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# **DEVELOPMENT OF A SUPERVISORY AND MANAGEMENT TRAINING PROGRAM FOR THE UNDERGROUND COAL MINING INDUSTRY**

**Contract J0188053  
Human Resources Research Organization**

**BUREAU OF MINES  
UNITED STATES DEPARTMENT OF THE INTERIOR**



The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies or recommendations of the Interior Department's Bureau of Mines or the U.S. Government.

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16. Abstract (Limit: 200 words) This report describes a project in which Development of a Supervisory and Management Training Program for the Underground Coal Mining Industry was developed and evaluated. The project was carried out in two phases. The first phase was a research effort to develop specifications for the program. The second phase was a development and evaluation effort. In the second phase, training programs for first-line supervisors (section foremen) and for middle managers (mine/shift foremen and mine superintendents) were prepared in accordance with the specifications and evaluated by members of the industry. This report describes the project and presents the conclusions drawn therefrom.			
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## FOREWORD

This report was prepared by the Human Resources Research Organization, Alexandria, Virginia, under U. S. Bureau of Mines Contract number J0188053. The contract was initiated under the Minerals Health and Safety Technology Program. It was administered under the technical director of the Pittsburgh Research Center with Mr. James Peay acting as Technical Project Officer. Mr. John Connelly was the contract administrator for the Bureau of Mines. This report is a summary of the work completed under this contract during the period October, 1978, to December, 1982. This report was submitted by the authors on 1 May 1983.

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## OVERVIEW

The training effort in industry has concentrated largely on task training. The overall concept has been that an employee who knew how to do a particular set of tasks well and was willing to take on additional responsibility, could supervise and manage people who were doing this same set of tasks. This concept is only partly true in that it does not take into consideration the need for training supervisors and managers to take care of the company's most valuable asset--its people.

The fact that industry has not emphasized supervisory and management training does not mean that there are no capable supervisors and/or managers. Just as there are excellent mechanics with inherent mechanical skills who have managed to acquire such skills on their own without formal training, there are also people with inherent supervisory or managerial skills who have developed skills in these areas on their own.

The expansion of the industrial work force has increased the need for supervisors and managers. At the same time, increased interest in employee welfare has emphasized the need for supervisors and managers to have skills in handling people. Some action has been taken to fulfill these needs, particularly at the higher levels of management. Colleges and universities have included human relations programs in their curricula. Other organizations have developed and conducted supervisory and managerial training programs and seminars. The majority of these educational and training programs, however, are directed toward the higher management levels.

More recently, the need for training all management personnel, down to the first-line supervisor, has been recognized. Some organizations, particularly those with more extensive resources, have initiated programs to fulfill these needs.

The Bureau of Mines has taken an interest in providing such training for the mining industry. A contract was issued to develop and evaluate a training program for all supervisory and management personnel in underground coal mines.

The overall effort performed under the contract was in two phases. The first phase was a research phase to develop specifications for the training program. The specifications identified the skills and knowledge that the trainees should acquire as a result of the training and the instructional strategy that would be most effective in providing the trainees with those skills and knowledge.

In the second phase of the project, two training programs were developed and validated. One program was for section foremen, the other was for mine middle managers, that is, mine/shift foremen and mine superintendents.

This report describes how the specifications were developed and the rationale for the decisions that were made regarding their development. It then describes the development and validation of the programs.

THE DEVELOPMENT OF A SAFETY-ORIENTED SUPERVISORY  
AND MANAGEMENT TRAINING PROGRAM  
FOR UNDERGROUND COAL MINES

INTRODUCTION

The Human Resources Research Organization has prepared two safety-oriented training programs for underground coal mines for the Bureau of Mines' Pittsburgh Research Center. One program is for first-line supervisors. The other program is for middle managers. The overall objective of the training programs is to provide supervisors and managers with the skills and knowledges that they need to effectively lead, direct and control their subordinates as they carry out their daily work activities. The programs' subject matter is primarily in the field of interpersonal relations and the techniques of planning, leading, directing and controlling.

The need for this type of supervisory and management training has not always been readily apparent. In the days when mining tools, equipment and labor were cheap, the hard-working section foreman who had a little more muscle than the other people in the section could effectively oversee coal production operations with little or no training in interpersonal relations. Today's typical section foremen, however, oversee the operation of more than a million dollars' worth of equipment and the use of over four million dollars' worth of supplies and labor each year. In addition, they are responsible for their sections' compliance with complex company-promulgated work procedures, company-and government-legislated safety programs and company and labor organization personnel policies. Managerial responsibilities have grown in the same proportion as supervisory responsibilities. Hence, supervisory and management training is becoming more of a recognized need.

This training program was developed in two phases:

Phase I: A research phase to develop specifications for the training materials.

Phase II: A development phase to prepare and evaluate the training materials.

The results and implications of the research phase were reported in detail in the Phase I Report of this project, submitted in June 1979. A brief of that report is included herein in order to provide a report of the entire project under one cover. The remainder of this report describes in detail the results of the program preparation and evaluation phases of the project.

Phase I - Research and Development  
of Specifications

The research phase was divided into four tasks:

- Task I - Determine what supervisory and management training is being done and what training materials are available.
- Task II - Select mine sites at which to conduct a training needs assessment.
- Task III - Conduct a training needs assessment.
- Task IV - Prepare specifications for the training materials, based on the training needs assessment.

Task I: Determine Available Training Programs and Training Materials

It was our intent to contact the industry and organizations involved in mine training to determine if there were training materials available that could be readily adapted for use in this program. Fifteen organizations were contacted by visits and/or by telephone to determine what supervisory and management training was being done and what training materials were available. The organizations included the Mine Academy, the West Virginia University Mining Extension Service, the BCOA/National Photo Laboratory, and several mines. A complete list of the organizations is in Table 1. We found that some of the larger mines that have competent training staffs had prepared supervisory and management training programs for their own use. Some mines were using the BCOA/National Photo Lab's "Working With People" program. There were no uncopyrighted or non-proprietary "off-the-shelf" training materials that we could use directly in our program. We did find considerable agreement among the organizations contacted regarding the content areas that the training materials should cover and the instructional strategies that are most effective in presenting the materials. In brief, the subject matter covers basic interpersonal relations, and the techniques of planning, communicating, leading and controlling. The most popular instructional strategy was a short lecture covering a particular topic, followed by a problem-solving/discussion period in which actual incidents that had occurred or conditions that existed in the trainees' mine could be discussed.

Although there was little material available for training mine first-line supervisors and middle managers, there was quite a lot of material available for training general industry supervisors and managers at the higher management levels. We prepared an annotated bibliography of such materials and submitted it to the Project Officer. We later used these materials for references in developing the training materials for our program.



## Task II: Select Mine Sites at Which to Conduct a Training Needs Assessment

Since the contract called for conducting the training needs assessment at "...a small mine, a medium sized mine, and a large mine, representative of the industry", it became necessary to define the terms "small", "medium" and "large", as well as "representative of the industry."

Available data that could be used to establish criteria for defining these terms were obtained from the Mine Safety and Health Administration's Health and Safety Analysis Center (HSAC) in Denver, Colorado. The Center provided us with taped data on:

- The man-hours worked in each underground coal mine in the U.S. in calendar year 1977
- The number of lost man-days due to occupational injuries and illnesses
- The tons of coal produced during the same period.

Analysis of the data led to the decision to define "small", "medium" and "large" mines on the basis of man-hours worked, and to define "representative" in terms of lost man-days per 1000 man-hours worked, and tons of coal produced per man-hour.

We encountered one problem in connection with establishing the criteria for "small" mines. Originally, we had used the term "large" for mines expending more than 500,000 man-hours in 1977 (250 + miners); "medium" for mines expending between 100,000 and 500,000 man-hours (50-250 miners); and "small" for mines expending less than 100,000 man-hours (less than 50 miners). On further analysis of the data, we found that about 25% of the underground coal mines expend less than 25,000 man-hours per year (less than 10-12 miners). These mines would be in the category of "small" mines. Such mines were considered to be more of a "family" operation and not representative of a typical commercial venture. It was decided, therefore, to consider a "small" mine as one that expended between 50,000 - 75,000 man-hours per year (25-40 miners). Such a mine, we believed, would require a formal organizational structure and training of the type envisioned in this program.

Next, we had to determine the criteria for the term, "representative of the industry". We re-analyzed the HSAC data to establish the mean and the standard deviation for the small, medium, and large mines in terms of number of miners, safety record and production record. We decided that a mine that is "representative of the industry" would be one whose safety record, production record and number of workers fell within the range of the mean  $\pm \frac{1}{2}$  standard deviation. The results of these analyses are given in Table 2.

There were two other considerations in selecting mines for the training needs assessment. One consideration was to select mines that used different mining methods. We felt that the responsibilities of supervisors and managers

would vary depending on the particular mining method used. Therefore, we selected mines that would provide data on continuous, conventional, and longwall mining methods used in both retreat and advance mining. The other consideration was the mine owners' and managers' willingness to cooperate in conducting the program.

Based on the above criteria and considerations, we selected these four mines as sites for conducting the training needs assessment:

Penn Allegheny Mine	(medium)
Harman Mine	(medium)
Kaiser Steel Mine	(large)
Crescent Hills Mine	(small)

We were then ready to prepare to conduct the training needs assessment.

### Task III: Conduct the Training Needs Assessment

Our plan for conducting the training needs assessment was to visit mine sites and interview and observe mine managers, superintendents, shift foremen and section foremen. The resulting data would give us a clear picture of the daily tasks that mine supervisory and managerial personnel perform. Analysis of these data would identify the skills and knowledges needed to perform the tasks and provide a base for selection of the training objectives.

In addition, we would gather data on acceptable training practices and prospective trainee profiles. Analysis of the data would help to identify the instructional strategies that would be effective in presenting the training materials.

There were two preparatory steps to be taken before visiting the mine sites. The first was to prepare an appropriate interview instrument to be used with the mine personnel.

The second step was to make arrangements with the mine managers for conducting the visits. The initial contact was made by telephone with a follow-up letter describing what we intended to do during the visit. The managers contacted were extremely cooperative.

The first interview instrument that we prepared emphasized safety. We used it to conduct the interviews at the first mine site and found that the instrument was not satisfactory. We discovered that typical mine supervisors and managers are as well informed about safety as they are in the technical details of mining. What they do need, however, is the ability to get their subordinates to carry out their assigned tasks with equal regard for safety and productivity.

We revised the document after that first visit and used the revised version in the other three mine site visits. Copies of both documents are in Appendices A and B.

Each visit took approximately two days. On the first day we conducted the interviews, and on the second day we observed the start-of-shift activities of the supervisors and managers and then proceeded underground to observe a section crew at work. After the visits we analyzed the data obtained. The results are shown in Table 3 for managers and in Table 4 for first-line supervisors. We then proceeded to the next task which was to prepare the training program specifications.

#### Task IV: Prepare Specifications for the Training Materials

Preparing the specifications for the training materials based on the gathered data completed the research task. The specifications identified:

- The prospective trainees
- The training objectives and the teaching points to support the objectives and
- The instructional strategies

#### Prospective Trainees

It was decided that two programs would be prepared, one for first-line supervisors (section foremen) and one for mid-level managers (mine/shift foremen and mine superintendents). Programs for higher level managers are available from colleges, universities and organizations such as the American Management Association.

#### Training Objectives and Teaching Points

During the needs assessment we determined the tasks that the supervisors and managers perform to carry out their functions. We then developed a matrix showing the skills and knowledges that they would need to perform these tasks. For example, in outlining the work of the day to their section crews, supervisors must be able to communicate, and, therefore, need communication skills. Hence, being able to communicate effectively with subordinates became a training objective.

After all of the training objectives were developed, they were grouped into certain subject areas. Each group of objectives then became the training objectives for specific lessons such as: Motivation, Planning, Leadership, Communications and Performance Review. Teaching points were selected from sources identified in the annotated bibliography of general industry materials.

#### Instructional Strategies

Next, the selection of instructional strategies was accomplished. The time needed to present the supervisor's program was determined to be 20 hours,

and the manager's program, 12 hours. We learned, while conducting the needs assessment, that prospective supervisors and managers could not be spared for large blocks of time. They could, however, be spared for about one or two sessions a week, either before or after the workshift. It was also apparent that each session should last no more than two hours. Spending any more than two hours in a classroom after eight hours at the working face would not be very productive from a learning standpoint. Using materials of this type, it would also be difficult to hold the trainee's attention for more than two hours per session. It was our observation that the typical coal miner is a practical person who would rather "do" than sit and listen to theory. Therefore, these instructional materials were designed with this in mind.

The two-hour lesson starts with a lecture and is interspersed with group discussions. The lectures contain and/or are followed by practical exercises that show how the points brought out in the lecture apply to the trainees' daily tasks. Some of the practical exercises provided can be used very effectively without modification. For others, the instructors are encouraged to develop similar exercises based on incidents and information from their mines. We feel that practical exercises based on situations with which the trainees are familiar will improve the effectiveness and trainee interest in the program.

The size of the class is important. Ideally, the class should have 6-12 trainees. Having too few trainees reduces the effectiveness of the discussions and practical exercises. Having too many trainees makes the class unwieldy, particularly with an inexperienced instructor.

Two additional areas of need were identified during the research task and brought to the attention of the Project Officer. One was the need for study guides for supervisors taking state certification examinations. On approval of the Project Officer, a subcontract was let to Western Wyoming College to prepare these guides.

The second need was training for managers of small mines (less than 25 miners). We felt that they need instruction in filling out tax forms, in basic accounting procedures and in complying with legislation that applies to all coal mines. Again, the Project Officer was informed of this need and a subcontract was let to West Virginia University Mining Extension Service to develop such a program.

This task concluded Phase I. A report was made to the Project Officer and the "go-ahead" was given for Phase II, the development and evaluation phase.

Phase II: Preparation and Evaluation  
of Training Materials

The two tasks in this phase were:

Task I - Prepare the training materials.

Task II - Validate the training materials.

Task I: Prepare the Training Materials

The training materials were prepared from the objectives and teaching points developed in the specifications. The manner of the presentation of the materials was based on the instructional strategy selected.

The training materials for each lesson are in two parts: an Instructor's Handbook and a Participant's Handbook.

The Instructor's Handbook contains:

Introduction - (Brief Description of the Lesson)

List of Objectives

Schedule and List of Required Materials

Instructor Preparation Section

Suggested Lecture

Practical Exercise Instructions

Visuals for Use with the Suggested Lecture

Summary

Self Checks and Answers

Lecture Outline

The suggested lecture in the Instructor's Handbook can be presented "as is" along with the visuals. If instructors want, they may develop their own lectures. The outline indicates the material that is to be covered. The practical exercises (not included in all lessons) are provided to add interest and to encourage trainee participation. As stated in the "Instructor Preparation" section of the training materials, instructors are encouraged to develop and use their own practical exercises based on actual incidents in their mines as substitutes for those in the handbook.

The Participant's Handbook contains:

Introduction - (Brief Description of the Lesson)

List of Objectives

Summary

Self Checks

Practical Exercise Materials (where applicable)

### Supervisory Training Program

The Supervisory Training Program consists of 10 lessons. Eight of the lessons can be accomplished in two-hour sessions and the other two in four-hour sessions (with each four-hour session further divided into two two-hour sessions). Titles and descriptions of each lesson follow.

<u>Lesson</u>	<u>Title</u>	<u>Duration (hrs)</u>	<u>Points Covered</u>
1	Role of the Supervisor	2	Includes an introduction to the supervisory training program; description of the supervisor's daily routine and how this program will help in carrying out the routine.
2	Leadership and Supervision	2	The five sources of a supervisor's influence; the elements of job satisfaction and the supervisor's effect on these elements; problem solving; directive and non-directive leadership.
3	Motivation	2	Definition of motivation, individual motivation; group motivation; how supervisors motivate miners and develop teamwork.
4	General Communications	2	Need for good communication; developing an open communications "climate", the elements of communication; one-way and two-way communication; developing communication skills.

<u>Lesson</u>	<u>Title</u>	<u>Duration (hrs)</u>	<u>Points Covered</u>
5	Organizational Communications	2	Formal and informal communication channels; basics of the formal network; use of written communications; use of verbal communications.
6	Enforcing Rules and Regulations	2	Need for rules and regulations; reasons why people break rules; how you can prevent rules from being broken; corrective action when rules are broken.
7	Performance Review	4	Setting standards; difference between standards and rules and regulations; presenting standards to miners; evaluating performance; formal and informal performance evaluation; scheduled and unscheduled performance counseling.
8	Planning	4	Planning responsibilities at all levels of the organization; detailed supervisory planning responsibilities; contingency planning, emergency planning.
9	Supervisor's Training Responsibilities	2	The four phases of training; who needs training, preparing to conduct training; conducting the training; evaluating the training.
10	Supervisor's Safety Role	2	Identifying, controlling, and eliminating hazards; sources of hazards; reducing hazards; supervisor's participation in the company program.

Although the lessons may be given in almost any order, the order shown is suggested for trainees who have had no previous supervisory training. If there are immediate problems in your mine, for example, in the areas of safety training or planning, the lessons could be presented in the order of the seriousness of the problems.

Since Role of the Supervisor is, in a sense, introductory, this lesson should be given first. Also, the two lessons on communication should be given in the order shown.

### Manager Training Program

The Manager Training Program consists of six lessons, each lasting two hours. Titles and descriptions of each lesson follow.

<u>Lesson</u>	<u>Title</u>	<u>Duration (hrs)</u>	<u>Points Covered</u>
1	Role of the Manager	2	The managers' responsibilities during the normal work day; the skills and knowledges required to carry out these responsibilities.
2	Leadership in Management	2	Directive and nondirective styles of leadership; choice of leadership styles; delegating work; desirable leadership characteristics.
3	Communications	2	Review of the elements of communications; the managers' communications responsibilities; when and how to use oral and written communications; communication networks; providing effective communications.
4	Personnel Management	2	Procedures for hiring; procedures for promoting from within; standards for an effective training program; personnel evaluation; rewarding and disciplining.
5	Planning	2	Mid-level managers' planning responsibilities; steps in planning; setting goals; guidelines for effective planning.
6	Financial Management	2	Managers' financial management responsibilities; budgeting; cost control.

### Special Features of the Programs

During the training needs assessment we found that each mine's training capabilities and training requirements varied widely. In order for this program to be applicable to and suitable for a large portion of the mining population, these variations had to be considered in designing the program.



A major variable was the training personnel and facilities available at the mines. Some mines had highly skilled personnel, well versed in education, training, and mining. Their facilities included classrooms with projection equipment, mining equipment simulators, and, in one instance, a simulated mine. Other mines had access to training organizations such as local school systems and private organizations who could take over their training tasks. At the other end of the scale, we found the responsibility for conducting training assigned as a collateral duty to a young administrator with limited training experience. The training "facilities" consisted of a table and chair.

We designed this program so that it could be used effectively by mines at both extremes. Obviously, the mines with better training facilities and more experienced personnel will be able to conduct more effective training. They will have the manpower with training skill and experience to develop a presentation based on the subject matter provided by the lecture outline in the Instructor's Handbook. The material in the handbook can be augmented with examples of problem situations that have occurred at the mine, and with visual and other training aids to improve trainee interest.

The less experienced trainer with limited facilities can also make an effective presentation of the training material. The suggested lecture states the basic precepts of each session in clear and simple statements. The visual aids highlight the teaching points presented. Learning is reinforced with the Self Checks. In the instructions for conducting each session, the instructor is urged to introduce for discussion some recent incident in the mine that reflects the need for the supervisory/management skills/knowledge training being developed in the session.

A second variable was the number of trainees that would require supervisory or management training at any one time. In some instances, there will be several trainees who need supervisory or management training, and it would be cost effective to conduct formal classroom lecture presentations of the material. In other cases, there may be a need to provide such training to one or two newly appointed supervisor(s) or manager(s), or it might be desirable to provide refresher training in supervision or management to someone who has been away from the industry for some time.

In the last two cases it may not be economically feasible to have one instructor for only one or two trainees. Therefore, we designed the program so that the training materials can be presented as a self-study program.

Each trainee will be given a copy of the Instructor's Handbook and the Participant's Handbook. The trainees will read through each lesson and answer the questions in the Self Checks. At the end of each session a training monitor will review each trainee's work and, if it is satisfactory, will have the trainee proceed to the next lesson.

Finally, the specific supervisory and management training needs at a particular mine at any one time may not always require that the trainees be given the full program. Therefore, each lesson in this program is designed to stand alone. If, for example, safety, training, planning or motivation is a problem at a mine at any time, the trainer may select the lesson that covers this specific need and present that to those supervisor or manager trainees who need it.

## Task 2: Evaluate the Program

The objective of a training program is twofold. First, as stated earlier, the program is intended to provide the trainee with new skills and knowledges for performing certain tasks. Secondly, it is intended to motivate the trainee to use the newly acquired skills and knowledges when performing the tasks. Evaluation of a training program should determine the degree to which each of these objectives is achieved.

In the Introduction we stated that this program was developed to provide prospective underground coal mine supervisors and managers with the skills and knowledges they need to plan, lead, direct, and control the activities of their subordinates. The basic subject matter of the program is interpersonal relations.

Evaluating the trainees' acquisition of the requisite skills and knowledges is comparatively easy. The majority of the objectives were knowledge objectives. The training materials presented accepted precepts for establishing and using communication channels effectively, leading, planning, evaluating performance, enforcing rules and regulations, and performing other supervisory or managerial tasks. Examples were presented to show these precepts could be applied to the everyday operations of an underground coal mine. Conducting tests at the end of each session that include questions on the meaning of or application of the precepts will determine whether or not the trainees have acquired the knowledge objectives.

Determining the degree to which the trainees are motivated to use their newly acquired skills and knowledges is more difficult. One approach considered was to determine if, in the post-training period, the overall operations are more efficient (more tons of coal produced per man-hour), a better safety record is achieved (fewer lost man-days per 100,000 man-hours worked), or labor relations are improved (fewer labor grievances). On closer scrutiny, however, it was decided that there are too many other factors that would affect these indicators to provide a valid evaluation. For example, tons per man-hour did increase at one mine where the supervisory program was presented. However, the evaluation took place at the time when the demand for coal had slackened and employment prospects suffered. Hence, the improved production could have been generated by the miner's concern for their jobs as much as by the supervisors' or managers' recent leadership training.

The worsening economic condition of the coal industry had a second undesirable effect on evaluating this program. Although mine management was cooperative and interested in the program, we did encounter a reluctance on their part to participate in any activity that did not relate directly to coal production. Therefore, we could expect one or more mines to use the program, but we would not be able to gather the data necessary to conduct an in-depth "laboratory" evaluation of the program.

We therefore re-oriented our plan for evaluating the training program. Under the new plan, the interest shown by the trainees in the program would be a measure of the degree to which they would be motivated to apply the skills and knowledges they had acquired. This decision led to the conclusion that promoting trainee interest should be a paramount consideration in designing the program.

Our principal method of generating trainee interest was to include in this program examples of how a supervisor or manager would carry out various aspects of leadership and interpersonal relations in an underground coal mining situation. Generating these examples required a considerable knowledge of the coal industry. Further, if the examples were to serve their stated purpose of generating interest, they had to be 100% technically accurate. Obviously, a technical error in such examples could destroy the credibility and hoped-for interest in the entire program.

We were fortunate in obtaining the assistance and cooperation of several mining industry training personnel (see Table 5). They reviewed the training materials as they were being developed and commented on deficiencies in technical accuracy, applicability to coal mining and semantics. Their assistance was invaluable in preparing this program.

After their comments were incorporated, we sent copies of the completed program to mine industry trainers with a request that they use the material in whole or in part. We have received word from them that the program will be used in their training curricula.

The Supervisor's Training Program was presented to supervisory and management personnel at Harman Mine, a medium-sized mine in Harman, Virginia. Sixteen persons, including five mine superintendents or mine shift/foremen, eight section foremen, and three prospective section foremen were asked by management to take the courses. Those on the night shift attended class from 1:00 to 3:00 p.m.; those on the day shift attended class from 4:30 to 6:30 p.m. Attendance was voluntary.

Questionnaires were passed out at the end of each training session, requesting the trainees to indicate if they felt that the material covering each objective would help them to carry out their supervisory or management responsibilities and if they felt that the training materials were clear and covered each objective in sufficient detail. Their answers were scored on a rating scale of 0 to 4. Seventy-five percent of the answers to both

questions were favorable. We felt that it was significant that the more senior persons--mine superintendents and foremen--rated the first question higher than did the more junior people.

We further felt that it was significant that attendance, though voluntary, was slightly better than 75%. In a number of instances, attendance suffered because the trainees were held over at the mine due to unforeseen conditions.

The trainees' achievement of the knowledge objectives was measured by giving a test at the end of each training session. The test included multiple choice, fill-in-the-blanks, and other similar questions. The average test scores were slightly over 75% for all sessions.

#### CONCLUSION

In conclusion, we feel that this training program has met the requirements of the original proposal in the following ways:

- It provides supervisory and management training for underground coal mines.
- The training is based on a valid needs assessment.
- The training program has been reviewed by mining industry training personnel and pronounced technically accurate and applicable to the mining industry.
- Industry personnel have requested copies of the program and are incorporating it into their training curricula.
- The trainees for the supervisory program pilot test displayed above-average interest in the program.

TABLE 1

AGENCIES CONTACTED

The Mining Academy at Beckley, West Virginia  
The Mine Safety and Health Administration in Arlington, Va.  
North American Coal at Powhatan, Ohio  
Penn Allegheny Coal at Tarentum, Pa.  
National Photo Laboratories at Houston, Tex.  
Peabody Coal Training Office in St. Louis, Mo.  
Kasier Steel Mine, Sunnyside, Utah  
Harman Mine, Harman, Va.  
Crescent Hills Mine, Daisey Town, Pa.  
Triangle Research Inc., Harman, Va.  
University of West Virginia, College of Mineral and  
Earth Resources, at Morgantown, W. Va.  
National Coal Training Office, Lexington, Ky.  
Freeman Coal Training Office, Frankfort, Ill.  
Island Creek Coal Training Offices, in Virginia,  
West Virginia, and Kentucky  
Monterey Coal Company Training Office, Carlinville, Ill.

TABLE 2

## SUMMARY DATA AND SELECTION RANGES FOR MINE CLASSIFICATION

	<u>SMALL</u>	<u>MEDIUM</u>	<u>LARGE</u>
	<u>Man-years (#Man-hours ÷ 1840)</u>		
Mean	32.64	141.905	647.92
SD	3.58	61.866	321.10
Range	27.765-40.424	55.89-270.65	275.75-1657.29
Selection Range (Mean $\pm$ 1/2 SD)	30.85-34.43	110.972-172.838	487.366-808.47
Number in Selection Range	64	74	52
	<u>Days Lost Per 1,000 Man-hours</u>		
Mean	13.178	7.663	4.146
SD	28.125	11.048	3.916
Range	0.00-119.1	.00-50.48	.107-18.532
Selection Range (Mean $\pm$ 1/2 SD)	.00-27.24	2.139-13.187	2.188-6.104
Number in Selection Range	64	74	52
	<u>Tons Per Man-hour</u>		
Mean	1.850	1.478	1.251
SD	1.007	.890	.556
Range	.20-5.94	.16-5.34	.46-3.17
Selection Range (Mean $\pm$ 1/2 SD)	1.346-2.353	1.033-1.923	.973-1.529
Number in Selection Range	64	74	52

TABLE 3

## TASK IMPORTANCE RATINGS OF MANAGERS

<u>Task</u>	<u>Mean</u>	<u>SD</u>
Set Long-Range Goals	5.00	.000
Set Objectives	5.00	.000
Discuss Long-Range Plans with Subordinates	5.00	.000
Formulate and Review Long-Range Policies and Procedures	5.00	.000
Communicate with Subordinates	5.00	.000
Prepare Records and Reports/Paperwork	4.66	.577
Control Internal Business Affairs	4.50	.866
Review Work of Subordinates/Lower Level Units	4.33	1.155
Interpret and Execute Policies	4.16	1.443
Discuss Short-Range Plans with Higher Management	4.00	1.414
Coordinate Activities of Several Units/Departments	4.00	1.732
Discuss Short-Range Plans with Subordinates	4.00	1.732
Troubleshoot Technical Problems	4.00	1.732
Handle People Problems	4.00	1.732
Represent Department to Higher Management	3.83	1.258
Advise and Instruct Subordinates on Work Problems	3.33	1.527
Counsel Subordinates About Work	2.66	2.082
Counsel Subordinates Who Have Problems	2.66	2.082
Organize Personnel and Equipment for Work	2.33	.577
Handle Conflicts Between Subordinates	2.16	1.258
Train Personnel	2.00	.866

TABLE 4

## TASK IMPORTANCE RATINGS OF FIRST-LINE SUPERVISORS

<u>Task</u>	<u>Mean</u>	<u>SD</u>
Check Condition of Worksite	5.00	.000
Give Orders and Instructions About the Work	5.00	.000
Train Crew Members on the Job	5.00	.000
Motivate Crew Members	4.89	.196
Enforce Policies, Procedures and Safety Rules	4.89	.196
Handle Complaints of Crew Members	4.89	.196
Counsel Crew Members About Their Work Performance	4.89	.196
Counsel Crew Members Who Have Problems	4.89	.196
Communicate With Crew Members	4.88	.196
Discuss Safety Regulations	4.83	.289
Receive Directives from Shift Foreman/Mine Supervisor Regarding Safety, Mine Policy and New Operations	4.72	.255
Prepare Reports and Paperwork	4.72	.255
Discuss Situation with Off-Going Section Foreman	4.66	.577
Discuss Equipment Condition with Maintenance Foreman	4.66	.577
Troubleshoot Problems as They Arise	4.66	.577
Check Work of Crew Members	4.66	.577
Represent Company to Crew	4.55	.774
Build Teamwork Within the Crew	4.55	.774
Check Condition and Inventory of Supplies	4.50	.866
Discuss Policy Regulations	4.39	.677
Investigate Potential Problems	4.33	.577
Instruct Crew Members on How to Handle Problems	4.33	.577
Receive Orders For the Day's Work-Shift Foreman	4.33	1.155
Handle Conflicts Between Crew Members	4.22	1.351
Discuss Situation With Fire Boss Prior to Start of Shift	4.16	1.041
Cite Needs of the Crew to Higher Management	3.83	.389
Plan Work	3.83	1.041
Check Condition of Equipment	3.66	.577
Estimate Supplies Needed	3.16	2.021
Estimate Manpower Requirements	3.16	2.021



TABLE 5

INDUSTRY PERSONNEL

Mr. Clif Burden	Island Creek Coal
Mr. Edward Carman	Eastern Coal Assoc.
Mr. Alfred Horvath	North American Coal
Mr. Chris Marshall	Republic Steel
Mr. Fred Morrell	North American Coal Beaver Creek Coal
Mr. Allen Plaisted	Westmoreland Coal
Mr. Edward Zajac	Bethlehem Steel
Mr. Edmund Zehel	United States Steel

## Appendix A

### INITIAL STRUCTURED INTERVIEW GUIDE

Questionnaire has 5 sections:

- 1) Background Information
- 2) General Questions on the Job
- 3) General Questions on Safety
- 4) General Questions on Regulations
- 5) Questions on the Safety Considerations for Specific Tasks

**Section 4: General Questions on Regulations**

1. When was the last time you were aware of new Federal or State regulations? \_\_\_\_\_ Year

2. Did you have any special meetings or training in order to learn about these regulations?

- Yes                       No

If yes, what? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Are these the most important set of safety regulations the mine follows?

- Yes                       No

If no, what are? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. What affect did the \_\_\_\_\_ regulations have on the operation of your mine?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Were there any changes to you on the job?

- Yes                       No

If yes, what? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. In overseeing the work of your people, how do you insure that they perform their work safely and in accordance with the regulations?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## **Section 5: Tasks and Their Safety Considerations**

### **Tasks:**

1. Receive and make work assignment
2. Conduct pre-work inspections
3. Conduct operations
4. Inventory and order supplies
5. Troubleshoot problems
6. Write reports

TASK: \_\_\_\_\_  
 (Fill in number)

Safety Duties	Purpose	Interpersonal Relations	Time	Equipment	Environment	Skill/Knowledge Needed	Problems	Training Needed	Criteria for Knowing Done Correctly
1.	<input type="checkbox"/> Do yourself <input type="checkbox"/> Delegate to whom? _____ _____ _____							You [ ] Men [ ] Boss [ ]	
2.	<input type="checkbox"/> Do yourself <input type="checkbox"/> Delegate to whom? _____ _____ _____							You [ ] Men [ ] Boss [ ]	
3.	<input type="checkbox"/> Do yourself <input type="checkbox"/> Delegate to whom? _____ _____ _____							You [ ] Men [ ] Boss [ ]	

**Appendix B**

**TASK LISTS FOR MANAGERS AND SUPERVISORS**

Mine \_\_\_\_\_

Title \_\_\_\_\_

**TASK LIST  
FIRST-LINE SUPERVISOR**

	<u>Job Significance</u>	<u>Training</u>
<b><u>Pre-Shift Activity</u></b>		
<b><u>Communicate with peers and higher management</u></b>		
Receive orders for days work—shift foreman	_____	_____
Discuss situation with off going section foreman	_____	_____
Discuss situation with fire boss	_____	_____
Receive directives from shift foreman/mine superintendent regarding safety, mine policy, new operations	_____	_____
Discuss equipment condition with maintenance foreman	_____	_____
<b><u>Represent crew to higher management</u></b>		
Cite needs of the crew	_____	_____
<b><u>Plan daily work activities</u></b>		
Estimate supplies needed	_____	_____
Estimate manpower requirements	_____	_____
Investigate potential problems	_____	_____
Plan work	_____	_____

**Significance for Job:**

- 5 - Highly important part of job
- 4 - Important part of job
- 3 - Moderately important part of job
- 2 - Part of job but not important
- 1 - Insignificant part of job
- 0 - Not part of job

	<u>Job Significance</u>	<u>Training</u>
<b><u>Shift Activity</u></b>		
<b><u>Organize crew and equipment for work</u></b>		
Check condition and inventory of supplies	_____	_____
Communicate with crew members	_____	_____
Represent company to crew	_____	_____
Discuss safety regulations	_____	_____
Discuss policy regulations	_____	_____
Motivate crew members	_____	_____
Build teamwork within the crew	_____	_____
Check condition of worksite (housekeeping gas checks, ventilation curtain, water)	_____	_____
Check condition of equipment	_____	_____
Give orders and instructions about the work	_____	_____
Instruct crew members on how to handle problems	_____	_____
Troubleshoot problems as they arise	_____	_____
Check work of crew members	_____	_____
Train crew members on the job	_____	_____
Enforce policies, procedures, safety rules	_____	_____
Handle complaints of crew members	_____	_____
Counsel crew members about their work performance	_____	_____
Handle conflicts between crew members	_____	_____
<b><u>End of Shift</u></b>		
Counsel crew members who have problems	_____	_____
Prepare reports and paperwork	_____	_____



Mine \_\_\_\_\_

Title \_\_\_\_\_

**TASK LIST  
MIDDLE AND UPPER MANAGEMENT**

	<u>Job Significance</u>	<u>Training</u>
<u>Plan Long Range Operations</u>		
Set goals	_____	_____
Set objectives	_____	_____
Discuss with subordinates	_____	_____
Formulate and review policies, procedures	_____	_____
<u>Plan Short Range Operations</u>		
Organize personnel and equipment for work	_____	_____
Coordinate activities of several units/departments	_____	_____
Discuss with subordinates	_____	_____
Discuss with higher management	_____	_____
Review work of subordinates/lower level units	_____	_____
Represent department to higher management	_____	_____
Interpret and execute policies	_____	_____
Train personnel	_____	_____
<u>Direct On-going Operations</u>		
Communicate with subordinates	_____	_____
Control internal business affairs (costs, budgets, inventory/order supplies)	_____	_____
Prepare records and reports, paperwork	_____	_____
Troubleshoot technical problems	_____	_____
Counsel subordinates about their work	_____	_____
Advise and instruct subordinates on work problems	_____	_____
Handle conflicts between subordinates	_____	_____
Counsel subordinates who have problems	_____	_____

Significance for Job

- 5 - Highly important part of job
- 4 - Important part of job
- 3 - Moderately important part of job
- 2 - Part of job but not important
- 1 - Insignificant part of job
- 0 - Not part of job

For each major activity (planning long range, planning short range, directing on-going operations, controlling business affairs), ask the interviewees the following three questions:

1. Tell me a little about what you do in this area of activities.

2. In this area, what gives you the most problems?

3. How do you usually handle them?

5. Do you receive reports on accidents that allow you to see how your people do?

- Yes                       No

If yes, do these reports show your people in comparison to the rest of the mine or mines in the state, or mines across the nation?

- Yes                       No

6. Do you ever set goals in terms of reduced accidents or improved safety for your people?

- Yes                       No

If yes, how do you communicate these goals to your people?

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How often do you do this? \_\_\_\_\_ times/year.

7. In assigning tasks to units or individuals, do you take into account their past performance relative to accidents and safety matters?

- Yes                       No

If yes, how? \_\_\_\_\_

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8. What is the responsibility of \_\_\_\_\_, your boss, in safety matters?

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9. What are the safety duties of the people working for you?

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Date: \_\_\_\_\_

Mine: \_\_\_\_\_

Time Started: \_\_\_\_\_

Circle One:        SM        MED        LG

Time Completed: \_\_\_\_\_

Interviewer: \_\_\_\_\_

Interview No.: \_\_\_\_\_

**Section 1: Background Information Form**

1. Name: \_\_\_\_\_

2. Title/Position: \_\_\_\_\_

3. How old are you? \_\_\_\_\_ years

4. How much schooling have you completed?

- Less than 8th Grade
- Some High School
- High School Graduate
- Technical School Training
- Some College
- College Graduate \_\_\_\_\_ (Degree)
- Some Graduate School
- Graduate Degree \_\_\_\_\_ (Degree, Area)

5. How long have you been in your current position? \_\_\_\_\_ months

6. What was your previous job? \_\_\_\_\_

7. Did you have any special training to prepare you for your current job?

- Yes                       No

If yes, what? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

8. Have you had any special training since taking your current job?

- Yes                       No

If yes, ask: on what? \_\_\_\_\_

How long did it last? \_\_\_\_\_

Was the course worth your time? \_\_\_\_\_

9. What do you think, or hope, will be your next position? \_\_\_\_\_  
\_\_\_\_\_

10. Who is your supervisor? \_\_\_\_\_  
What is his title? \_\_\_\_\_

11. Who reports to you? \_\_\_\_\_  
How many: \_\_\_\_\_  
Titles: \_\_\_\_\_

**Section 2: General Questions on Your Job**

1. If you had to break your duties into 3 or 4 major categories, how would you do it?

Here are some examples to help you.

(Hand them sheet of paper.)

- (A) \_\_\_\_\_
- (B) \_\_\_\_\_
- (C) \_\_\_\_\_
- (D) \_\_\_\_\_
- (E) \_\_\_\_\_
- (F) \_\_\_\_\_

2. If safety is NOT on list:

You didn't mention safety as an area. Did you omit it or do you think of safety as part of these other categories?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3. Is there a written description of your job?

Yes                       No

If yes, (ask for a copy)

## **EXAMPLE CATEGORIES**

### **How you spend your time:**

**DOING INSPECTIONS**

**ON PEOPLE PROBLEMS**

**CONDUCTING OPERATIONS**

**EQUIPMENT MAINTENANCE**

**GOING TO MEETINGS**

**WRITING REPORTS**

**PAPER WORK**

4. As far as your total time at work goes, what percent of your time do you spend on each of the following activities?

(Hand them a list to fill in and a pencil)

<u>Activity</u>	<u>% of Time</u>
Report writing	_____
Going to meetings	_____
Inspection of equipment and site	_____
Conducting daily operations	_____
In emergency situations	_____
With employees' problems	_____
Inventory and ordering supplies	_____
Receiving and making assignments	_____

5. Can you think of any of your important duties that I left out?

Yes                       No

If yes, what are they? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



6. I see you spend the greatest proportion of your time on \_\_\_\_\_  
(Fill in)

What are your major problems in \_\_\_\_\_  
(Fill in)

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7. Are there any of these duties where you feel additional training would improve your performance?

- Yes                       No

If yes, which ones: \_\_\_\_\_

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8. What about your superiors? Can you think of any area where they need more training?

- Yes                       No

If yes, what? \_\_\_\_\_

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9. What about the people reporting to you? Is there any additional training you would like to see them get?

- Yes                       No

If yes, what? \_\_\_\_\_

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