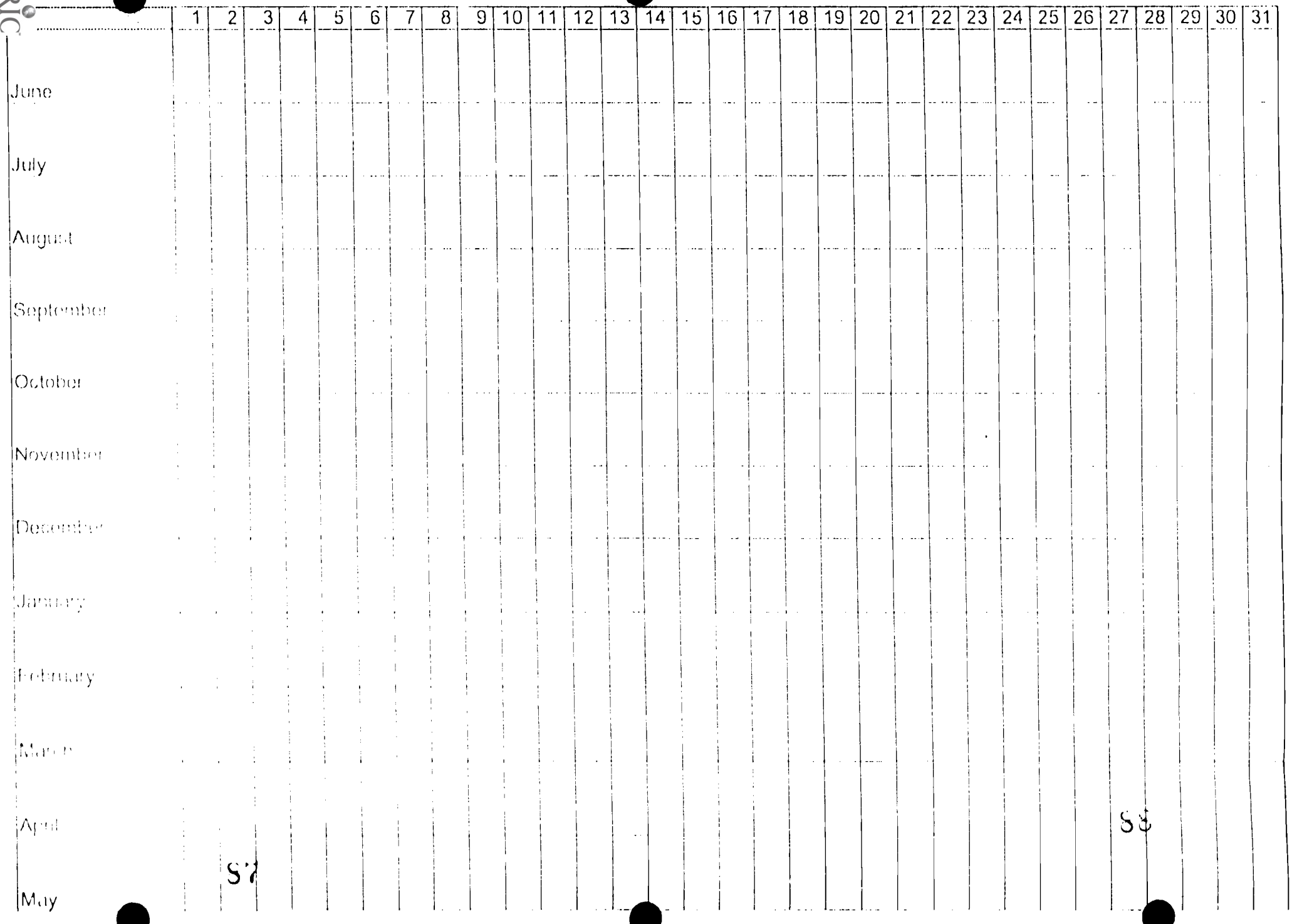
# ATTACHMENT C

# Individual Educational Plan

ID# _____

Individual Enhancement Program  Occupational Title  Gender  Shift

| Skill | Level | Materials Used | Hours Attending | Goals/Comments |
|---|---|---|---|---|
| Listening | | | | |
| Problem Solving | | | | |
| Applied Math | | | | |
| Graph Comprehension | | | | |
| Reading | | | | |


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
June
July
August
September
October
November
December
January
February
March
April
May
S7
S8

## REACH Background and Purpose

The Nabisco Corporation obtained a grant from the U.S. Department of Education to develop an innovative employee training program that will be used as a model for other corporate training programs around the country. The program, entitled Richmond Enhanced Academics for Change (REACH), uses bakery materials to enhance the academic skills of employees. The REACH curriculum, which was developed by the Capital Area Training Consortium staff, includes five modules. Those modules are: Listening, Reading, Problem Solving/Critical Thinking, Applied Math, and Graph Comprehension.

Approximately 100 individuals participated in a pre-screening process to assess their skill levels. Participants tested at the minimum, moderate or maximum skill levels. Instruction for the Listening Skills Module began on June 27 and concluded on July 7. Thirty four (34) individuals participated in two-hour class sessions for eight days, resulting in 16 hours of instruction. See the Statistics and Comments Section for attrition details.

Facilitators guided the participants through group discussions, role playing, cassette tape listening, and workbook activities. Nineteen (19) activities of varying skill levels were completed. On the last day of instruction, the participants were asked to evaluate the course content and effectiveness by completing a questionnaire (See attached questionnaire). Overall, the participants rated the course as "excellent, well organized, and effective." The module objectives were clear, and many commented that they had improved in some areas and learned new listening techniques. The workbook activities were described as "good and relevant". Participants felt not enough time was devoted to some workbook activities. A weakness noted by a majority of the students is the module's inability to teach them how to handle situations when supervisors refuse to adhere to listening skills guidelines. However, the course was not structured to deal with management's skill level or personnel issues.

## Major Conclusions/Recommendations

*Strong Points Noted by Participants*

- The listening skills training was beneficial.
- The module was well organized.
- The objectives were made clear to participants.
- The workbook activities were relevant to jobs.

*Weak Points Noted by Participants*

- There was not enough time was allotted for some exercises.
- Some participants are not sure the listening skills guidelines can be used on a daily basis in the plant because manager's do not practice the guidelines.
- Some participants wanted more practice using active listening techniques in groups and with supervisors.

*Recommendations Noted by Participants*

- Require all plant personnel to take listening skills review courses, twice a year at least.
- Managers and supervisors should take REACH Listening Course.
- Allow more time for activities in the workbook.
- Do not give homework assignments. Provide a way to do telephone listening activity in class.
- Make adjustments to several of the activities or delete them.

*Recommendations Noted by Facilitators*

- Delete some activities that were not effective in encouraging interaction.
- Shorten some activities to allow adequate time for other activities.
- Revise several of the activity sheets in the notebook.
- Do not schedule students during their vacations or days-off.
- Remind students that the course cannot deal with personnel problems.
- Provide students with snacks (some were disgruntled due to lack of sodas, donuts etc.).

## Statistics and Comments

### *Listening Skills Module Participants*

| Session Time | Number Scheduled | Number Added | Number Deleted | No Shows | Actually Attended | Number Attritions | Number Transfers |
|---|---|---|---|---|---|---|---|
| 7:30 - 9:30 a.m. | 18 | 0 | 4 | 5 | 7 | 2 | 0 |
| 1:00 - 3:00 p.m. | 18 | 0 | 3 | 2 | 7 | 5 | 1 |
| 3:30 - 5:30 p.m. | 12 | 3 | 4 | 1 | 5 | 5 | 0 |
| 9:00 - 11:00 p.m. | 4 | 1 | 1 | 1 | 2 | 1 | 0 |
| **Totals** | **52** | **4** | **12** | **9** | **21** | **13** | **1** |

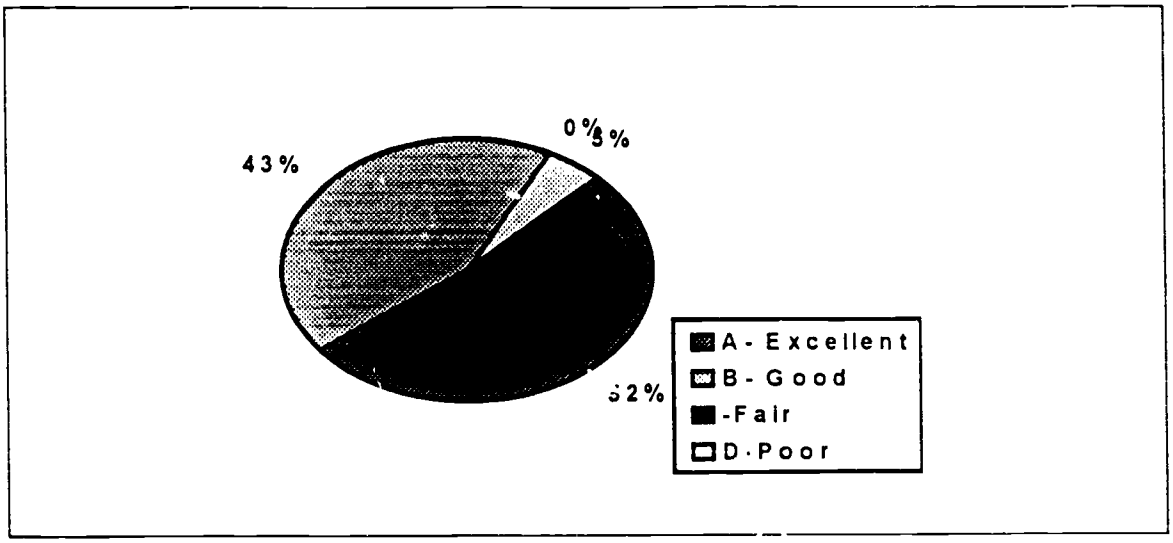
***Legend:***

**Attrition** = Those who began the class, but did not complete the class because of vacation, days-off, or personal circumstances.

**Transfers** = Those who transferred from one class to another.
**Actually Attended** = Those who attended all class sessions.

**Conclusion:** The attrition rate was very high due to scheduling and other reasons. A total of 34 (21 +13) individuals participated in the class.

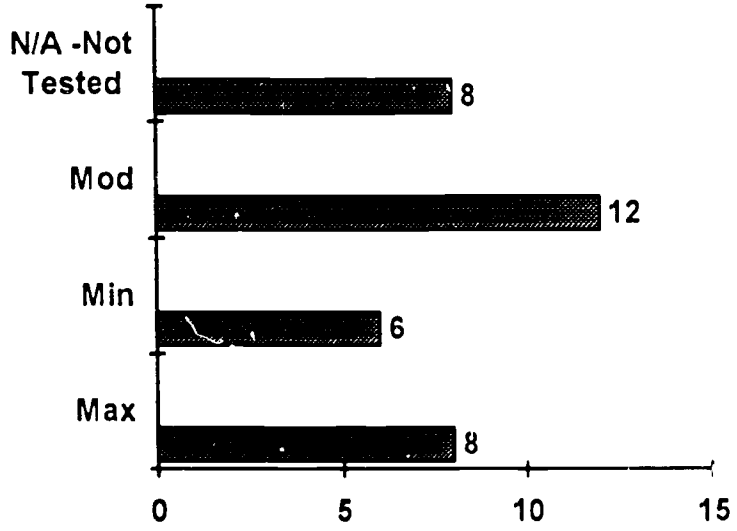
The chart below represents the percentage of students that rated the listening module excellent, good, fair, or poor overall.




Number of total students: N =21
(11 checked excellent; 9 good, 0 fair, and 1 poor)

**Conclusion**: Overall, the participants said the calss was excellent.

The chart below records the skill level of the students that attended the class.



## Comments

- The course help make better working environment better for all workers.
- The course helped them me evaluate myself to be more open-minded.
- Helped me understand how to better deal with co-workers.
- Personally motivated me to work on improving my listening skills on the job as well as outside of work.
- Group discussions were very helpful and attention getters.
- Should slow down the pace. Some activities went too fast.
- Should allow more time for group listening activities and more practice.
- Clarify directions of activities in the yellow section by numbering.
- I received some additional knowledge from the course that I can use at a later time.

**This report has been provided by the Hay Management Group.**

# *Development and Internal Validation of the Nabisco Basic Skill Assessment Battery*


NABISCO BISCUIT COMPANY

*by*

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*July, 1995*

# *Table of Contents*

NABISCO BISCUIT COMPANY

# *Development and Internal Validation of the Nabisco Basic Skill Assessment Battery*

## Purpose

The purpose of this report is to document the results of the Pilot Test of the Basic Skill Assessment instruments developed for the Richmond bakery. The report describes how the assessments were developed, the purpose of the analyses performed for the validation, their results, and the impact of the analytical findings on the final form and potential use of the assessments.

## Development of Assessment Battery

The assessment battery was developed by the HayGroup in conjunction with job incumbents from the Nabisco Bakery, Richmond, Virginia during the summer of 1994. For its development, several steps were taken. First, the project was introduced to bakery employees via the employee newsletter, posted flyers, informal discussion with the Project Coordinator, Ms. Judy Bailey-Kinker, and formal project kickoff meetings with the HayGroup. After the project's introduction, four Hay consultants made job site visits to the Richmond bakery during the first, second, and third shifts. The job site visits had several purposes: for the HayGroup consultant to become familiar with the bakery environment and protocol, talk to job incumbents about their daily activities, and observe job documentation (e.g., training manuals, safety notices). The consultants observed and talked with incumbents from ten job titles: Assembler, Baker, Electrician, Machine Captain, Machine Operator, Mechanic, Mixer, Packing Technician, Sanitor, and EHS Utility.

From the information gathered during the site visits, a preliminary task list was developed for each of the ten jobs. A series of meetings were then held with job incumbents to review and edit the task information and identify the type of basic skill and level of skill required for successful performance of each task. Basic skills included in the analysis were: reading comprehension, listening, applied math, graph comprehension, and problem solving. Skill level requirements were defined as: none, minimal,

moderate, and maximal. To identify such information, job incumbents were given real-world examples of each type of skill at each level. The incumbents were asked to generate an example for each skill level that was job-related. The result of these meetings was a detailed description of the type of basic skills required of a job incumbent for task performance, as well as the level of skill required.

Based on the job analysis information, separate assessments were written for five types of basic literacy skills:

- Reading comprehension
- Listening
- Applied math
- Graph comprehension
- Problem solving

Items in each assessment were written to simulate the type of information or calculations encountered in a job or real-life situation.

The purpose of the assessment battery is to measure an individual's skill level. Based on his or her skill level, appropriate recommendations can be made regarding refresher or academic training and education. For example, if an individual is assessed as having a minimum level of applied math skills and a moderate or maximal level of applied math skills is required for the desired job, the individual can choose to: take no action to develop his or her skills, pursue math education in the community, or enroll in a Math course offered by Nabisco at the bakery.

## Description of Assessment Battery

The assessment battery is a paper-and-pencil test composed of 5 parts: Reading Comprehension, Listening, Applied Math, Graph Comprehension, and Problem Solving. When appropriate, practice items or examples are provided. A detailed description of each part is as follows.

### Reading Comprehension

The Reading Comprehension assessment contains seven passages (e.g., a television schedule, advertisement, recipe, safety information) and three to five questions for each. The assessee is told that the passages require the understanding of written English sentences and paragraphs. Assessees should read the passage and answer the questions given. This assessment should take approximately 30 minutes, but no more than 45 minutes, to complete.

### Listening

The Listening assessment is designed to measure the assessee's ability to listen and to comprehend verbal statements. The assessee is asked to listen to a 25- minute tape recording. The recording contains seven passages or scenarios (e.g., completing a grid, setting a clock) with two to six questions for each. The tape is played only once. While listening to the tape, the assessee may take notes on the answer sheet that is provided and then answer the questions. This assessment should take approximately 40 minutes, but no more than 55 minutes to complete.

### Applied Math

The Applied Math assessment is designed to measure the assessee's ability to add, subtract, multiply, and divide numbers accurately. Instructions are given to read the word problems and/or perform computations, and write the answers in the spaces provided. Computations may be performed on the answer sheet and scratch paper. The Applied Math assessment should take approximately 30 minutes, but no more than 45 minutes, to complete.

Graph Comprehension

The Graph Comprehension assessment requires the interpretation and understanding of graphs and charts. Instructions require the assessee to review the graph or chart and answer several questions that follow. A variety of graphs and charts are represented: one point-to-point graph, one pie chart, one table, two bar charts, and three line charts. This assessment should take approximately 30 minutes, but no more than 45 minutes, to complete.

Problem Solving

The Problem Solving assessment requires the assessee to identify and follow rules to solve problems or to arrange items in a particular order. Separate instructions are provided for the eleven problem types (e.g., analogies, logical thinking, coding, following a map). This assessment should take approximately 35 minutes, but no more than 50 minutes to complete.

The assessments are designed to be administered individually or as part of a battery. If the assessments are administered as a battery, total testing time without breaks is a minimum of 2 hours and 45 minutes. A total of 4 hours should be allotted to administer the entire battery.

## Pilot Test Methodology

Data for the analyses described in this report came from a pilot, or evaluation, test of the assessment instruments. One hundred bakery employees volunteered to take part in the test. The number who completed each assessment is listed in the table below:

| Assessment | Number of employees participating |
|---|---|
| Reading Comprehension | 99 |
| Listening | 95 |
| Applied Mathematics | 100 |
| Graph Comprehension | 99 |
| Problem Solving | 100 |

The assessments were scored and the results entered into computer files for statistical analysis. The passing score for each level (minimal, moderate and maximal) was set at correctly answering 80% of the items at that level.

## Statistical Analysis and Recommendations

### Overview

The statistical analysis of the pilot test data was made up of two major phases. The first of these phases focused on the evaluation of the basic structure, or psychometric properties, of the assessments. The second phase evaluated the assessments in terms of their possible adverse impact based upon minority status or gender.

### Phase I Analyses Results

The purpose of the Phase I analyses was to determine if the individual items, or components, of the assessments were functioning in the proper manner. The key aspects of this phase of the analysis included the determination that the items were of the appropriate difficulty for their target level, and that they were measuring the same skill as the rest of the items of the assessment.

The first step in answering these questions was to calculate the pass-fail rates (i.e., the percentage of individuals passing) for all of the items within each assessment. A sample of this analysis is displayed in Table 1 (on the next page), and a full copy of the analytic output is included as Appendix A of this report. In these tables, the column labeled "Frequency" gives the actual number of pilot test participants who passed or failed the item. The column designated "Percent" shows what percentage of the total pilot test participants corresponds to that frequency. The percentage of individuals passing the item is called the "pass-fail rate" for the item. The columns labeled "Valid Percent" and "Cum Percent" are automatically produced by the statistical analysis program, but are not relevant for the analyses on hand.

The pass-fail rates for each item were compared to the other items in its assessment level (i.e., an item for moderate level reading comprehension was compared to the other moderate reading comprehension items). Items identified as too easy or too difficult for

their assigned level were placed in a pool for possible elimination or reassignment to a different level.

RCMIN_1A

| Value Label | Value | Frequency | Percent | Valid Percent | Cum Percent |
|---|---|---|---|---|---|
| | .00 | 49 | 49.0 | 49.5 | 49.5 |
| | 1.00 | 50 | 50.0 | 50.5 | 100.0 |
| | . | 1 | 1.0 | Missing | |
| | Total | 100 | 100.0 | 100.0 | |

Valid cases 99 Missing cases 1

RCMIN_1A refers to the Reading Assessment item number 1A testing for the minimal level of ability. "0" refers to those who incorrectly answered the item, and "1" to those who correctly answered the item.

**Table 1. Sample Analysis: Item Pass-Fail Comparison**

The next step in evaluating the functioning of the assessments was to determine if the items measured the skills they were designed to assess. For example, Hay determined that Reading Comprehension item 4A, which asked employees to read an article and select the most appropriate title, was not measuring reading comprehension skill. Hay also determined that Graph Comprehension item 1, which asked employees to plot a series of points on a chart, was not measuring graph comprehension skill. This determination was accomplished in part by using correlational analysis to measure the relationship between each item and the other items within the assessment level. A sample of this analysis is illustrated in Table 2 below, while the full analytic output is contained in Appendix B.

- - Correlation Coefficients - -

| | RCMIN1AX | RCMIN_1A |
|---|---|---|
| RCMIN1AX | 1.0000 | .2804 |
| | ( 99) | ( 99) |
| | P= . | P= .005 |
| RCMIN_1A | .2804 | 1.0000 |
| | ( 99) | ( 99) |
| | P= .005 | P= . |

Again, the notation is similar to the previous example. RCMIN_1A refers to the Reading Assessment item number 1A testing for the minimal level of ability. However, in this case an additional variable, RCMIN1AX, refers to the entire score for Reading Comprehension assessment items testing at the minimal level minus the unique contribution of the variable RCMIN_1A

**Table 2. Sample Analysis: Item to Assessment Comparison**

Correlations are expected to fall between zero and one, with high numbers indicating a strong relationship. In the example shown in Table 2, the correlation item 1A in the reading comprehension test to the total score of all of the other items on the minimal level subtest is .28. Ninety-nine (99) individuals in the pilot test completed this item and the other items in the reading comprehension test. The correlation is statistically significant (p=.005), meaning that a correlation this large cannot be attributed to chance or random variation.

Items whose correlations with the rest of the assessment were negative or close to zero were placed in a pool for possible modification or elimination. For example, the correlation shown in Table 2 of .28 between item RCMIN_1A and the rest of the reading comprehension minimal level subtest is lower than one would expect (such correlations should be around .8). Therefore, the item (which dealt with reading the time and date on a TV schedule) was revised for the final assessment battery.

**Phase I Analyses Recommendations**

These two types of item analyses indicated that the assessments were generally psychometrically sound. However, they also indicated that the assessments could be improved through some minor changes. These changes included:

1. Dropping nine items from the assessments,
2. Moving three items from the "MINIMAL" to the "MODERATE" level,
3. Moving nine items from the "MODERATE" to the "MINIMAL" level, and
4. Moving one item from the "MODERATE" level to the "MAXIMAL" level.

| Assessment | Level | Total items | Possible Points | New Threshold 80% |
|---|---|---|---|---|
| Reading Comprehension | Min | 15 | 15 | 12 |
| Reading Comprehension | Mod | 7 | 7 | 5.6 |
| Reading Comprehension | Max | 8 | 8 | 6.4 |
| Reading Comprehension | Sum | 30 | | |
| Listening | Min | 5 | 5 | 4 |
| Listening | Mod | 8 | 11 | 8.8 |
| Listening | Max | 7 | 12 | 9.6 |
| Listening | Sum | 20 | | |
| Applied Math | Min | 23 | 23 | 18.4 |
| Applied Math | Mod | 10 | 11 | 8.8 |
| Applied Math | Max | 13 | 14 | 11.2 |
| Applied Math | Sum | 46 | | |
| Graph Comprehension | Min | 7 | 7 | 5.6 |
| Graph Comprehension | Mod | 12 | 12 | 9.6 |
| Graph Comprehension | Max | 8 | 10 | 8 |
| Graph Comprehension | Sum | 27 | | |
| Problem Solving | Min | 11 | 11 | 8.8 |
| Problem Solving | Mod | 10 | 10 | 8 |
| Problem Solving | Max | 7 | 9 | 7.2 |
| Problem Solving | Sum | 28 | | |

**Table 3. Final Item Content for All Assessments**

Table 3 shows the item content, or design, of the assessments after incorporating the changes noted above. It should be noted, that of the 173 items in the original assessments, only 22 (or 13%) required revision based upon the psychometric analyses.

**Phase II Analyses Results**

The purpose of the Phase II analyses was to evaluate the assessments for possible adverse impact. The key aspect of this phase of the analysis involved comparing the assessment pass-fail rates for different sub-group (e.g., minority status and gender) differences. For those assessments that showed sub-group differences, additional sub-group comparisons were conducted on the pass-fail rates based on the individual items of the assessment.

Two different types of comparisons were conducted. The gender comparison contrasted the passing rate (percentage of the total who passed) of males to the passing rate of females. The minority status comparison contrasted the passing rate of whites to the passing rate of non-whites.

The results of these comparisons are summarized in Table 4 below, and a complete output of the analyses are included as Appendix C. A sample of the output is illustrated in Table 5 (on the next page). In the example illustrated in Table 5, the first number in the table's cells shows how the 63 females and 35 males who took the pilot test of reading comprehension were spread across the three levels of the assessment (e.g, 5 females and 3 males were at the minimal level). The second number shows the percentage of the 63 females and 35 males who took the pilot test for reading comprehension at each of the three levels (e.g, 7.9% of the females and 8.6% of the males were at the minimal level). The most important feature of these analyses is the Chi-Square table on the bottom. If either the "Pearson" or "Likelihood Ratio" significance level (the last column) is less than .05, the analysis indicates that there are important differences between the subgroups (in this case females versus males). The text underneath the Chi-Square tables is automatically produced by the statistical analysis program, but are not relevant for the analyses on hand.

| Assessment | Gender Comparison | Minority Status Compariso |
|---|---|---|
| *Reading Comprehension* | No Difference | No Difference |
| *Applied Mathematics* | No Difference | Whites Higher |
| *Graph Comprehension* | Males Higher | Whites Higher |
| *Problem Solving* | No Difference | Whites Higher |
| *Listening* | No Difference | Whites Higher |

**Table 4. Sub-Group Analyses Summary**

Several of the assessments showed different pass-fail rates as a function of sub-group. Findings of this sort are common for skill assessments[1] but indicate that using the assessments for selection or promotion may result in adverse impact for those minorities.

RCPTRN_3 PC Pattern (3 levels) by GENDER Gender

| | | GENDER | | Page 1 of 1 |
|---|---|---|---|---|
| | Count / Col Pct | 0 | 1 | |
| | | F | M | Row Total |
| RCPTRN_3 | | | | |
| | 2.00 | 5 | 3 | 8 |
| PFF | | 7.9 | 8.6 | 8.2 |
| | 3.00 | 25 | 8 | 33 |
| PPF | | 39.7 | 22.9 | 33.7 |
| | 4.00 | 33 | 24 | 57 |
| PPP | | 52.4 | 68.6 | 58.2 |
| | Column Total | 63 | 35 | 98 |
| | | 64.3 | 35.7 | 100.0 |

| Chi-Square | Value | DF | Significance |
|---|---|---|---|
| Pearson | 2.91673 | 2 | .23262 |
| Likelihood Ratio | 3.01287 | 2 | .22170 |

Minimum Expected Frequency - 2.857
Cells with Expected Frequency < 5 - 1 OF 6 ( 16.7%)

Number of Missing Observations: 1

In this example PFF refers to those scoring at the MINIMAL level for the Reading Comprehension assessment; PPF refers to those scoring at the MODERATE level for the Reading Comprehension assessment; and PPP refers to those scoring at the MAXIMAL level for the Reading Comprehension assessment. The various forms of the Chi-Square test are alternative ways of determining the statistical significance of the sub-group comparisons.

**Table 5. Sample Analysis: Passing Rates of Sub-Groups**

Given that some of the assessments showed different pass-fail rates as a function of sub-group, the next step was to make similar sub-group comparisons at the item level. The purpose of these comparisons was to identify any items with large sub-group differences. These items were then examined to determine potential sources of the differences A sample of this analysis is illustrated in Table 6 (on the next page), while the full analytic output is contained in Appendix D.

[1] See Reynols, C.R., & Brown, R.T. (Eds.) (1984) *Perspectives on bias in mental testing*. New York: Plenum.

These analytic outputs are very similar to those illustrated in Table 5. The difference is that the output shows how the 63 females and 35 males who took the pilot test of reading comprehension did on a particular item. In this example 30 females and 19 males passed the item. Again, the second number shows the same information in a percentage format (e.g., 47.6% of the females and 54.3% of the males passed the item). In this case there are three analyses presenting the Chi-Square table on the bottom (i.e., "Pearson," "Continuity Correction,"[2] and "Likelihood Ratio"). If the significance level (the last column) of any of these statistical tests is less than .05, the analysis indicates that there are important differences between the subgroups (in this case females versus males). The text underneath the Chi-Square tables is automatically produced by the statistical analysis program, but are not relevant for the analyses on hand.

This analysis identified six items that could be improved through the addition of examples. These items involved rounding of numbers and examples were added to clarify the rounding procedure desired in each item. These changes may reduce sub-group differences in future applications of the assessments.

RCMIN_1A by GENDER Gender

| RCMIN_1A | Count / Col Pct | GENDER 0 F | GENDER 1 M | Row Total |
|---|---|---|---|---|
| .00 | | 33 | 16 | 49 |
| | | 52.4 | 45.7 | 50.0 |
| 1.00 | | 30 | 19 | 49 |
| | | 47.6 | 54.3 | 50.0 |
| Column Total | | 63 | 35 | 98 |
| | | 64.3 | 35.7 | 100.0 |

| Chi-Square | Value | DF | Significance |
|---|---|---|---|
| Pearson | .40080 | 1 | .52709 |
| Continuity Correction | .17778 | 1 | .67329 |
| Likelihood Ratio | .40037 | 1 | .52690 |

Minimum Expected Frequency - 17.500

Number of Missing Observations: 1

Where RCMIN_1A is the first item in the Reading Comprehension test, minimal level. The various forms of the Chi-Square test are alternative ways of determining the statistical significance of the sub-group comparisons.

**Table 6. Sample Analysis: Item Sub-Group Comparison**

[2] The Continuity Correction is only relevant for two by two tables, so it was not output for the previous analyses.

**Phase II Analyses Recommendations**

The primary outcome of the comparison of sub-group differences was that use of the assessments for selection or promotion could lead to adverse impact for some groups. This finding means that before the assessments are used for that purpose, they must be validated against actual job performance. Once this validity is established and documented, the assessments can then be used for selection.