REPORT ON INTERNSHIP WITH BUSINESS AND INDUSTRY TRAINING SERVICES OF TULSA COUNTY AREA VOCATIONAL AND TECHNICAL SCHOOLS AND KIMBERLY-CLARK CORPORATION JENKS FACILITY

By

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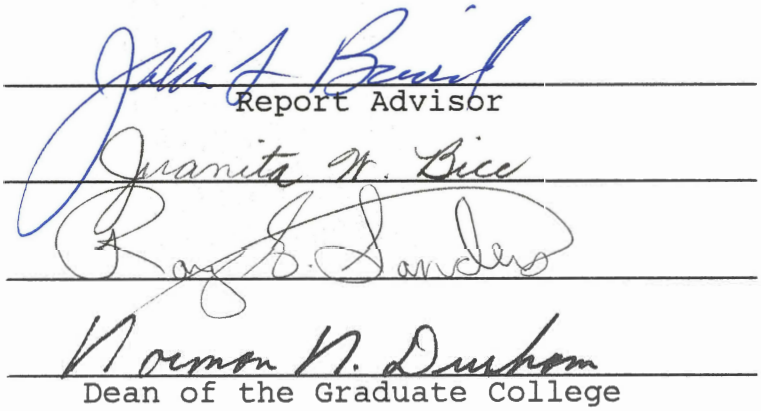

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CHAPTER I

INTRODUCTION

Overview

The Basic Skills Training Program was developed for Kimberly-Clark Corporation (K-C) by the Business and Industry Training Services (BITS) division of Tulsa County Area Vocational and Technical Schools (Tulsa Vo-Tech) to provide their employees with an overview of basic skills useful in their work. These people were employed by K-C to operate and maintain a paper-making plant being built near Jenks, Oklahoma. K-C has chosen an operating style for the plant based on self-directed, multi-tasking work groups with rotating leadership. The training program was designed to incorporate the operating philosophy into the classroom while providing the skills training.

This report focuses on aspects of the program relating to the teaching of adults and the incorporation of cooperative learning into the classroom. Additional comments are included relating to the subject matter being taught including observations, insights, and recommendations for improvements. During the course of the internship, three different groups went through the four-week training sequence. They were designated as A-class, B-class, and

C-class. This designation is used in the text to denote the different groups. The internship began in June, 1989 and finished in Mid-September, 1989. The classes met from 7:30 am until 4:00 pm., Monday through Friday. The participants in the classes were mixed with regards to age, sex, race, experience and abilities. The majority of each class were operation associates with the remainder being maintenance associates.

The skill blocks began with technical mathematics, followed by measurements, blueprint reading, and electricity. An overview of tool safety and usage, encompassing hand and power tools, followed. A unit on lubrication principles completed the training sequence. The program was supervised by Richard Cotner, an industrial coordinator with BITS.

Terms and Definitions

Associate - Employee of Kimberly-Clark Corp.-Jenks Facility

Basic skills - General skills useful in operating and maintaining equipment in a manufacturing environment.

Cooperative learning - Educational experiences which allow participants to interact which each other. Experiences, expertise, and insights are freely shared.

Lockout procedure - Statement of policies and procedures used to assure the removal of electrical power from equipment and tools.

Maintenance associate - Employee of K-C whose primary responsibility is to maintain and repair equipment.

Multi-tasking - Group design feature requiring the members to acquire expanded roles in the work setting. The ability to perform more than one job function.

Operation associate - Employee of K-C whose primary responsibility is to assure the smooth operation of the plant equipment and process.

Pictorial drawing - Representation of an object showing three dimensions (height, width, and depth).

Pneumatic tools - Tools powered by compressed air.

Scaled drawing - A representation of an object or structure proportional to its actual size.

Schematic drawing - A representation of relationships and processes not necessarily showing actual sizes, shapes, or positions.

View drawing - Orthographic drawings. Two dimensional representations of objects as viewed from one to three perspectives.

Visualization exercises - Learning exercises to develop skills in recognizing three dimensional objects and pictures from two dimensional orthographic drawings.

CHAPTER II

DESCRIPTION OF SKILL BLOCKS

Mathematics

The mathematics portion of the program was comprised of 40 classroom hours covering elements of fractions (common and decimal), ratios and proportions, percentages, basic algebra, geometry applications, and trigonometric functions. The Test of Adult Basic Education (TABE) was used as pre- and post-tests for the associates. Five 8-hour sessions were used to complete the forty hour block. The progression in the subject matter was structured to work from fundamental concepts to abstract applications.

The initial session (8hrs.) began with basic math operations of addition, subtraction, multiplication, division, powers, and roots. Work with common and decimal fractions and fractional conversion followed. The principles of each type of problem were reviewed, followed by a placement survey to assess each individual's abilities. If needed, practice problems and a review survey were available. This material was developed by Jane Burgess of Tulsa Vo-Tech for Kimberly-Clark. The remainder of the first session was used to familiarize the associates with the computer math lab and the math programs available for their

use. Their pre-test results were also made available at this time.

The completion of fractions problems, ratios and proportions, and percents comprised the subject matter of the second eight-hour session. The format followed that of the first session with a placement survey, practice problems, and a review survey. Work with fractions was also taken from Robert D. Smith's, Mathematics for Machine Technology, (1984).

Algebraic principles were taken up on the third day (8 hr.). The use of symbols and working with signed numbers made up the initial exposure to algebra. The algebraic operations corresponding to the previously discussed mathematical operations were demonstrated and reviewed. Equations were then introduced along with the algebraic principles involved in solving and rearranging them. Practical application problems from the Smith text were used as practice and to provide more concrete examples of the applicability of the principles. An achievement review from the Smith text marked the end of the algebra portion of the mathematics section.

The fourth day was devoted to geometry. Principles and problems relating to angles, circles, and polygons were presented. Some basic geometric constructions were done using compasses, straightedges, and protractors.

Trigonometry began the final mathematics session. The basic trigonometry functions were described. Problems to

find unknown sides or angles of right triangles were demonstrated and practiced. If time allowed, Cartesian coordinates were also discussed. K-C provided some sample problems relating to paper plant operation for the associates to solve. The final item of the mathematics portion was the completion of the TABE post test.

Blueprint Reading

The blueprint reading segment was sixteen hours over two days. The subject matter was sequenced to begin with line recognition, visualization exercises, and interpretation of view drawings. The text used was Basic Blueprint Reading and Sketching, by Olivo, Payne, and Olivo. The initial timelines asked that this material be covered in the first four hours. This proved to be unrealistic and was subsequently restructured and covered in the first eight to ten hours. The remainder of the time was used to expose the associates to the variety of scaled and schematic drawings which they might encounter. These included machine drawings, building drawings, hydraulic/pneumatic drawings, plumbing and piping drawings, ladder diagrams, flow charts, electrical drawings and schematics, and assembly drawings and illustrations. Due to the amount of material covered, subject matter was presented for exposure rather than in-depth knowledge. The pre and post assessment covered the basic print reading skills from the text.

Measurement

The measurements segment of the training utilized Making Measurements developed by TPC Corporation (TPC). The materials examined types and methods of measurement for linear, volume , area, temperature, fluid, electrical, and surface measurements. A representative of Starret Tools provided hands-on experience with precision measuring tools. The A-class session covered the material in sixteen hours. Subsequent sessions were shortened to ten hours. Classroom lecture was used as a teaching method along with exercises on measuring different materials. The assessments were multiple choice instruments. The same questions appeared on each test but in a different order.

Electricity

The electricity text was Understanding Basic Electricity and Electronics by TPC. The format of this material was to give the subject matter along with assessment questions and ending with a review. A worksheet was also developed to supplement the TPC materials. Electrical safety began the electricity portion of the training. A videotape on electrical lockout procedures was used in the safety segment. Static electricity was covered fairly comprehensively due to its relevance to papermaking. Sources of electricity, as well as conductors and insulators, were included in the lessons. AC and DC electricity and measuring equipment were included. The segment

concluded with an explanation of Ohm's law and properties of series and parallel circuits. Practical applications of electricity were covered in the second day of the session. K-C was responsible for this portion in B and C classes.

Hand Tools

Sixteen hours was allotted for covering hand tools. TPC's Using Hand Tools was used as a text. The instruction focused on identification, safety, use, and care of tools. The tools were separated into measuring tools, wrenches and screwdrivers, pliers, pipe fitting tools, woodworking tools, metal-working tools, electrical tools, and hoisting and pulling tools. A tool box which will be used at the plant by the associates was examined and the tools utilized in teaching exercises. The tool representative for Stanley/ProtoTools attended the class as a resource person. A videotape was shown to accentuate tool safety. Multiple choice assessments were used for pre and post tests.

Portable Power Tools and Light Shop Tools

The portable power tool segment taught the proper use, care, and safety considerations for electric and pneumatic equipment. Included were drills, saws, sanders, and grinders, and power wrenches and screwdrivers. Using Portable Power Tools by TPC was used as the reference text. Black and Decker provided an assortment of electric power tools for a hands-on exercise near the end of the session.

The light shop tools portion of the session was initially a segment by itself. In B and C-classes, they were presented as a single segment. Bench grinders, drill presses, and band saws were briefly discussed. Both types of power tools were covered in the multiple choice pre/post tests.The light shop tools used no formal text but rather relied on demonstration and observation of the equipment available.

Lubrication

Lubrication was covered in an eight hour time block. The first five hours of which utilized a lecture-discussion in conjunction with a videotape. This curriculum material was Basic Maintenance: Lubrication developed by NUS Corporation. The remaining time was a presentation by Mobil Oil, the vendor to the K-C plant. Different types and functions of lubricants were examined. The characteristics of lubricants were described. Storage and handling procedures were covered. Worksheets were developed to correspond to the various units in the NUS materials.

CHAPTER III

SYNOPSIS OF TRAINING SESSIONS

A-Class

The A-Class session of the Basic Skills Training began June 1, 1989 and was completed the 22nd of the same month. Forty-four associates were divided into three groups. The groups were shuffled after every other portion of the training. The reshuffling was intended to lessen the likelihood of individuals becoming dependent on other classmates and to give associates the opportunity to work with different people in their class. Ten of the forty-five were maintenance associates. These individuals had previous experience in maintenance work before employment at K-C. Participants were of both sexes, varying ages and races, and different educational and work backgrounds.

The classes were held at the Southeast Campus of Tulsa Vo-Tech. The classrooms used were located in automotive and electronics areas of the facility. Tables and chairs were arranged to facilitate small group work (4-5 at a table). Refreshments and lunch were available on site for the K-C associates.

The mathematics segment was done in five consecutive days. A weekend fell between the second and third days.

The instruction followed the previously described format. The associates were able to work in small groups to reinforce understanding of the concepts. The assessments were done individually to ascertain competency levels. The cooperative group learning worked well. The more advanced individuals acted as resources for those unfamiliar with portions of the training. There was some tendency for individuals of similar abilities to work together. The sequence of five, eight-hour days of math was arduous. The comments at the conclusion of the session suggested the need to break up the sequence either into shorter days or intersperse math with other segments. The other instructors reported that their classes reached a point mid-afternoon on the fourth day in which very little was accomplished. Different learning styles were evident in the manner in which individuals solved problems. The inclusion of problems directly related to plant operation on the final day was well received. It was recommended that more of these problems be included in subsequent sessions and interspersed throughout the math sequence. Despite the amount of material covered, the post-test assessment using the TABE indicated an improvement in all associates' test scores.

The blueprint reading segment immediately followed the mathematics. This marked the first reshuffling of the associates into different groups. Materials to be covered in two days were voluminous. The initial outline was

overly optimistic regarding the associates abilities to learn, as well as the degree of previous exposure to the subject. The pre-test was administered as a group exercise. The Olivo text was used for the introduction to print reading skills. The use of three dimensional blocks for visualizing the views of an object proved to be a beneficial exercise. From this concrete visualization, the views were then discerned from pictorial drawings. A combination of text exercises and worksheets provided the associates with learning exercises. Basic print reading skills were covered in the first day of the segment. The use of a drawing, provided by one of the associates, of a piece of equipment similar to those being installed in the plant added relevance to the training. From this exercise, the class was asked to discern as much information as possible from a number of other types of drawings. Even without formal training, the associates, working in small groups, were able to interpret symbols and representations to a limited extent. The point was not for in-depth knowledge, but for exposure. The session finished with a individual test similar to the group assessment.

The measurements portion of the training followed the TPC materials and the format described earlier. Even with the Starret presentation, the time frame for this segment was too long. The addition of more hands-on exercises and a shorter time frame were recommended as changes for the next session.

The format of the pre and post assessments was a concern. The tests were composed of the same fifty multiple-choice questions only in a different order. By reviewing the pre-test, the associates had only to remember the answers, not truly learn the subject matter.

The associates were reassigned to different groups at the beginning of the electricity segment. The maintenance associates assistance and contributions to the subject matter were very valuable. They provided first-hand comments regarding situations which the remainder of the class might encounter. The TPC curriculum and the supplementary handouts did not always agree. This pointed out a problem in using a variety of materials. The theoretical portion of the TPC materials was too in-depth. The need for practical information was mentioned in the evaluations. The second day some hastily developed labs were used. A tour of the boiler area by the physical plant manager also provided a break from the classroom activities.

The major revisions requested for the next class included more labs and exercises, less theoretical subject matter, and revision of the curricula to assure agreement between the text, worksheets, supplemental information, current industry practice, and the tests.

Classroom behavior was a concern in the electricity segment. Although the associates were to be self-managing, intrinsically motivated groups, they reverted back to

classroom behavior which required the intervention of the instructor. This included not adhering to time restraints on breaks, disruptive behavior in the class, and need for overt instructor direction. Rather than the instructor assuming responsibility for correcting these behaviors, it was directed back to the associates to determine the actions necessary to reestablish the learning environment.

There was a chance for some hands-on exercises in the hand tools segment of the training. With access to the tool boxes to be used in the plant, the material was related to what the associates would have available to them in the plant. After distributing the tools to individuals, they were asked to identify what it was, how it should be used and cared for, and state any safety concerns. These reports were elaborated on by the class in open discussion. The TPC units were helpful as a resource for the exercise. Another resource was the Stanley-Proto representative who attended the session. Stanley-Proto also provided a video tape on hand tool safety. The second day of hand tools was short on materials. Some rudimentary labs were developed overnight to fill the time period. These exercises might easily be expanded to provide more manipulation and identification practice in future classes.

The power tools portion for the A-Class was divided into two segments. The first day was devoted to portable tools. The TPC material were dated but provided materials on use, care, and safety with electric and pneumatic tools.

The presentation/demonstration by Black and Decker in the afternoon provided a welcome opportunity to operate tools, including state-of-the-art cordless equipment. A positive point of the portable tools portion was the hands-on demonstration. The inclusion of pneumatic tools in the demonstration would have been an asset.

Light shop tools were covered the second day. The materials for the class were not available until class was scheduled to begin. The materials that were provided proved to be irrelevant to the associates needs. A portion dealt with machine tools and types and nomenclature of threads for fasteners. The materials were abandoned in favor of a walking tour of some of the shop facilities at the S.E. Vo-Tech Campus. The tour allowed the associates the opportunity to see shop equipment, ask questions regarding its operation and care, and to share experiences relating to the operation of power equipment. The pre and post assessments for both the portable and the stationary tools needed to be revised for accuracy and consistency to current equipment and practices.

The final phase of the A-class skills training was a segment on lubrication. The beginning portion of the segment was a video tape/discussion following the NUS materials. The fact that much of the material was new to all the associates made this one of the more valuable segments. It provided basic information, was easily understood, and was appropriate to the time frame of the

training. The afternoon session with the plant's lubricant vendor, Mobil Oil, allowed for a more in-depth discussion of lubrication which built upon the NUS material. No changes were recommended for this segment.

B-Class

The B-Class section of the Basic Skills Training began June twenty-sixth. This overlapped the end of the A-Class section. The mathematics portion was covered by another instructor. B-Class was composed of sixteen operations and maintenance associates. The smaller class size allowed this section to complete the training sequence as a group, without the reshuffling used in the earlier group.

A wide range of experience in reading and interpreting drawings was evident in the associates. One person had no experience at all, while several had two years of drafting and design coursework at the post-secondary level. The cooperative format of the class allowed those with a large knowledge base to assist the less knowledgeable in learning the materials. The material to be covered had been scaled back from the A-Class session. The primary focus was to introduce print reading skills as covered in the Smith text. The use of visualization blocks and worksheets was retained. The latter portion of this segment asked the associates to examine a wide variety of different scaled and schematic drawings. They were to answer a question relating to the drawing and then to ask an additional

question of their own for the next group to answer. Recommendations to come from this session were to review the various materials used for consistency in terminology and convention. The inclusion of prints from the K-C plant were mentioned as good additions to the final exercise.

The measurements segment was shortened to twelve hours for the B-Class. An opener was added in which small groups were asked to measure an object in the room without the use of a formal measuring instrument. It stimulated discussion of criteria for measurement. The remainder of the classroom time followed the TPC materials. The Starret Tool presentation provided a welcome break for manipulative learning. The inclusion of additional lab exercises would help relate the materials to work situations. An examination of the test showed an over-emphasis on one particular chapter. Revision of the test for balanced representation of the covered materials was recommended.

The electricity segment for B-Class was modified to a more practical format. The first day encompassed the theory from the TPC materials. The second day was conducted by K-C associates. The TPC units were presented too fast for the time allowed. Subsequent sessions might benefit if the material covered was restricted to a portion of the TPC materials.

The K-C tool boxes were utilized for the hand tools segment of the training. The breadth of the materials required that it be covered scantily. The labs exercises

used in the afternoon session provided practical identification and operation of some of the tools discussed.

The combination of the NUS text/video and the vendor presentation by Mobil Oil made the lubrication segment one of the better training segments. There were practical aspects which the associates could easily relate to their work at the K-C plant. No changes were recommended.

The final portion was over power tools and equipment. The inclusion of associates input and experiences showed a variety of backgrounds relating to power tools. The TPC units were used as a reference text to supplement the classroom discussion. The inclusion of pneumatic tools in the demonstrations would be of value.

C-Class

The third session of the training program involved thirty-seven K-C associates. They were broken into two groups. These larger groups were not reshuffled during the course of the Basic Tools Training.

The mathematics portion was broken up over a three week period. The final day was ten days after the previous day. Although the first two sessions, running on consecutive days, were too hectic, this time frame was too drawn out. A compromise between the two would be appropriate.

The format of the lessons was similar to the first two sessions. Inclusion of additional plant related problems

from K-C would address some of the associates questions regarding the relevance of the skills. A number of the associates requested to use the math lab to work on deficient areas. The variety in abilities and experiences in math skills may require adjustment of the curricula to accommodate both those who need a math refresher and the associates needing to acquire new math skills.

The format for the blueprint reading segment followed that used in the previous session. The materials and methods worked well. The tests needed to be polished to remove unclear dimensions and irrelevant questions. The print reading exercise on the second afternoon was divided according to scaled and schematic drawings. As long as a variety of drawings is available, this division would be appropriate in subsequent sessions.

The time allotted for the measurement segment was again shortened from twelve to ten hours. The first day was spent skimming the units of the TPC material. No lab exercises were included due to time restraints. The value of this segment could be enhanced by either expanding the time frame to allow for measurement exercises or narrowing the scope of the material covered.

Limitations in classroom space required that the electricity portion for C-Class to be conducted in a combined group. The auditorium seating of the room and the size of the class precluded the small group methods used in previous sessions. The materials covered were the same as

those for B-Class. Two instructors taught this portion as a team. The associates expressed the desire for more manipulative tasks along with additional time to cover the materials.

There was a constant struggle on the part of the instructors and the associates to not look at the segments in terms of mastering the skills and information presented, but rather as exposure to the breadth of the subject. The learning was designed to aid in job communication and skills. A careful revision of the objectives to reflect these broader goals would be helpful in presenting the materials and provide a guide to the associates in their learning.

The class was split for the power tools segment. The inclusion of some pneumatic tools, brought by one of the associates, was an benefit to the class. The demonstration by the Black and Decker representative was again well received. The smaller groups lent themselves to animated discussions and an atmosphere where they helped each other gain insights.

The lubrication portion of the training used only the NUS video tape and text. The vendor was unable to attend the session. This absence was detrimental to the integrity of the session. The NUS materials were insufficient to fill the time allotted.

The final segment of the C-Class session was dedicated to hand tools. The class was combined and team-taught by

the two instructors. The methodology was the same as in other sessions. The size of the class made it difficult to incorporate individual and small group exercises. Being the last day of the session and a Friday, some of the associates were not inclined toward learning the presented materials. An active approach to the materials might have held their interest better.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

The Basic Skills Training Program was evaluated as each segment was completed. Recommendations were given regarding changes in subject matter, teaching methods, and exercises used. The time constraints under which the program was developed proved to be a barrier to implementing the revisions. The acquisition of tools and materials to enable more active forms of instruction would have enhanced the training for the K-C associates. The cooperative, team-centered nature of the participant groups was a positive aspect in the teaching of these adults. The associates were very supportive of their peers.

The mathematics portion of the training attempted to cover extensive materials in a short period of time. The variety in the experience levels of the associates provided an additional challenge to the learning process. The foremost recommendation for this segment would be to demonstrate its relevance to the work which they will be doing. The inclusion of more plant related problems through out the segment and testimonials from associates already on the job could easily be incorporated into the instructional design.

Changes were implemented in the blueprint reading segment each time it was presented. Further refinement of the print reading exercise for schematic and scaled drawings should be undertaken. The test needed to be cosmetically revised for clarity and readability. Building a foam replica from a drawing should be included for future sessions.

The time frame for the measurement segment was insufficient. Either additional time should be allocated or the amount of material to be covered should be shortened. The inclusion of laboratory exercises rather than lectures from the text would be more suited to the condensed time frame.

The BITS portion of the electrical segment relied heavily on theoretical material presented in the lecture format. The incorporation of the BITS portion into the two days, interspersed with plant related materials and exercises from the K-C portion, would break up the monotony of the continuous lecture format of the first day.

The use of the associates' toolboxes for the hand tools segment helped to tie the training to their anticipated work situation. The TPC materials provided a good supplemental resource. The use of work stations to allow practice in the use of these tools would allow a more active approach to the learning.

The inclusion of more pneumatic tools would benefit the power tools portion of the training. The materials

should be assessed to determine if all the units currently being included are needed. The woodworking units may not be particularly relevant to their job situation. The portion devoted to stationary power equipment needs to be examined for relevance as well. The goals and objectives for this segment are not clear for the associates or for the instructors.

The lubrication segment needs no revision. The combination of the NUS curriculum and the Mobil presentation combined for an effective session. Care should be taken to assure that the vendor is scheduled for the lubrication segment.

The consideration and inclusion of each of these recommendations may not be feasible given the overall time allowed for this program and its broad scope. They are given as observations relating to the improvement of the educational value of the segments.

The goals of the Basic Skills Training Programs were to expose the associates employed by Kimberly-Clark Corporation to basic skills and information and to promote the development of the self-directed, team oriented groups that are an integral part of the plant operation. The program was effective in doing this. Throughout the course of the internship, examples of cooperative learning were shown by the associates and fostered by the instructors and BITS staff. The post test scores of the associates were consistently better than their pre test scores. Large

jumps were not uncommon. Improvements are possible. The program proved to be an effective tool in achieving the stated goals.

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