RESOURCE GUIDE FOR EVALUATING WORKER TRAINING:

A FOCUS ON SAFETY AND HEALTH

DEDICATION

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This Guide is dedicated to the people who have lost their lives and health because of unsafe work places and to the people who implement safety and health programs, so that fewer workers will lose their lives and health tomorrow.

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FOREWORD

It is with great pleasure that the George Meany Center for Labor Studies publishes this Resource Guide for Evaluating Worker Training. In joining with the National Institute of Environmental Health Sciences (NIEHS) and its Hazardous Materials Worker Training Program, the Center has been able to combine its support for worker training and evaluation with the pragmatic experiences of more than 100 groups from around the United States -- groups from labor, labor-management, and academic organizations. The Center is fortunate to house the library and curricula of these training groups, as part of the National Clearinghouse for Worker Safety and Health Training -- and also to head one of the 20 NIEHS awardee consortia, the Rail Workers Hazardous Materials Training Program.

WORKER TRAINING

Worker training is unique in many ways. It is adult-based, action-oriented, and result-centered. The goals and objectives of worker training focus on outcomes rather than on learning for its own sake. If workers learn how to properly monitor confined space, they literally have the ability to save their own lives; but, if upon return to the workplace that monitoring is not done, then safety and health training has not truly served its purpose. If workers learn how to read material safety data sheets, but do not have them at work and are not able to form the safety and health committees that can help them get such resources, then the benefit of training is not adequately achieved at the work site.

Workers come to training with a great volume of experience, and are, in many ways, the richest resources of a training class. The format of a training program can take advantage of the richness of these resources or it can stifle them. Experience shows that successful adult education often emphasizes peer-sharing activities, such as problem-solving and simulation exercises, that tap the experience of the learner. People often learn better from participatory, or active, learning than from the traditional lecture approach, or passive learning. Successful worker training often mirrors the way people learn at work -- from each other.

After training, workers should be able to bring what they have learned in the classroom or worksite training back to their jobs. Sometimes the goal is enhanced productivity, sometimes it is better worker control on the job site, and sometimes the goal is to help workers protect their lives and their health. In addition to providing specific skill training, worker education is also a social movement education, whether provided through university labor education programs, labor-management efforts, or trade unions. It is designed to enhance the workers' collective power of self-determination. An empowerment approach to safety and health education, for example, may include in its goals raising awareness of health and safety issues and increasing worker activism in safety and health.

A successful worker involvement approach to training often requires strong union and management support, and the NIEHS approach toward emphasizing the development of successful labor-management partnerships has been on the cutting edge of worker training.

THE CRITICAL ROLE OF EVALUATION

It is important to evaluate training programs to make sure they are achieving the results intended. Worker training programs, because they are geared toward success at work as well as in the classroom, are especially in need of evaluation. Evaluation should determine not only how well a program is implemented and how much knowledge is gained by students, but also actual outcomes of evaluation; i.e., what changes occur at work after training is complete. These changes may be increased awareness -- of health and safety risks or of rights related to wages and hours or to pensions and disability leave. Changes may occur in attitude and behavior at work. There may be newly formed worker committees or joint labor-management committees. Changes may also occur in actual work processes or in the equipment used at work. Knowing the role that worker training plays in bringing about these changes is an important part of evaluation.

Worker training is not a panacea for solving workplace problems, but research increasingly shows its critical role in stimulating improvement in working conditions and workplace productivity. Evaluating worker training helps on-going and future programs to more effectively accomplish their training goals. This guide, along with the dozens of time-tested evaluation instruments that accompany it, is an invaluable resource in improving evaluation of training programs that already exists and in making it simpler for those who are yet in need of bringing evaluation to their training programs.

We at the George Meany Center for Labor Studies are proud to have participated in making the <u>Resource Guide for Evaluating Worker Training</u> available to you.

> Susan J. Shurman, *Executive Director*
> Jeff MacDonald, *Deputy Director*
> George Meany Center for Labor Studies
> Silver Spring, Maryland
> 1997

PREFACE

Workers deserve safety and health training that works for them, especially when it comes to protecting their health and safety. This <u>Resource Guide for Evaluating Worker Training</u> is intended to help further the goal.

In the case of the federally-supported worker training, for which I am responsible as the program manager at the National Institute of Environmental Health Sciences (NIEHS), we aim to train hazardous waste operations and emergency response workers to be able to do their job, while, at the same time, protecting themselves and the communities in which they work from harm. Indeed, I firmly believe that all workers are entitled to training that really contributes to preventing work-related harm - that is, their training must be effective as far as those of us who are responsible for training programs can make it so.

Those of us who are responsible for training must pay close attention to worker health and safety training quality as one key way to help assure that the training is contributing to lower injury and illness rates and thus, lower costs -- both in terms of human suffering and financial expenses. While definitive measurement of the contribution of training toward this goal is difficult, this <u>Resource Guide for Evaluating Worker Training</u> offers a multiplicity of tools that can provide trainers with some better measure of assurance that they are helping to prevent injury and illness.

In addition, I believe high quality health and safety training for workers involved with hazardous materials is good public policy and should be a high priority to the country. Such high quality training:

- Enhances job skills
- Helps reduce health care costs by preventing work-related injury and illness, and
- Contributes to a cleaner and safer environment in both the workplace and in the communities in which the work is being conducted.

This <u>Resource Guide for Evaluating Worker Training</u> takes the specific lessons we learned about how to evaluate worker health and safety training programs for hazardous waste operations and emergency response and applies them more generally to health and safety training in the workplace. The <u>Resource Guide for Evaluating Worker Training</u> is part of a continuing effort of the NIEHS model training program to better worker health and safety training.

NIEHS has been interested in improving the quality of safety and health training since it was given major responsibility for initiating a training grants program under

the Superfund Amendments and Reauthorization Act of 1986 (SARA). The primary objective of this program is to fund non-profit organizations with a demonstrated track record of providing occupational safety and health education in developing and delivering high quality training to workers who are involved in handling hazardous waste or in responding to emergency releases of hazardous materials. Since the initiation of the Hazardous Waste Worker Training Program in 1987, the NIEHS has developed a strong network of non-profit organizations that are committed to protecting workers and their communities by delivering high-quality, peer-reviewed safety and health curriculum to target populations of hazardous waste workers and emergency responders.

The program is currently authorized $37 million per year and includes additional authorities for development of model worker safety and health training development and delivery in the following four areas:

- *Superfund Hazardous Waste Worker Training*. This training assistance program is for the training of workers who are or may be engaged in activities related to hazardous waste removal or containment or chemical emergency response.

- *Nuclear Weapons Cleanup Training*. This training assistance program is targeted for workers engaged in environmental restoration, waste treatment and emergency response activities at sites in the Department of Energy's nuclear weapons complex.

- *Minority Worker Training*. This program is focused on delivering comprehensive training to disadvantaged minority youth in order to prepare them for employment in the environmental restoration and hazardous materials fields.

- *Hazmat Employee Training*. The purpose of this training is to educate HAZMAT employees regarding the safe loading, storage and transportation of hazardous materials and emergency preparedness for responding to accidents or incidents involving the transportation of hazardous materials.

Congress wrote strong provisions for worker protection in SARA. The statute calls for a minimum of 40 hours of initial training for supervisors and workers "engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances..." SARA required the Occupational Safety and Health Administration (OSHA) to promulgate standards for the health and safety protection of employees in this area. OSHA's final rule 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, was promulgated on March 6, 1989 with an effective date of March 6, 1990. Similar

worker training provisions have since been written into the Asbestos Hazardous Emergency Response Act and recent Lead-Based Paint legislation for HUD.

The NIEHS model training programs for hazardous waste workers and emergency responders satisfy minimum requirements as specified in Federal OSHA rules and other related regulations that have been promulgated. Further, these training programs also meet the minimum requirements specified in the <u>Minimum Criteria for Worker Health and Safety Training for Hazardous Waste Operations and Emergency Response</u>, published April 1990, as a result of an NIEHS-sponsored technical workshop on training quality. These criteria were developed in the absence of others through a consensus of expert representatives of management, labor, academia and other governmental agencies and have been the lodestone pointing the way to better training since.

More recently, a 1993 NIEHS-sponsored workshop furthered the usefulness of the minimum criteria by developing a document that provided interpretive guidance including detail regarding what the educational goals should be and defined appropriate means to achieve them. Both documents became the basis for Appendix E of 29 CFR 1910.120 (59 FR 43268, August 22, 1994), which now gives official guidance to all those covered by the rule about the constitution of high quality training programs.

NIEHS continues to support activities to make safety and health training better. For example, NIEHS supported a student intern to organize and summarize the program evaluation data reported by individual awardees to NIEHS. NIEHS awardee evaluation must demonstrate not only effective training program implementation, but also impacts on the health and safety of workers. The findings clearly demonstrate that NIEHS grantees have responded to the challenge for program evaluation and have documented significant changes in health and safety of workers and communities across the U.S.

Then, during March 1996, NIEHS sponsored the first national conference on "Measuring and Evaluating the Outcomes of Hazardous Waste Worker Training" to examine the methods which have been developed by various programs to document the effectiveness of training activities. Drawing on public health experts in the evaluation field, awardee representatives spent two days exploring the methodological issues that underline the collection of program effectiveness data. Breakout sessions examined issues from trainee comprehension of curricula to outcome results in the workplace after training had taken place. The significant resources that have been allocated for NIEHS training awards require that recipients demonstrate not only effective implementation, but also positive impacts on the health and safety of trained workers. The findings reported at the technical workshop clearly demonstrate that NIEHS grantees have responded to the challenge for program evaluation and have documented notable improvements in the health and safety of workers and communities across the United States. After

the technical workshop, an ongoing effort was established to publish this guidance manual on program evaluation to benefit other organizations that grapple with safety and health training evaluation issues as a means of more effectively measuring training program quality.

Legitimate quality assurance programs examine quality issues from bottom to the top. In May 1995, NIEHS management established a special External Panel of outside peer reviewers with a specific charge: 1) to review and evaluate the overall NIEHS Superfund Worker Training Program taking into consideration program quality, output, productivity and impact, and 2) to make any recommendations considered appropriate by the Panel with regard to future directions for the NIEHS program. The Panel met twice at NIEHS, in June and October 1995. Before, during, and between these meetings, the panel reviewed extensive materials on the worker training program, analyzed the program in depth, and developed its findings, recommendations, and conclusions. A final report from the External Review Committee was completed December 1995 and found that the program was meeting its goals and gave new recommendations to help it to continue to improve.

To date the NIEHS worker training program has successfully trained over half a million workers in how to better protect themselves and the communities in which they work from work-related harm. Lessons we have learned about how to document these successes form the basis of this <u>Resource Guide for Evaluating Worker Training</u>. Please use the Guide in your own training programs to make work place safety and health programs better still for workers everywhere.

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FROM THE EDITORS

This Resource Guide for Evaluating Worker Training combines the hard work of many people -- authors, editors, peer reviewers, and those representing its funding sources. The final Guide reflects all input, though not everyone agreed on what to emphasize and how to best describe available options for evaluation. Some, for example, feel strongly about instructor involvement in designing evaluation; some would put more emphasis on the importance of a detailed needs assessment. For some reviewers, early establishment of goals and objectives for training is crucial, while for others, there is a concern that an evaluation focusing on attainment of goals and objectives may overlook serendipitous or other unexpected results. The relative roles of quantitative and qualitative assessment are a subject requiring continuing dialog among those doing and using evaluations.

Ultimately, layout and content -- and any errors or omissions -- are our responsibility. Everyone involved -- at the Clearinghouse, NIEHS, and the George Meany Center for Labor Studies -- hope this Guide will be useful in simplifying, explaining, and suggesting techniques for those who evaluate worker training programs.

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SECTION I

INTRODUCTION

Comprehensive program planning and implementation include evaluation. Yet, full evaluation isn't part of most worker training programs. It's true that workers often take a post-test to evaluate what they've learned and remember immediately at the end of training. And, trainees may evaluate a training program by marking a smile sheet to rate how pleased they were with the apparent quality of a program and its instructors and course materials. But, full evaluation goes beyond these useful, but limited, tools. Worker training programs focus on the knowledge and activities that go back to the work place and on-the-job outcomes that result. Evaluation should too. Full evaluation doesn't always need to be highly formal or costly. Programs vary in scope and potential impact, so evaluation can, and should, be kept in scale.

REASONS TO EVALUATE

Money spent on evaluation, to many, suggests money not spent on training. Since money is limited, why spend it and other resources on evaluation? Below are some reasons to do evaluation:

- **Positive evaluation results may open opportunities for program expansion**. If you're onto something good, you'll want to document what you've done -- either to help others try it or to get more money to expand what you have been doing, or both.

- **Evaluation may indicate how to improve future training**. Evaluation may help to identify content that's not technical enough or conversely, is too technical. It may show that peer training should be emphasized or point out the need to provide a handout during class or a job aid for trainees to refer to after training is over. Once workers have taken their new knowledge back to their work sites, they'll be the experts who can confirm which parts of training are most useful and suggest how to make training even more useful for future worker-trainees.

- **Evaluation may determine what type of refresher training is needed -- and when**. What specific information and skills do trainees retain and for how long? Some technical knowledge and abilities are critical to worker protection or essential for successful completion of a job. An evaluation may be crucial to assess specifically what information to cover in refresher training and when to provide it.

- **Evaluation helps document the confidence building from training that allows workers to use new knowledge and skills**. A worker who doesn't know, or isn't sure of the health effects of work place exposure to a toxic material is unlikely to work toward improving work place

conditions. But, many workers fresh from training are especially motivated to work with a shop steward or through a labor-management committee to improve work place practices.

- **Evaluation may be required by law or contractual obligation**. Your funding source, especially if it's a government agency or a foundation, may require that you document the successes (and/or failures) of your training program.

Safety and health training can make a significant difference in workers' lives. When it does it should be documented.

Jack has just returned from HAZMAT training and knows he needs to test the air in an underground tank before entering. He asks his employer for monitoring equipment, tests the air, and finds a lethal level of carbon monoxide. Acting upon his training, Jack has just saved his life, and possibly those of colleagues working with him.

How will those evaluating Jack's training course learn of this event when they are measuring program effectiveness?

Lack of quality safety and health training can also make a significant difference in workers' lives. These situations also need to be documented.

Andrea has had no HAZMAT training. She has just been instructed to clean up a chemical spill of unknown origin. No one is sure what the chemical is. It doesn't smell bad. She grabs a mop and bucket and heads for the spill -- no gloves, no boots, no MSDS. By afternoon, suffering from nausea and dizziness, she is sent to the company doctor, along with three other maintenance workers.

Could HAZMAT training have prevented this incident? When such an incident is prevented, how can evaluators document the "near-miss"?

EVALUATION OF WORKER TRAINING PROGRAMS

This Resource Guide for Evaluating Worker Training presents and explores a range of successful evaluation ideas, techniques, and tools for:

- Identifying areas for program improvement;

- Measuring the short- and longer-term accomplishments of a worker training program; and
- Assessing whether, and to what extent, training has brought positive change to the work place.

Worker training topics, particularly those in the safety and health arena, such as respirator use, must be understood and practiced in the context of on-the-job application. A worker must learn to identify the type of respirator needed for particular work conditions, know when to use it, how to use it, whether it fits properly, how to ensure that it is functioning properly, and how to maintain it. A worker must know when additional information is needed and how to get that information in a timely way. What's more, a worker may need to know how to carry out proper decontamination procedures after using a respirator. Hazardous materials training must, therefore, focus on trainees' achievement of pragmatic results that will meet the demands of their daily worklife routines and emergencies. It is the responsibility of management to provide this safety and health training to workers.

Since 1987, the Worker Training Program of the National Institute of Environmental Health Sciences (NIEHS) has supported hazardous materials safety and health training for more than a half-million people across the United States. NIEHS training is sponsored in cooperation with the Environmental Protection Agency and the Department of Energy. The organizations that are awarded grants develop curricula and provide training and are also required to devise ways to evaluate program effectiveness. Many evaluation protocols of NIEHS awardees use innovative techniques to measure both implementation and outcomes. Sharing the innovative techniques developed by NIEHS awardees, as well as reviewing several time-tested techniques, is a mission of this Resource Guide.

The Guide is supported by the work of the NIEHS's Worker Training Program, its 20 awardess (see Appendix A for list of awardees and associated institutions), and its National Clearinghouse for Worker Safety and Health Training as well as the George Meany Center for Labor Studies. The concept for the Guide arose from a technical workshop on evaluation that was sponsored by NIEHS and held at the George Meany Center in March 1996. The Guide was written under the auspices of the National Clearinghouse for Worker Safety and Health Training, a support arm of the NIEHS Worker Training Program, with contributions from more than a dozen experts in the field and the NIEHS awardees. Another dozen experts provided peer review.

Throughout the Guide are examples from instruments that NIEHS awardees have developed and used to evaluate their worker training programs. The Guide is available in published format and also on the World Wide Web. The Internet format can be printed for ready reference, adaptation, or direct use. This automated format facilitates editing and combining of instruments, so that you may adapt them to the terminology and evaluation needs of your worker training programs. Hard copies of the full instruments are located in Appendix B.

While examples used in the Guide come mostly from hazardous materials worker training experience, nearly all the Guide's information readily translates to use in

evaluation of programs in other areas of occupational safety and health, and worker training generally.

HOW TO USE THIS GUIDE *

If you want evaluation instruments, either off-the-shelf or to adapt to your own use, the Appendix of this Guide has dozens to offer. If you have a good sense of your goals and objectives and of how you want to evaluate your training program and its outcomes, the attached instruments, which have been used and tested by worker training experts from unions, universities, and labor-management consortia across the country, may be just what you need.

If you want specific ideas for how to evaluate your worker training program, or specific parts of it, look for the topic in the Table of Contents to find guidelines, suggestions, and specific examples. There will also be references to instruments in the Appendix.

If you want more general guidance on how to design your evaluation, what to measure, how to measure, who to involve, or how to analyze and present your findings -- first read the two page Action Plan that directly follows this introduction; then read through the text and make notes of those portions that best apply to you and your program.

If you are new to evaluation, read the evaluation overview and then the section on methods, to best determine how you want your program evaluated.

If you are an experienced evaluator, but new to evaluating worker-training programs, then Section II should be read with special care. Many guides on evaluation are available, but evaluation of training, especially worker-training, requires emphasis on outcomes as well as implementation and process. The ability of workers to bring their work place to their classroom, and perhaps even their classroom to their work place, helps make training relevant and transferable. Sensitivity to literacy levels and written test-taking ability allows workers to better understand materials and convey what they have learned. Assessing how workers learn in environments of hands-on, site specific training is especially important.
If you are unconvinced of the value of evaluation, but perhaps are obliged to do one anyway, look at the Action Plan on the next four pages, to give structure to what you should do.

There is no one best way to evaluate. But remember, running a great program is more than just good classrooms, good instructors, good materials, and good learning. Without good outcomes at work, based on improving work place

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* As you read through the Guide you may want to take some notes. For this purpose, we have provided "NOTE boxes" throughout the Guide.

practice and process, workers are not gaining the full benefit of their safety and health training. Evaluation should scrutinize the training process, but also go beyond that to find out how training is being applied at work. Use this Guide for helpful suggestions on how to do both.

NOTES_____

Worker Training Program Evaluation: An Action Plan

This Resource Guide presents several ways to do good evaluation. The Guide addresses each point of this Action Plan.

❏ Make sure that initial program planning encompasses planning for evaluation.

❏ Make sure that a program's advisory team (recognized stakeholders or other decision-making group) establishes program goals and objectives that are suitable for later evaluation.

❏ Establish, if possible, an evaluation plan before program implementation gets underway. This timing allows evaluation to assess the program in terms of what it was meant to be; it eliminates any temptation to lower standards or eliminate objectives simply to make program results look better than they are. (nonetheless, don't ignore unexpected results, be they positive or negative.)

❏ Develop a framework (and choose a technical design) for the evaluation, by making a series of fundamental determinations and decisions.

★ Do a needs assessment to determine the purposes of the evaluation; for example, requirements from a funding agency, finding program weaknesses that need correction, re-examining existing goals, documenting accomplishments.

★ Decide what will be evaluated:
❖ How well the program was implemented (Implementation Evaluation)
❖ How well the program is progressing (Formative or Process Evaluation), and/or
❖ What the outcomes of the program have been (Summative or Outcome Evaluation).

★ Decide who will do the evaluation:
❖ Someone from the program staff,
❖ An "outside" evaluator, or
❖ A combination of inside staff and outside personnel.

★ Decide who will be evaluated:
❖ Trainees
✳ everyone who has been trained
✳ a defined sample of trainees, or
✳ groups of trainees
❖ Trainers, and/or
❖ Program administrators.

★ Decide when evaluation will take place:
❖ Before training
❖ Immediately after training
❖ After 3 or 6 months as a follow-up, and/or
❖ At annual refresher training.

★ Determine how much budget, time, and other resources will be available for doing the evaluation.

❏ Plan the Evaluation

★ Decide on measurable objectives and instruments

❖ Quantitative Measures; Qualitative Measures; or Both
❖ Choose Appropriate Measures and Techniques:
  ✳ case studies
  ✳ close-ended questionnaires
  ✳ contractor reports
  ✳ co-worker reports and other work site assessment tools
  ✳ debriefings
  ✳ direct observation
  ✳ focus groups
  ✳ hands-on and field exercises
  ✳ interactive participatory-based approach
  ✳ near-miss documentation
  ✳ open-ended questionnaires
  ✳ personal interviews
  ✳ post-training use of written materials
  ✳ retrospective post-test
  ✳ review of written documents and materials
  ✳ risk mapping
  ✳ self-rating of competency and other self reports
  ✳ simulations
  ✳ skill-performance checklists
  ✳ small-group exercises
  ✳ surveys
  ✳ systematic collection of anecdotes
  ✳ videotaping
  ✳ work site visits
  ✳ written competency tests, and/or
  ✳ written pre-test and/or post-test.
❖ Consider Issues Especially Important in Evaluating Worker Training:
  ✳ hands-on training
  ✳ issues related to written testing
  ✳ peer training
  ✳ site-specific training, and/or
  ✳ training for people with limited literacy or English as a second language.

❏ Decide how to collect and analyze information.

❏ Decide how to report evaluation findings:

★ Written reports
★ Oral presentations, or
★ Both.

❏ Report evaluation findings, including, if appropriate, recommendations for change.

SECTION II
EVALUATION: AN OVERVIEW

Evaluation assesses a program's achievement of intended goals and objectives, or its progress toward them. Evaluation should be part of an overall, systematic program-planning process, with goals for evaluation defined during initial program design. When this happens, training objectives and methods can be thoughtfully established.

Full program evaluation is important in assessing:

- How well a program has been designed

- How well a program is being implemented

- How much or how well workers learned during training

- Whether worker training led to improvements in the work place in terms of:

  * better job performance
  * improved worker safety and health
  * better jobs and working conditions, and/or
  * enhanced opportunity for workers to meet longer-term career goals

- How much workers are involved in safety and health activities.

Because of the need for broad support and participation in evaluation, an evaluation advisory team can be helpful for:

- Planning an evaluation, by defining its purpose and helping to establish its scope

- Guiding decisions as the evaluation develops and is implemented

- Reviewing evaluation materials and reports.

When developing an evaluation advisory team, consider how to represent the interests of:

- Workers who are trainees or peer trainers in the program

- Program instructors

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- Employers

- Funding agency representatives, and the overall funding agency

- Sponsoring or participating organizations

- Program administrators

- Policy makers

- Others involved in health and safety.

An advisory team may serve as the advisory team or board for the whole training program, including evaluation. An advisory team for general oversight is suggested because:

- A team representing central roles in evaluation will help ensure a genuine sense of ownership for members of stakeholder groups

- Program evaluation will be strongest if decisions about evaluation are consciously made by a team prepared to generate and consider as many options as possible

- A well-designed program evaluation will anticipate, and address head-on, issues posed by potentially conflicting interests, and

- A team charged with aiding those designing the evaluation can consciously decide the extent to which various interests will be served and what compromises, if any, need to be made.

Although striving to balance interests is important, ultimate interest clearly is to address matters that contribute most to improving worker health and safety.

A. STAGES OF EVALUATION

Program evaluation has five major stages:

1. **Needs assessment** identifies appropriate goals for a particular program evaluation.

2. **Program planning for evaluation** outlines the particular evaluation methods to be used.

3.   **Implementation evaluation** measures how well a program was implemented. Were the expected number of workers trained? Were teaching materials in place? Were student materials available? Were classroom and other sites adequate? Was registration smooth? etc.

4.   **Formative evaluation** (also called **process evaluation**[*]) measures how well a program is progressing. Formative evaluation takes place while a program is still underway so that program deficiencies can be identified and corrected. An evaluator seeks to understand how instructors, course content and training materials, trainees interests and abilities, and relationships among these might cause the program in practice to differ from the ideal concept of the program. In formative evaluation, an evaluator may monitor and assess whether program development or current implementation requires adjustment to avoid straying too far from the ideal.

5.   **Summative evaluation** (also called **impact or outcomes evaluation**[*]) assesses an overall program and its outcomes, focusing on the measurement of outcomes -- such as fewer injuries and illnesses and other positive work place changes that might be tied to training. A challenge to measuring the evaluation of training's impact is that some outcomes are not evident or measurable until months, or even years, after training.

Evaluations do not always include all five stages. In some evaluations a stage may be missing or have less emphasis than others. The needs assessment stage is important, but it may be done quickly by an advisory team or it may be a major undertaking. It may be mandated by a grant-making organization or other sponsor. The program planning stage should be extensive, but short time frames for implementation may also cut this stage short. Most programs that evaluate, do implementation evaluations, sometimes to the exclusion of all other evaluation. The classic "smile sheet" that asks how well a trainee liked a particular aspect of training is an example. Implementation, formative, and summative evaluation may go hand-in-hand with each other rather than being separate processes. For example, evaluation of an on-going multi-year program may have instruments or questions on how well a training program was implemented, how well it is accomplishing its goals and objectives, and also what impacts can be observed in the work place.

It would be ideal if evaluation could prove direct cause and effect between safety and health training and outcomes; i.e., showing that training was unquestionably

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[*] Though some may differentiate between these terms, in most contexts they are used interchangeably.

the reason -- perhaps, the sole reason -- that there were fewer accidents or greater worker involvement in safety and health committees. Such proof is rare. Typically, evaluation will note or measure the occurrence of sought-after events and lessening or absence of undesirable ones, which suggest, but don't prove, a program's influence. Evaluation also acknowledges that multiple causes often contribute to change. Evaluation should sort out causes to the extent that's feasible and use them to explore explanations for change or lack of it.

1. Needs Assessment

A needs assessment investigates a training program's targeted participants and their specific needs. A needs assessment helps determine program goals and, therefore, also helps determine evaluation measures. It includes determination of:

- Who will be trained -- with demographics including age, sex, ethnicity, first language spoken, literacy level

- What training is needed

- Where and how to deliver the training; for example, at a work site or in a training center, with peer trainers and/or training staff

- What types of training methods have succeeded in the past for similar groups of workers, and

- Other factors that may influence the development of a training program and its delivery.

If a needs assessment wasn't done during program planning, an evaluator (or evaluation advisory team) should examine needs before developing an evaluation strategy. An evaluator may choose to talk with workers and employers or directly observe the work place and work practices, especially if the number of training participants is small and they're from one work site. Depending on the circumstances, and if time and money permit, assessment may be more formal, using methods such as surveys or focus groups. Needs assessment methods may include activities that take place during training, such as risk-mapping exercises,[*] which allow workers and trainers to determine needs jointly.

Because many different groups are interested in the success of a worker training program, it is important to analyze the interests of a broad range of stakeholders. Safety and health training that's developed with a "one size fits all" approach probably won't be effective. Workers come to training from a variety of backgrounds and for a variety of reasons, and recognizing these differences makes

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[*] Risk mapping and other evaluation methods are discussed in more detail in Section IV.

it more likely that training will meet the needs of the particular workers to be trained. Learning about characteristics of the training population is a significant component of a needs assessment.

Because development of effective training programs and materials depends on knowing your audience, an evaluator seeks answers to questions such as:

- What type of work do potential trainees do?

- Where do they work?

- For whom do they work?

- What health and safety concerns or issues relate to their work?

- How aware are they of the health and safety concerns and issues related to their work?

- What prior education and training do they have?

- What languages do they speak? How are their literacy skills in English?

- What general state of labor-management relations surrounds the trainees at work and in training?

It's not always possible to address all concerns, but if potential trainees perceive that their needs are being ignored or discounted, they aren't likely to be receptive to training. So, besides knowing what the trainees know about the subject matter of the training, those who develop a program need to know what information potential training participants want to receive and what issues they want addressed. One example of needs assessment questions, that assess issues of worker concern, was developed by the University of Michigan on behalf of the United Auto Workers Union. (See Appendix for full instrument):

SAMPLE NEEDS ASSESSMENT QUESTIONS

THIS SECTION ASKS ABOUT HEALTH AND SAFETY WORKING CONDITIONS AT YOUR PARTICULAR WORK PLACE.			
How much of a problem are the following conditions in your own work area?	Not a Problem	Somewhat of a Problem	A Big Problem
a. Improperly functioning ventilation			
b. Temperature is too hot or too cold			
c. Dust, smoke			
d. Fumes, mists or other air pollutants			
e. Exposure to hazardous materials/chemicals			
f. Poor lighting			
g. Loud noise levels			
h. Having to work in physically uncomfortable positions			
i. Poor housekeeping			
j. Maintenance of equipment			
k. Job description sheets			

Source: University of Michigan for the UAW Hazardous Materials Training Program

2. Program Planning For Evaluation

Once a needs assessment is complete, program planning for the evaluation can begin. After goals and objectives are established, decisions are made about what to evaluate, who to evaluate, who will evaluate, and when.

Establish Goals and Objectives

Goals should be established just after the needs assessment, early in the program planning process. Goals related to program outcomes and impact are broad statements about what the program is trying to achieve or what problem the program is trying to solve; for example, "improve awareness of work place hazards." Typically, goal statements are limited to one or two realistic sentences, such as "Training will improve workers' knowledge of job risks" or "Training will improve the chances of averting injuries at work." Goals should state clearly what health and safety conditions are to be changed. Make sure that goals are in accord with the overall organizational

mission and purpose. Goals don't need to be measurable or achievable within the span of a single program; they often express continuing, long-range aims.

Objectives should be established during program development. They should be more specific and their achievement should be measurable; for example, "Rail workers should be able to read placards and identify the contents of rail cars." Objectives need to be logically connected to achievement of one or more of a program's stated goals. The factors chosen for consideration need to be good indicators of important outcomes or progress toward a goal. If you have an idea or theory of how the program should work, this is where it comes in. Objectives should be determined by an evaluation advisory team (including instructors, if possible) or by other evaluation planners familiar with program goals.

Since the purpose of program evaluation is to measure results against intended goals and objectives, having clear goals and objectives is a prerequisite for good evaluation.

Develop Objectives: Short-, Intermediate-, Long-Term

Objectives take various lengths of time to accomplish:

- Short-term objectives are fulfilled during or immediately following a class; for example, being able to read a material safety data sheet.

- Intermediate-term objectives relate to actions that workers might take initially at their work sites after training; such as wearing eye protection or becoming active in an existing health and safety committee.

- Long-term objectives are fulfilled through worker actions that may take time to bear fruit, but not soon enough to cite in an end-of-the-year evaluation report. Examples would be encouraging a company to properly fit-test respirator, development of an emergency action plan, or getting contaminated soil removed from an outdoor work site.

Write measurable objectives. Begin by determining:

- What will be measured; for example, trainees will not enter confined space prior to adequate air monitoring.

- Whose learning or performance will be assessed; for example, those trainees who face confined space hazards.
- When the objective is to be accomplished (find a date or time span such as "before completing the course" or "within six weeks," or say that some activity will occur "at least twice a year"); for example, from the time training is completed.

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- How much change or achievement is expected; for example, either there is adequate monitoring equipment and it is used or the worker refuses the hazardous assignment until monitoring is done.

It's difficult -- and not always wise -- to estimate the degree to which change or achievement should be accomplished. You may be able to base an estimate on past experience with programs in your organization or in other programs that are known to you. Often, however, an estimate is no more than a best guess, possibly communicating a belief that stakeholders have about achieving objectives. Achievement of objectives is usually the key measure of program success, so be realistic and try to avoid overly ambitious objectives or overestimation of a program's ability to meet objectives. In the confined space example the stated expectation for change -- "from the time training is completed" -- is perhaps unrealistically high, but, nonetheless, crucial due to the life and death nature of the hazard.

Evaluators interpret the data and information they collect in light of program goals and objectives; they reach conclusions by comparing accomplishments to the stated objectives; and they create program reports using these objectives as a framework.

Well-written goals and objectives help to ensure that:

- Evaluation focuses on program aspects that are most important to stakeholders

- Findings will satisfy, at least in part, the needs of a funding agency that stipulated goals and objectives in its request for grant proposals

- Consensus exists, among those with a stake in the program, about what is to be accomplished and how success will be recognized.

The evaluation team should also seek to identify unintended effects. For all their importance, goals and objectives aren't the only focus of an evaluation program. To focus only on goals and objectives would prevent evaluators from looking for program activities or results that weren't in the program plan. For example, trainees may return to work and have labels translated into Spanish, Polish, Portuguese, Vietnamese, or other languages. Or, workers might be generally motivated about their rights and go back to work to get clean water for drinking and washing or to get adequate lighting for parking facilities, or to find a clean place to eat their lunches.

Determine What to Evaluate

Evaluation measures program implementation, progress being made, and outcomes of completed training. Many evaluations measure all of these. Ways to measure progress include changes in knowledge, attitude, and work place outcomes.

Changes in Knowledge and Awareness

A basic element of evaluation, probably the most basic, is measurement of what trainees have learned -- both factual knowledge and new awareness. Typical learning objectives that might be tested for after a hazardous materials training class include:

- Trainees will be familiar with the dangers involved in chemical exposure and the health problems that may follow

- Trainees will understand their rights and responsibilities regarding work with hazardous materials

- Trainees will be able to recognize and identify hazards associated with their work

- Trainees will be able to transport hazardous materials safely

- Trainees will know what first response actions to take in an emergency.

Assessing increased awareness means identifying a new-found recognition. For example, before taking a HAZMAT training course, many workers are unfamiliar with resources -- such as the <u>North American Emergency Response Guidebook</u> or the <u>NIOSH Pocket Guide for Chemicals</u> -- resources that might help them in emergency situations. Asking about trainees' use of these resources (before and after training) can identify whether workers have gained an awareness of the availability and use of these resources during training. (See questions below, for an example of how to measure new knowledge of the <u>NIOSH Pocket Guide</u>.)

A Sample Knowledge Measure

NIOSH POCKET GUIDE PERFORMANCE MEASURE
Version E

You have been called to an area where the lid has been removed from a drum containing 18% aqueous ammonia solution. The lid has apparently been off for some time, and there are no open flames in the area.

Air monitoring determines the vapor concentration near the drum to be between 275 ppm and 300 ppm. According to the NIOSH Pocket Guide, which of the following types of respirators would be recommended for you to approach the drum?

   1   Full-Face Mask   ❏Yes   ❏No

   2   Half-Face Mask   ❏Yes   ❏No

The worker who left the lid off the drum was washing beakers and has splashed his canvas tennis shoes and bare legs, What two things should you do for him?

   3 _____
(Write in your answer.)

   4 _____
(Write in your answer.)

The drum of aqueous ammonia is located in an area used to store other substances. The other substances are listed below. Which of the following items in that area would have caused a problem for you if they came in contact with the ammonia?

   5   Methyl Iodide   ❏Yes   ❏No

   6   Picric Acid   ❏Yes   ❏No

   7   Methylene Chloride   ❏Yes   ❏No

   8   A roll of copper tubing in the corner   ❏Yes   ❏No

Source: Midwest Consortium for Hazardous Waste Worker Training

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Anecdotes can tell how a worker applies new awareness. In the following example, a trainee protected himself and his co-workers from harm:

> After an employee attended a hazardous materials training course he experienced a diesel-fuel line break. Employees had to wade through the fuel to get to work. The former trainee told the company how unsafe that was, but had to threaten to call OSHA before the company took action to clean up the fuel. Because training had made the

employee aware that there were OSHA regulations to protect him, he was able to take a central role in getting the fuel cleaned up.

Changes in Attitude and Behavior

New awareness can lead to immediate or gradual changes in attitudes and behaviors. In the example above, threatening to call OSHA was a new behavior. Discovering that a material they've been around or using all their working lives is hazardous can be an eye-opener for trainees. Suddenly they have new respect for the material. They're primed to take special precautions that they'd never considered. For instance, many workers who are in constant contact with lead have no idea that washing their work clothes at home contaminates the family laundry and can cause family members to become ill. When they learn this they're often motivated to change. They may also have to deal with fear for themselves and family members. It's important to find out what learning has occurred. Identifying new awareness may require the use of telephone interviews that allow people to talk freely rather than having to write. Written, open-ended questions sometimes provide similar results. Actions resulting from new awareness should be documented whenever possible. For example:

> As a result of training, a rail worker from the Brotherhood of Maintenance of Way Employees (BMWE) established a HAZMAT committee and another rail worker from the Brotherhood of Railway Signalmen reported starting a safety committee after completing four-day HAZMAT training.

Many employees believe they're powerless to make changes in the work place. When safety and health training makes employees aware of their rights, the knowledge may be more than liberating; it may be lifesaving. Safety and health training is often designed to help trainees help themselves and to encourage them to take initiative in improving their work places. Although encouragement comes from the outside, actual empowerment comes from within training participants. Evaluators might use open-ended instruments or conduct interviews or observations to evaluate such outcomes.

> One BMWE member who participated in the very first railway worker 4-day training course became more aware and, consequently, more involved. When he sees a safety and health problem he voices his opinion. Since he attended the training course, there was an oil spill with an unknown chemical. The city fire department's HAZMAT team put the chemicals into barrels. His supervisor directed him to take the barrels away. He said he wouldn't remove the barrels until he knew exactly what was in them and what the chemicals could do to him. He then referred to the resource materials that he received in training to see what the chemicals were, what they could do, and what the best way was to transport the barrels.

Changes In Decision Making and Outcomes

For worker training, outcomes are especially important. When trainees share new information and skills with co-workers, that's an outcome which shows that people learned the material and found it applicable to their work place.

An example of positive change in work place conditions would be the addition of a windsock to an outdoor work area to show what direction is upwind should there be a hazardous materials emergency. The addition of laundry facilities to a work site so workers no longer take contaminated clothing home for washing with family laundry or the addition of appropriate personal protective equipment (PPE) in a facility are other examples of changes in conditions.

A change in work place practice could be the discontinuation of an unsafe practice; for example, after trainees learned that building outdoor warming fires near hazardous waste containers is dangerous the practice in their area stopped.

Change in work place practice may involve being more consistent in a practice or adding a practice:

> Some workers use Material Safety Data Sheets (MSDSs) to verify they're using proper materials-handling precautions. A trainee who hadn't used MSDSs learned about them at training and now uses them. He also now wears flame-retardant pants. And, he and his co-workers, who used to package materials with a mud containing silica, have replaced that with less harmful materials.

> After returning from training, a staff member from the International Brotherhood of Firemen and Oilers was ready and able to get emergency response plans into work places where there hadn't been any. After much effort, he was also able to convince employers to get MSDSs for the workers.

Very important as an outcome of safety and health training, but somewhat harder to measure, is the emergence of safety as a work place priority. Employers who emphasize safety provide the climate in which safer practices and work processes can emerge.

The particulars of outcomes may best be elicited from workers by using open-ended, qualitative questions such as "What have you done differently since you had training?" If it's feasible, arrange for face-to-face interviews conducted by peers, as these tend to yield more detail than written, mailed questionnaires. The next section of this Guide tells more about these and other methods of asking questions.

The NIEHS Worker Training Program has documented examples of workers who, post-training, insisted on monitoring air before entering a confined space -- and who

literally saved their own lives when lethal doses of chemical gases were discovered. The answers to a situation question -- such as one that asks "If a co-worker is lying injured in a pool of unknown chemicals what should you do?" -- gives a good indication of whether knowledge and decision-making ability gained in training is being (or will be) properly applied. Calling for emergency help is the correct answer and the only one, because it ensures that no other worker will be injured. Yet, time and again, the majority of workers, pre-training, will say to pull the victim out -- a compassionate and instinctual response, but one to resist in order to avoid more injuries.

3. Implementation Evaluation

Implementation evaluation is necessary, but not sufficient, for a full evaluation. Logistics, materials, and instructors are all essential elements of a quality training program, but their quality does not necessarily lead to accomplishing objectives. If it is difficult to register; if the time and location of the facility is inconvenient; if the classroom is too small and too hot; if training materials don't arrive; or if the instructor is excellent but doesn't speak the language of the trainees, then there are lots of needed improvements to be made before one even begins to address changes in knowledge, attitude, and outcome.

Did training provide new information to trainees? If so, was it understandable to them? Were the vocabulary level, sequence of presentation, and level of detail appropriate? Did trainees say that the materials presented -- handouts, videos, resource guides -- were useful?   One example of a comprehensive instrument that measures implementation was developed by a coalition of community colleges (see Appendix for full instrument):

CCCHST/HMTRI Course Evaluation Form

For the following statements, please respond with
na-not observed, SD-strongly disagree, D-disagree, U-unsure, A-agree, S-strongly agree

Printed	Well organized	na	SD	D	U	A	SA
Materials were	Technically correct	na	SD	D	U	A	SA
	Consistent with regulatory requirements	na	SD	D	U	A	SA
	Complete	na	SD	D	U	A	SA
	At an appropriate reading level	na	SD	D	U	A	SA
	Printed and bound satisfactorily	na	SD	D	U	A	SA

Adapted from the Community College Consortium for Health and Safety Training

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A simpler implementation evaluation instrument was developed by the Iron Workers, International Association of Bridge, Structural and Ornamental. This instrument asks trainees to respond with either A, B, C, or D -- which corresponds to Outstanding, Good, Fair, or Poor -- to sixteen statements. Statements include "My instructor

seemed well prepared for class" and "The amount of material covered in class was reasonable." (See Appendix for full instrument.)

4. Formative Evaluation

The central purpose of formative evaluation is to identify where program adjustments need to be made to keep a program on track or to improve it. Formative evaluation also helps program staff to prepare for implementation of a new program phase or it might help update the description of an evolving program.

Evaluation activities used to improve a program may include re-testing or piloting a program and its materials and methods. Or, there may be ongoing monitoring of program activities.

Program evaluations often stop either with assessment of short-term achievements or move immediately to assess longer-term program effects. Also important for understanding how a program works, is investigation of the processes that people and organizations go through in carrying out the program. These processes occur at several levels.

In formative evaluation the evaluator collects and uses information to shape a program about to be presented or to modify an ongoing one. Trainees may gain an understanding of what a material safety data sheet contains, but not fully learn how to read one and use the information. Trainees may learn a lot about airborne hazards, but have more immediate needs to understand skin exposures. Evaluation identifies issues and helps remedy them for future courses.

In designing an education or training program, a trainer chooses teaching content and methods that are likely to lead to desired, immediate changes for workers --changes that are likely, in turn, to lead to achievement of program objectives and goals such as reduced injuries and illnesses.

If a trainer-evaluator believes that improving worker health and safety comes from changes in work site health and safety policies, programs, and controls, then program design will reflect this educational philosophy. If a trainer believes such changes can be promoted by actions of workers who possess knowledge, skills, and the confidence to take them, then the trainer might design an education program that uses participatory, small-group, problem-solving exercises led by workers. The trainer would choose learning activities to provide needed information to participants as they develop and practice problem-solving skills.

If a trainer believes that improving the health and safety of chemical emergency responders is best addressed by improving how to respond to emergencies, then program design will reflect this educational philosophy. A trainer may also believe that excellent response actions require workers to have highly developed individual and group skills executed according to a well-designed emergency response plan. Such a

trainer might design a training program that uses interactive lectures and hands-on, practice sessions led by skilled emergency response professionals. In the first case, the immediate objective is development of problem-solving skills. In the second case, the immediate objective is improved skills related to chemical emergency response based on a plan. In both cases, program planners choose educational methods that suit immediate objectives leading to achievement of longer-term goals. Of course, multiple goals may simultaneously be reflected in teaching content and methods.

Often trainers have a vision of how they want a program to work. But, there's no foolproof way to make that vision a reality. Most programs don't go exactly the way the trainers want. Sometimes what was planned doesn't work. This may be the result of transient conditions that won't affect future running of a program or may indicate that a program needs alterations, the nature of which may become obvious as problems are analyzed. In evaluating a program, one should realize that external factors, more than program design or framework, could influence outcome.

The program context is the environment in which training occurs. It's what an evaluator assesses by investigating whether a program would probably be more or less effective if carried out under different circumstances. So, besides seeking to understand to what extent the program was delivered as planned, an evaluator needs to know how conditions surrounding the program either supported or hindered it. For example, if an accident occurred just before or during the training, participants may be somewhat "down" and distracted despite their wish to learn safe practices. To see the big picture clearly, an evaluator looks beyond the training site -- to the work site, labor-management relations, community events and so forth -- for more information.

Many aspects of training program design and delivery are well understood and lead to fairly predictable results. But, sometimes what happens during and after a program is a mystery. Evaluation might solve the mystery to indicate how to eliminate or moderate undesirable happenings; for example, the specific needs of the students may be too diverse. On the other hand, evaluation may identify desirable outcomes and suggest that they be replicated; for example, risk mapping as an "ice-breaker" drew trainees together into a cohesive learning group. Still, trainers and evaluators frequently operate with tight time and resource constraints. So, they may opt to avoid expending the resources necessary to analyze what happened and to share "lessons learned" about training. But, if evaluation is neglected, much of what was learned about how to conduct a program can be forgotten, and much of what is remembered will not be communicated to others.

Sometimes program planners don't anticipate a program's most meaningful experiences or most important results. And, certainly, no one plans for difficulties or problems, but they can occur. So the design of an evaluation should include efforts to identify and analyze unintended effects as well as stated goals and objectives.

5. Summative Evaluation

Although summative evaluation is similar to formative evaluation in many ways, it has a different timeframe and a somewhat different purpose. In general, summative evaluations look back at a program to develop an understanding of why a program had the effects that it did. Summative evaluations answer how, when, under what conditions, and with which groups a program approach will work. Summative evaluations, especially for worker training programs, seek to identify and measure outcomes. Summative and formative evaluations may blend, especially if evaluation is done annually, with one year's summative evaluation serving the function of formative evaluation to influence the year that follows.

In the short-term, a health and safety education program aims to help workers change their level of knowledge, skills, and action. A program's longer-term aim may be to help workers explore their attitudes and actions regarding work place practices and change these over time.

B. PLANNING A TRAINING PROGRAM EVALUATION: NINE HELPFUL STEPS

If you will be planning a program evaluation, you have a series of decisions to make. These apply to implementation, formative, and summative evaluations alike. The following eight steps are helpful in planning any evaluation:

Step 1: Choose Which Levels of the Program to Evaluate

List the program levels that you wish to investigate and one or more major questions associated with each level.

Level 1: <u>The initial education program impact</u>: What were instructors' and worker trainers' perceptions about how well the train-the-trainer program helped prepare worker-trainers to conduct the program in the field?

Level 2: <u>Workers' activities following the program</u>: What actions did worker-trainers take to organize and conduct the programs at their work sites? Why did they engage or not engage in actions recommended by program planners?

Level 3: <u>Other organizational impacts (for example, the health and safety committee)</u>: How and why did management support or not support the program? Similar questions could be asked about the local union leadership. Also, were labor-management relations regarding health and safety affected immediately before or during the training? If so, how and why?

On the following page is an example based on the following cancer prevention case study:

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A Formative Evaluation Case Study:
The Search for What Didn't Work

Cancer Education Prevention Program

In the early 1980s, a major union's cancer-prevention education program was provided to rubber workers, a group known to have high rates of cancer. The targeted outcomes were: changes in workers' knowledge, attitudes, beliefs, and behaviors related to cancer prevention. An evaluation of program effects found little, if any, change. Evaluators analyzed results of a survey of thousands of workers from a group of 13 sites where there'd been a special Train-the-Trainer program. This was compared with 10 sites that hadn't had the program. The education program stressed three ideas to worker-trainers:

- Tailor education programs to each work site's specific needs;
- Involve co-workers in program planning and implementation; and
- Develop partnerships of social support among families of co-workers

Looking for Reasons for Lack of Achievement

Why were almost no changes found? Were the ideas behind the program -- tailoring, involvement, and partnerships -- the wrong approach or did other factors influence the outcome? After the training project, evaluators conducted an in-depth study at a plant in which program personnel had believed the program would be most likely to succeed. This study consisted of site visits, observations of program activities, interviews, and examination of a large number of program documents.

In addition, at all training sites, information was collected about program activities and educational events. Program-monitoring data were collected monthly from the sites and included information on program planning, advice or help needed, program activities, problems and barriers encountered, and solutions applied.

Findings From the Studies

Analysis of the program-monitoring data pointed out several unanticipated barriers to effective program implementation. Three factors were identified that could have resulted in the program's lack of achievement:

- During the project, OSHA implemented its Hazard Communication Standard. Most resources (including energy) available for addressing health and safety issues went into putting a HAZCOM program in place.

- The project lifespan paralleled a major decline in the rubber industry. Buyouts, mergers and plant closings were big news. People's attention was directed at concerns about more immediate job issues.

- Few of the desired program activities were conducted, and when they were, participation was low.

Lack of program success may have had more to do with external factors than with the program itself or its design.

Source: Tom McQuiston, University of North Carolina at Chapel Hill

The scope of an evaluation needs to be manageable. An evaluation that attempts to answer all possible questions will probably be too large an undertaking. If resources are tight, questioning may be restricted to only one level or may require concentrating on one level more than the others. Studying a few issues in-depth is nearly always more useful than a superficial review of many issues.

Also think about shared and divergent interests among the program's stakeholders. You might add some evaluation questions to balance stakeholder interests. Or, later you might offer stakeholder representatives an unranked list of questions and ask them to assign rankings. Then, tabulate their rankings and consider including one or more of the questions that scored highest, even if they weren't among your priorities. But before actually selecting questions (as opposed to thinking about them), you need to assess resources.

Step 2: Assess Resources Needed and Available for Evaluation

As you plan an evaluation continually ask yourself how much time, energy, money, and other resources are available to conduct the proposed evaluation, which questions will be worth the effort, and resources required to find an answer.

Resources for developing questionnaires are usually limited, -- be they time, money, or energy. Before you create a new questionnaire or other instrument, think about alternatives such as using or adapting an existing questionnaire or set of questions. If you can't find a set of questions that fits well with the current evaluation's objectives, then consider overhauling an existing one or making a few compromises that enable you to make use of an existing questionnaire. If the degree of compromise would be too great or if it would undercut the main purposes of evaluation, create a new questionnaire.

The Evaluation Resource Planner that follows can help you rough out a picture of the resources you'll need for an evaluation. Think of the evaluation components already discussed in this Resource Guide. Begin thinking ahead: about the meetings to be held and the kind of information that needs to be gathered. Estimate the time and money needed for major activities and associated expenses, such as costs for travel to meetings.

Evaluation Resource Planner

For evaluation activities that seem essential or at least, worth the resources, fill in this Planner with your estimates. As you make more decisions and gain more detailed information, you may update and refine this information or translate it to the budget format of your organization.

Resource	Planning	Data Collection	Analysis	Report Distribution
• TIME OF PERSONNEL Person A				
Person B				
Person C				
Person D				
• BUDGET				
Personnel				
Consultants' Fee(s)				
Equipment				
Phone and Faxes				
Postage				
Copying				
Supplies				
Travel and Per Diem Personnel Consultant(s)				
Other:				
TOTAL				

Developed by: Tobi Lippin, New Perspectives Consulting Group

Step 3: Select an Evaluation Design

Once major evaluation questions are set and availability of resources is clearer, decide on an evaluation design. (Issues related to evaluation design are covered in Section IV of this Resource Guide.) The selected design should be the one that is most compatible with the evaluation questions and available resources -- including the knowledge and abilities of the people conducting the evaluation.

Typically, evaluation designs are:

- Single-group studies that use either a before-and-after or one-time measure

- Comparative studies of two or more groups

- Goals and objectives studies that focus on whether targets have been achieved, or

- Case studies that look at either single or multiple cases -- individuals, groups, or organizations.

Make note of the study design and of the persons, groups, or organizations about whom data will be gathered and analyzed.

The full-page boxes on the next two pages give further guidance on the process of your evaluation design. For additional information on design options, see Section IV, Methods of Evaluation.

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Impact Evaluation: A Process for Priority-Setting

When evaluators are trying to determine which impacts or outcomes are most important for an evaluation, the process below may help people sort through and prioritize outcomes to evaluate:

- <u>Brainstorm -- with members of the evaluation advisory team or others -- possible program impacts to be measured.</u> When listing a possible impact, try to categorize where it might have effects: individual, work group, organization, and, if applicable, community. Also try to anticipate whether the impact will have effects in the short -, intermediate-, or long-term. As the team generates ideas, write each measurable effect on a separate paper and tape it to the wall or write each one on a large sticky -backed note and arrange the notes on a wall or flip chart. Make sure that the writing is large enough for everyone to read. To the extent possible, group the ideas in a grid that shows who'd be affected by each impact and when. Merge impact measures that have a great deal of overlap (that is, rewrite them as one).

    Sample Grid:

IMPACT: Improved -- Testing of Respirators			
When ▸ Who ▾	Short-Term	Intermediate-Term	Long-Term
Individual			
Work Group/Site			
Organization			
Community			

- <u>Focus on long-term impacts first</u>.
    - -- As a group, select one effect that has high priority for evaluation.
    - -- Assess whether it's realistic to expect this k ind of effect to occur and be measured easily within the time that's available.
    - -- Keep in mind all the interests that need to be served. For example, the funding agency may require that certain types of outcomes be reported. Or, a safety committee may have been promised information about a particular impact.
    - -- Select the impact notes that list required and realistic measures of long-term impacts. Move these notes to a second wall -- or another section of the same wall -- or to a second flip chart.
    - -- Stop to think about how to measure each impact. Ask yourselves whether it's realistic to expect each effect to be experienced by enough individuals, groups, sites, or organizations to warrant assessing it. Try to reach consensus on this point.

- <u>Sort out, intermediate effects that lead to long-term effects</u>. Think about the effects that you selected to assess and measure. Look again at the original grouping of impacts. Do any of the impacts not selected express effects that are important in leading to the long-term impacts selected? If so, these notes should be moved to the "keep" area. Settling people's differences about this may take a fair amount of moving notes back and forth in response to intense, perhaps lengthy, discussion. Once decided, this second batch of notes would show intermediate-term effects to include in the evaluation.

- <u>Repeat the step above to distinguish short-term effects that lead to intermediate effects</u>. This step is likely to identify changes that can be examined immediately after the class is completed.

- <u>Draw arrows to illustrate the causal relationships among the effects</u>. Some effects do more than lead to another effect, they cause a later effect(s). Use arrows (taped or pinned to the wall or drawn on a flip chart) to show the existence of causal relationships. Last, draw a diagram that will record which impacts to evaluate, which ones cause other effects, on whom they have effects, and over what time spans.

Any step may be repeated to add more effects and detail. Be sure to factor in the resources that will be needed to evaluate the collection of effects. If the diagram becomes too complex to be useful, consider whether this is a signal to scale back, to evaluate a narrower set of effects. But, recognize that comprehensive programs may call for comprehensive evaluation beyond the typical scale of this diagramming process.

Keep in mind that although very short-term effects tend to be easier to measure, they provide less reliable information about whether longer-term aims have been achieved. Longer-term effects may be harder to measure, and over time it may become difficult to sort out whether measured effects are a result of a training program or other factors. Longer-term effects, though, are more likely to show whether program goals are achieved or nearly achieved, for whatever reasons. It's easy for program evaluation to focus too narrowly on short-term influences such as knowledge and skills, rather than broadening investigation to discover important underlying and contextual causes of injuries and illness -- such as poor work design, lack of health and safety programs, poorly thought out policies and procedures, faulty or improper equipment, or flawed organization of work. Evaluation of impacts should include gathering information about these matters.

Having information about program impacts on different levels (see step 1) can give you a richer understanding of the program and its effects. It can also help you determine what you can and cannot reasonably expect to be affected by your program. It can provide information about which short-term outcomes are most important because they're causes of intermediate effects leading to achievement of desirable long-term outcomes. Coupled with information from formative evaluation, information on these various levels begins to clarify connections between program activities and outcomes.

Source: Tom McQuiston and Tobi Lippin.

Step 4: Select Implementation Study Questions

Having chosen levels of evaluation, assessed resources, and selected study design, you're ready to prioritize and select evaluation study questions. As noted earlier, you may opt to involve other stakeholders in setting priorities for questions to answer. In any case, the instrument that follows is a useful priority-setting tool. If a funding agency already requires that certain questions be studied, you may mark them with asterisks as a reminder. If the instrument will be filled out by others, add a paragraph up front to explain the asterisks, such as "An asterisk (*) indicates that the financial backers of the program require evaluation of an item. Please rank them too."

Step 5: Write Impact Evaluation Questions (formative, summative, or both)

Once you decide on key objectives or other indicators of impact, you're ready to draft specific questions for the evaluation. Questions may be quantitative, qualitative, or a combination of the two. Quantitative questions ask: "how much," "how many," "how often," and their analysis may have numerical summaries; for example, 90 percent of the students chose answer "a." Qualitative questions ask: "how," "what," or "why" something happened. Qualitative methods often uncover more details about specific cases.

Examples:

> <u>Quantitative evaluation question</u>: How many of the grain-mill workers who attended the two-day, confined-space entry education program have attempted to engage the company in a review process of the existing confined space entry program?

> <u>Qualitative evaluation questions</u>: For the local unions that reported confined-space entry incidents or near misses following the program, did the program have an impact on the incidents? If it did, how? If not, why not?

Using established goals and objectives, write specific evaluation questions for each desired impact and note the information-gathering method (for example, interviews, surveys, observations, report tallies) and sources that you'll use.

Impact evaluation findings may have serious consequences for a program. Decisions on whether to increase or decrease a program's funding, or whether to continue it at all, may depend partly on evaluation results. Look at each evaluation question and consider the possible consequences of either positive or negative findings. How would each stakeholder be likely to react to negative findings? It's prudent to consider and weigh the possibilities before the evaluation formally begins, and to gain approval of instruments from the evaluation advisory team.

Step 6: Refine Implementation Evaluation Questions

Following a preliminary selection of impact evaluation questions, the evaluation planning group might choose to rewrite questions or to expand and customize them. For instance, an evaluation group for the cancer-prevention program (discussed in the case study earlier in this section) might ask a question like: In what ways is the program being delivered differently from what was planned? Then the group could have converted that single question into more detailed, more clearly targeted sub-questions such as:

- Who have worker-trainers tried to bring into the planning process for work site education programs? How have they done this? What's worked and what hasn't?

- To what extent have worker-trainers followed the step-by-step planning guide presented at the original train-the-trainers education program? To what extent have they found the planning guide useful? In worker-trainers' views, what are the strengths and weaknesses of the planning guide?

- When work-site education programs were presented, to what extent did worker-trainers use the methods, materials, and curriculum in their program presentation kits?

Continue thinking about the resources necessary to answer these more specific questions. Keep asking whether the scope and focus of the evaluation is reasonable.

Once the evaluation team has agreed on the evaluation questions to be studied, the evaluation planning can begin to focus on methods and sources for data collection.

Step 7: Decide Sources and Methods of Information Collection

Evaluations may draw from many sources and methods. A few of them are noted in this section of the Guide, and will be explained more fully in the section on methods. Program description and any related conclusions and recommendations will be strongest if they're based on information from a variety of sources and methods. Information may be collected from people involved, directly or indirectly, in the program:

- Advisory team/board members

- Company health and safety personnel

- Co-workers of program participants

- Instructors and other program staff

- Program participants

- Shop stewards or other local union leaders

- Supervisors of program participants.

Consider using sources of information already being gathered (such as health and safety reports or supervisory reports that limit the amount of time, energy and money expended.) Identify gaps in information collection that may occur if information gathering is limited to these approaches. Remember the need to include a variety of perspectives in the evaluation. Then, when considering what additional information sources might be chosen to fill gaps and address important perspectives, assess the resources each additional source would use.

Next, decide:

- Which methods of information collection to use

- Possible sources of information

- When, where, and by whom the information will be collected.

If the evaluation will measure outcomes, the ultimate objectives to assess are whether:

- Hazardous conditions have been eliminated or reduced; and

- There are fewer deaths, injuries, and illnesses.

Other positive changes in work place conditions that evaluation may consider include:

- Upgrading of health and safety equipment

- Use of air-monitoring equipment for confined space work

- Development of emergency response plans

- Improvements in chemical labeling

- Availability of Material Safety Data Sheets.

Changes in work practices are also important outcomes. Among these may be:

- Proper use and care of personal protective equipment

- Familiarity with evacuation and emergency response plans

- Hazardous chemicals replaced by safer chemicals.

Step 8: Analyze and Organize Information

Scores, averages, or other statistical measures will be computed from quantitative data sources. Major themes sometimes may be identified in quantitative data, but are more often identified and organized from qualitative data. Drawings, photographs, tables/charts, and graphs may help clarify any findings and conclusions. These are often an effective way to summarize information in the evaluation report. (See later section on presentation of reports.) The report will organize the evaluation's major findings and supporting evidence so that these can be presented orally, in writing, or both.

It is helpful to prepare the tables and graphs first. Begin this approach by compiling all of the summarized data -- program descriptions, data summary sheets from questionnaires and interviews, computer analysis, etc. In the next step, review each question and find the graph or table that best conveys your findings. Once the tables and graphs have been organized and drafted, arrange them in a logical order and write text to support each of them. In some cases, this will be all that is necessary for a brief report to a manager or staff person. This summary can provide the basis for discussions on the progress of a program, an evaluation, or an instructor.

In formative evaluations, to improve a program, evaluators must consider the possible consequences of what is found. What does the information collected in the evaluation mean? For example, if program delivery is different than planned, do the changes alter what the program is likely to accomplish? If so, how? Do the changes strengthen or weaken the program?

If workers enrolling in the program aren't those the program intended to reach, is the program achieving its aims? If not, are there indications of how to achieve the original aims? Perhaps there is a need to market the program with a different course description or to add a profile of "who should take this program"? What were the expectations of the workers who did enroll? If original aims aren't being achieved, are other worthy aims accomplished? Which aims should be priority? Examination of questions like these should lead to discussions among the evaluation team, administrators, instructors, and other staff.

For example, should the program plan be modified to incorporate the new ways instructors have delivered the program, or should program delivery be brought back in line with the original design? Can, and should, the program be viewed and publicized

in a new way so that it attracts the intended workers as well as the others who've expressed interest?

If the assessment indicates that a program worked well where it was properly implemented, but that some sites had trouble implementing the program, say so. Avoid lumping data together (that is, aggregating data) if results show major variations. If highly positive results from several sites were averaged in with very negative results from a few others, and then the average was all that the evaluation report told, the program would appear modestly successful for all sites. And, that's not what happened. Acknowledge problems with program delivery in the field. Examination of this information should lead to discussions among the evaluation team, administrators, instructors, and other staff about the implications for continuation of the current program or for design of future programs. Planners might choose to collect additional information about differences and similarities between the sites where the program went well and where it didn't. Eventually, program planners might, for example, design a future program with much the same content and materials but offer worker-trainers new advice about options for getting information to workers on the shop floor.

An impact (summative) evaluation and a process (formative) evaluation coupled together shed light on changes that may have occurred. This will help evaluators --and those to whom they report findings -- understand how and why changes did or did not occur.

Step Nine: Decide How to Present a Report

Evaluation reports need to be written so they are used. The ultimate success of an evaluation aimed at program improvements depends not only on the evaluators, but also on those who will implement program changes, and/or those that will be affected by them. Thus, an important aim of the evaluation is consensus among these various interests. To serve these various interests reports should be made in three steps:

1. The evaluators create an initial report.
2. The report is shared and discussed with the evaluation team which works towards agreement on modifications to the report.
3. The evaluators finalize the report.

Different stakeholders may have different interests in an evaluation report. Reports for formative evaluation range from oral presentations followed by a brief written report of conclusions, to more detailed written reports that include both conclusions and supporting documentation. The report for a process evaluation may need to be written to correspond with an evaluation report on program effects. Additionally, the report may need to be included as part of an accounting process for the funding agency. The format for the report, and the stakeholders for whom it is being prepared, will influence the types and sources of data, how the data is to be collected, and how it is to be reported.

Think about:

- Who will use the reports

- How the reports will be used

- When they are needed, and

- What format will work best.

An oral report is most often presented to instructors and staff to brainstorm on potential program changes. Written reports are usually reported to the program director as documentation of program implementation to be included in an annual report to a grant agency.

Regardless of presentation method, consider your timing. Timing of the delivery of an evaluation report is important. If the report is too early, the application or use of the information will be delayed, allowing for the possibility that the data will become obsolete. If findings are given too close to the time that changes are scheduled to take place in the program, too little time may be available to make a successful transition. If a deliverable date has been established, make sure that clear and complete results are available on schedule. The loss of credibility could carry over into the presentation. If reports or data are delivered too late, decisions may have already been made without evaluation results to support or refute them.

Reports should be readable, interesting, and should be presented in a positive manner. Report presentation should not be an afterthought, but should be part of the overall evaluation plan. Evaluation findings can be presented in many ways. How they are presented depends on the audience, the message, the reason for the evaluation, and the results.

To influence the audience, think about the motivation for the report, and choose a reporting style that takes this viewpoint into consideration. Be sure that the report stays relevant to the audience at all times. Consider the following questions:

- Who are the users? Are they your supervisor? The training staff? Training participants? Employers? A government or private funding agency?

- What information does the user want to know and why does the user need to know this?

- Do the findings tell the users what they are looking for?

The Written Report

You may prepare more than one type of written report. A formal report with lots of words and tables may not be the best format for all users. Also consider developing information briefs, an abstract of the evaluation report, or a press release. Whether or not you choose a formal or informal style of communication, a number of suggestions can help you improve the impact of your message.

<u>Put the Most Important Information First</u>. When reviewing reports, readers look for the most important information first. Use that information as a framework to develop the smaller or supporting information. Professional writing should meet five requirements:

- Specify the subject matter in the opening paragraph or section

- Succinctly state the principle message that will be emphasized

- Tell the reader the reason that the document has been written

- If the report is long or complex, outline the organizational scheme that will be followed

- Summarize the main ideas, conclusions, or recommendations of the report in a cover letter or executive summary.

Assume that the reader has limited time to get through the report. The goal is to present as much as possible in the least amount of space. Consequently the executive summary is critical.

<u>Organizing Your Evaluation Report</u>. To organize the evaluation report, keep in mind the intent behind gathering the information. Determine whether or not to use a formal evaluation report. If a traditional report is not necessary, the following format can be used as an outline or guide:

- Provide a front cover. The cover represents the whole report, so be sure it is attractive and accurate. It should include:

    * The title and location of the program
    * The name of the evaluator(s)
    * The period covered by the report
    * The date the report is delivered.

- Write an executive summary to explain the reason the evaluation was conducted, the conclusions, and the recommendations.

- Include background information describing how the evaluation was initiated and what the intention was.

- Describe the evaluation study, including why it was conducted, and the methodology.

- Give the evaluation results, presenting the measurements, observations, and methods used to collect the data.

- Discuss and interpret the results.

- For the last section, present the conclusions, recommendations, and options. It may be useful to list these elements instead of delivering this information as text. Emphasize what is important and clarify which recommendations are optional and which are strongly suggested.

Communicate the Credibility of the Report. Those receiving an evaluation report may not trust the results of the evaluation and, therefore, disregard the information. Address issues involving credibility.

If data are collected in ways which the user believes are valid, reliable, and objective, then the evaluation is more likely to be perceived as valid. Analysis taken from a number of sources adds to the soundness. Details of qualitative studies, direct observations, and interviews show understanding of program experience and an understanding of stakeholder interests. Consider referring to the findings of other studies or respected individuals to support statements. Using technically accurate information improves reliability, but the evaluator's style of interaction and reporting can be nearly as important. Conveying the methodology in easily understood terms also improves credibility. The more straightforward and completely the findings are communicated, the better. Give strong and weak program elements equal treatment.

Be Clear. Clarify all information, as the user may not be familiar with the report material. Do not force the user to try and tie findings and recommendations to their interests or to decisions that must be made. It will most likely not get done. If the evaluation was conducted to get information for a decision or problem, tie the findings directly to that decision or problem.

One approach is to list each decision question, followed by the summaries of the evaluation findings. Consider including your answer or recommendation for the question. This technique gives the user a quick summary.

Another technique is to state implications in a "cause-and-effect" or "if, then" terms. State simply and directly what the findings mean, what actions should

follow, what decisions should be made, or what will be the likely result of these actions. Recommendations usually give only one course of action, but it may be useful to list alternative recommendations. In that case, a summary of data should be given to relate all relevant information, and explain the consequences of each option.

Address the Audience. Think about who your audience is and put yourself in that audiences' position (philosophically). Deliver evaluation findings on a level that will be understood and accepted.

Give the audience only the vital information so that they can absorb the data they need. If you give them too much information, they may not be able to absorb it all. This rule is easily violated when presenting results to authority figures because most of us were taught to disclose everything in such cases. There is also the tendency to want to show the audience the complexity of the evaluation plan or the evaluation process; however, by doing this, you run the risk of either boring the audience or making the findings too confusing.

Highlight the Important Points. Help the reader determine what points are the most important. Aside from putting that information first, other options exist:

- Use descriptive section headings; use the titles to develop interest and motivate the reader on to the conclusion

- Write the first draft report using as many headings as possible, then read it over and double the number

- Use the headings as a running commentary that parallels the report text

- Use the spacing and layout of the report to highlight information and improve readability. Try an outline format with more dots or white space, boxes, typestyle changes, bullets, underlining, or capital letters.

Improve Report Readability. It is important to make the report easy to read without sacrificing accuracy. Some suggestions for improving readability are:

- Before writing, imagine that the user is someone who is unfamiliar with the program being evaluated. Think about this person as you are writing.

- Consider dictating a draft report into a tape recorder. Imagine that you are speaking with your imaginary person to explain the basic aspects of the evaluation program.

- Once you have organized the draft report, review its vocabulary to make sure that you have used simple and familiar terminology. Do not assume that everyone can understand technical and industry jargon. If you must use a technical term, define it with a footnote, a parenthesis, or as part of the glossary.

- Use active verbs as much as possible. This style shortens sentences and increases the impact of the statements.

- Eliminate unnecessary words and phrases. When editing the report, look for extra words and long run-on phrases that can be removed. Sometimes it is better to have someone else edit the paper. If planning to edit your own work, allow a day or two to pass between the time you write and edit.

- Write short paragraphs. It is discouraging for the reader to see a wall of text. When editing, try to break down these walls into shorter paragraphs. Some ideas will require a longer discussion, but any time it is possible, confine an idea to a shorter space; this increases the reader's understanding and reduces their effort. A one sentence paragraph may be very effective in some circumstances.

- Personalize the text. Attempt to make the report sound less like a technical document and more like a letter to a friend. Make sure, however, that this tone is appropriate to the audience. Some audiences will respond to a casual approach better than others.

Other ways are available to personalize your materials:

- **Consider using first person pronouns** . Recently, the use of "I" and "we" have become more appropriate and a part of the fashion when referring to yourself and the audience. Using "he" and "they" may sound stiff and awkward.

- **Consider using contractions** . In written text, contractions make the text more natural. Their use in formal written materials, including industry and business annual reports, is becoming more acceptable.

- **Consider using casual working language** . Say exactly what you mean by using more casual, but expressive terms. These phrases can be quite effective if used sparingly. (Example: "pulling the rug out from under us") The audience will know exactly what you mean if they don't mind the informality.

<u>**Create An Attractive Report**</u>.   The evaluation report doesn't have to be dull sounding or dull looking.   If the budget allows, consider involving a graphics specialist. At the very least, consider the paper and color that best fits the mood of the message and the audience and then suggest designs for the report's cover.

<u>**Apply Collected Data**</u>.   Data can be collected from many resources including: interviews, questionnaires, ratings, financial records, and statistics. Use as many resources as are necessary for your goal. Including direct quotes from participants in reports can make the findings come alive and convey the depth of your findings. To tabulate and report the data, use the following two methods:

1.   Examine responses separately.   Each group's responses to each question may be important enough to be discussed and displayed individually, especially if the questions relate to opinions or practices of an instructor or a program, for example: "Does the program need to be modified?" or "What did you like least about the class?"

2.   Add responses together to create an index of the degree to which an attitude or trait exists. This is very useful for cases with attitude rating scales, for example, attitude toward a program, instructor, or course.   The result of an index or attitude rating scale is one number which can be displayed using a table or graph.

Oral Presentations

If presenting evaluation results to those who are being evaluated, set an atmosphere for a positive learning environment. To develop a good atmosphere, allow the exchange of information, be open to new ideas, and encourage goal setting. In order for your audience to hear your feedback and effectively apply the evaluation results, they need to feel that they are in a non-threatening atmosphere. The receiver should be comfortable enough not to be defensive and positive enough to use the information wisely. If individuals are comfortable learning new behaviors and skills, and if performance improvement is supported, others are encouraged to participate and exchange ideas.   The excitement of learning and making positive changes can motivate others. If presenting information to a larger audience, a graphics artist can assist in designing posters, brochures, and leaflets that broadcast an easily understood message.

<u>**Add Interest to the Presentation**</u>. Make the oral presentation varied enough to keep the audience entertained. Audiences will appreciate your attempts to liven up the presentation. Below are some of the techniques that are available to add interest to oral presentations:

- Do something different. Vary the presentation from the lecture approach that audiences are used to. The audience may appreciate a couple of slides or transparencies. Some of the many examples of useful formats are:

    * Audiovisual shows with commentary
    * Skits
    * Symposia or panel discussions
    * Question and answer sessions.

- Vary the format and visuals. To make a fifteen minute presentation more interesting than a straight lecture, consider audience participation and visuals (see section on visuals below). Another idea is the use multiple presenters. Also, you may want to use movement to shift the focus of the presentation to different parts of the room.

__Act Naturally__. It is important to present an evaluation report smoothly and confidently. Some nervousness doesn't matter, but too much will shift the focus away from the message onto you. Use a style that is natural and have the necessary props; for example, an outline, overhead projector, or cue cards. Consider inviting someone that you know to be in the audience. Practice will always improve a presentation. You may want to get a friend or co-worker to critique your delivery. Complicated audiovisual presentations may take more than one practice run. Pay attention to the arrangement of equipment in the room. To prepare for a question and answer period, think about answers to the most difficult questions. You may want to have someone ask you questions and then critique your answers. Keep rehearsing until you feel comfortable because too little practice may increase anxious feelings.

__Allow Audience Participation__. If presenting the findings alone or in an informal setting, allow or prompt the audience to participate in the presentation (by acting or responding). A basic teaching principle involves learner involvement. The level of participation can be as small as laughing at a joke or as large as acting out role playing. A number of involvement techniques exist for your audience:

- Ask for a show of hands to answer a question.

- Ask for a prediction of results before presenting them.

- Ask for help in interpreting results.

- Prepare an activity that the group can participate in; i.e., allow for audience questions or arrange for group discussions.

- Organize an audience debate. Divide the groups into advocacy, adversary, and neutral groups to review the report and discuss certain perspectives of the data and the results.

- Ask the audience to be active in recording data from the presentation; i.e., have the audience take notes on the presentation instead of delivering handouts, or have them fill in the blanks on handouts that have been prepared. This will allow the audience to focus on the information that you think is important.

- Ask someone from the audience to assist you with the equipment.

Visuals

Any visuals that are used should be big enough for the audience to see. As you are designing a visual, find out how far the farthest audience member will be, and create the visual to be seen at that distance. Charts full of numbers can be used in a small group of people, but do not work well for a large group. Transparencies for the overhead projector should use large fonts.

Some visuals that support oral presentations contain a lot of information. You can use transparencies, slides, or handouts, but make sure that you give the audience sufficient time to review all the data presented. Giving the audience a moment to look over the material before speaking will keep the audience from being distracted. Handout materials that can be kept for further reference may be useful. If this is the case, pass out the information as the audience is on the way out. This way no one will be reading during your presentation.

A number of visual images can be used as part of your overall collection strategy. You may give yourself an advantage in some evaluation situations by using photographs, videotapes, and film that will illustrate the findings which are drawn from the more traditional methods. They may also help you to demonstrate the implementation of program elements or outcomes. Visual images must be valid, reliable, accurate, and interpreted in common terms.

Tables and graphs provide a basic visual form for the presentation of evaluation findings if they are properly designed and depicted. In addition to their inclusion in written reports, tables and graphs can be displayed through posters, brochures, overhead transparencies, and slide or tape presentations.

All tables and graphs should be self explanatory. Keep in mind while you are designing any tabular and graphic data displays that many viewers won't read the surrounding text, but will look at the displays. Therefore, all displays require a complete title, full labeling, a key to symbols, and footnotes with commentary.

Because some people cannot read graphs well, you will still need reliable text. The text should describe and discuss the key results which are presented in the visuals.

<u>Tables</u>. A table is a good way to give the audience an overview of the activities that have been completed or implemented; for example, tests given, observations made, reports delivered. This kind of display summarizes data collection and reporting plans according to each objective.

<u>Graphs</u>. Utilize graphs for pictorial display. Graphs can make the data clear while drawing attention to the important points. They also help the audience explore the information, and analyze apparent trends. Most people, as they review a report, pause the longest to examine graphs.

Bar graphs are a common way to display information in evaluation and research reports. They are easy to understand and very useful for either presenting data to show achievement or for displaying results from two groups. If the graph is designed to depict each bar as one objective, a quick glance can easily view the strengths and weaknesses. When displaying pre- or post- results, use a shadow bar behind each object bar to emphasize the comparison. For a different style, leave out the space or the vertical lines between the bars.

<u>Other Methods of Pictorial Display</u>. Time lines may be useful in showing program implementation if phases or segments of the program can be confined to time periods. Consider using a line graph if the horizontal axis of a bar graph shows a sequence, such as time or scores. This is especially useful for showing the results of a number of elements across time. Trend lines can be shown in the same graph.

<u>Finalizing Graphics</u>. As you are completing the evaluation graphics, review the following questions:

- Do the titles describe the figures?

- Are the graph axes labeled clearly with a name?

- Are the interval sizes marked on all the graph axes?

- Are summary statistics marked on tables and graphs?

- Are all the graphics labeled and numbered?

- Is there a table to back up every graph?

- Is the report long enough to need an index of the graphics in the Table of Contents?

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SECTION III
SPECIAL CHALLENGES TO AN EVALUATION TEAM

Evaluation of worker training programs requires special sensitivities. Because a major goal of worker safety and health training is safer and more healthful work places, evaluation of classroom learning is only the beginning of an effective evaluation program. Outcome evaluation may be the key to knowing what actually happened after the training class was completed. In what ways was the training influential in improving worker behavior, in challenging employees and their employers to make changes in work processes and procedures, in helping to make available information necessary for safety improvements, or in promoting an effective emergency plan for evacuation and hazard control?

Worker training is not successful if it only imparts knowledge. To be effective, it must promote increased safety and health at work. Documenting these post-training activities is a major challenge in evaluating a worker training program. Ultimately, one seeks out examples of lives saved or injuries and illnesses prevented. But better use of

personal protective equipment, activation of a safety and health committee, quick response to a spill, installation of handwashing facilities, or knowing the telephone number to call in an emergency are also important outcomes to be measured in an evaluation. Without a wide range of work place improvements health and safety would be harder to achieve.

TRAINING IS ONLY ONE PART OF A WORK PLACE SAFETY AND HEALTH PROGRAM

Evaluation of worker training must recognize the limited, though critical, role of training in an overall work place safety and health program. Training programs alone cannot make a work place safe. Training may change worker behavior or attitudes, but these changes are only part of the picture. To control hazards, altering work processes, or re-structuring a job to make it safer, may require actions beyond those made by an individual worker or work group. It is the employer that is ultimately responsible for the safety of a workplace. Investment in plant and equipment, use of safety and health professionals, and development of a health and safety program are just a few of the other elements critical for a safe and healthful work place.

KEY ELEMENTS TO LOOK FOR IN WORKER TRAINING PROGRAMS

A major goal of worker training programs is to provide the knowledge, skills, and attitudes (such as confidence) that workers need for successful job performance. To achieve this goal, worker training should be action-based, with trainees applying what they learn to real or simulated work place conditions. Another goal is to encourage workers in on-going, active involvement in health and safety.

Evaluation of worker training programs should take into account the full range of stakeholders -- workers, trainers, training administrators, employers, funding sources -- whoever has an interest in potential outcomes of a training intervention. Positive change is not simply reflected in workers' changed attitudes. It may also result from knowledge that a trained worker conveys to management or to a safety and health committee, which ensures safer practices or equipment.

Some training outcomes can be seen and measured within the time designated for training. For instance, a trainee may demonstrate how to monitor the air in a confined space or may describe and demonstrate how to avoid exposure to a lethal chemical. Other outcomes occur over time and may be difficult or impossible to quantify, although anecdotal data may be observed. If, for example, a trained person gains knowledge of hazardous materials and communicates this to a labor-management team that substitutes less hazardous materials where possible, that clearly reduces people's risk of exposure to harmful chemicals. So, it's easy to see that risk was reduced, but not easy to say by how much. Both kinds of training outcomes can save lives, and good evaluation will measure the impacts of both.

Successful health and safety training builds workers' competency to do their jobs more safely. At its best, training will:

- Equip workers with the knowledge and skills necessary to do their part in making their jobs safe, and the confidence to work toward doing so

- Teach ways to work toward bringing a job site into compliance with existing safety and health regulations

- Offer hands-on experience and site-specific instructional material that is clearly presented, possibly by peer-trainers

- Enable workers to make decisions in an emergency that will protect their own lives and health, and the lives of their coworkers and community, and
- Encourage workers to stay involved in resolving safety and health problems at their work sites.

Training effectiveness may be influenced by, or even depend on:

- The inclusion and "buy-in" of managers to training plans and activities

- Sensitivity to the language base and literacy levels of learners

- The multiplicity of job sites and job skills represented by the learners in a training class

- Trainees' motivation and expectations about the training, and

- Other factors related to the organizational culture, training population, and learning and working environments.

Training designs of particular benefit to workers consider: site-specific training, hands-on training, problems related to written testing, training for people who may have limited literacy or for whom English is a second language, and peer training. Below are descriptions of these approaches and how some NIEHS programs have used them.

Site-Specific Training

Worker training programs are usually best when they are site-specific. The programs supported by the NIEHS Worker Education and Training Program are unique in several ways, including the way course content is tailored to make it site-specific. For example, the International Association of Fire Fighters (IAFF) designs all training materials used at a given site to the hazards in the identified response areas of that site and to the particular needs of the department in which training is being conducted. Departments tell IAFF instructors or staff about specific hazards at the target site and provide examples of actual responses so these can be used as case studies throughout training courses.

Hands-On Training

Hands-on and participatory training methods are crucial. NIEHS-supported worker training mandates both classroom learning and hands-on training with personal protective equipment used in simulated emergency response and in task-specific, mock-site clean-ups of hazardous and radiologic waste. Studies find that these training methods lead to higher retention of learning, higher competence and skills, increased solidarity and group action to solve problems, and increased future activism to reduce work place injury and illness. Evaluation of actual safety and health training programs has validated study findings.

Here's how a participant in a Service Employees International Union training course explained the value of hands-on training:

> The part I liked best about the training, this training, in comparison to others is we had more hands-on work. You just don't sit at a table all day long and have the guy up front either read to you from a book or show you pictures and show you slides, then when you leave you're done. You don't get the same feeling as if you put the thing on, you go down in the hole, try to adjust the monitors, you know, do hands-on work. It's much more effective, I think, in getting the point across.

Problems Related to Written Testing

Most people's learning is assessed through written tests given at the end of a class. Many believe that passing a written test is the only way to be certain that workers have learned how to protect themselves on the job. Many also believe that a written test is needed to certify that a participant is competent. Some people believe that when trainees know there will be a written test, it motivates them to pay attention. Others argue that developing alternatives -- such as performance-based testing -- takes more training staff and preparation time. Sometimes the decision to use written testing isn't up to a trainer or evaluator. Funders or employers may require documentation that each person in a class has passed a written test.

Written testing can be extremely stressful for someone who's nervous about testing in general; it can be a disaster for someone who has trouble reading. Your evaluator may be compelled to use written testing and written testing may be an appropriate choice. But, recognize inherent limitations and problems with written testing:

- Written tests measure the ability to recall information but not necessarily the ability to apply it.

- Trainees may do poorly on a written test because they simply don't take written tests well. They may feel rushed, intimidated, or nervous.

- Trainees aren't usually allowed to work together during a test, although hazardous materials work is often done by partners or teams.

To avoid or diminish problems, workers have suggested that when testing is required:

- Instructors could read test questions aloud

- Assessments could be conducted in groups

- Participants could be allowed to choose whether they'll be tested in writing, visually, or orally

- Instructors could tell trainees at the beginning of training what kind of assessment to expect

- Tests could be visual, using slides or a video to present a problem and then participants would be asked questions about how to solve it.

<u>Written Tests</u>. If a written test is being used as a predictor of successful behavior, the test developers, the test sponsors, and the test users are assuming that the capacities measured by the test (whatever they may be) are similar to the capacities required by the behaviors being predicted.

It seems obvious that the more one knows about the principles of occupational safety and health, the more safely one ought to be inclined to work. But, if test users want to make decisions about who or who not to hire on the basis of a test that measures the extent of a person's safety knowledge, then they should be able to demonstrate that greater knowledge is in fact related to safer work.

For occupational safety and health and hazardous waste operations training, validity (see section ahead) is probably more important than any other information that could be collected. Among other issues that need to be addressed is whether it is more important to avoid "false positives" (selecting someone for a task who will ultimately fail at it) or "false negatives" (not selecting someone who would have succeeded). Unfortunately, unless a test is a perfect predictor -- and no test yet devised is -- it is impossible to avoid both of these pitfalls at the same time.

According to an evaluation for the Oil, Chemical and Atomic Workers (OCAW), predictions about training success were wrong 60 percent of the time, and predictions about job performance were wrong between 70 and 80 percent of the time. Some training programs do not use written tests as an evaluation tool because of their limited validity. In the view of OCAW evaluators, there are three principal problems with tests:

1. They distort a training program's objectives, directing attention away from the prevention of injuries and the elimination of hazards in the work place and toward the classroom.

2. They contribute to the illusion that the principle cause of work place injuries is worker rather than systemic failure.

3. They unfairly stigmatize those who perform well on the job but test poorly.

In addition, some tests may put ethnic minorities, females, or older persons at a disadvantage, compared to whites, males, and younger persons. Sensitivity to these issues in designing an evaluation is important.

Alternatives to Written Testing. Alternatives to written testing include having participants:

- Work in teams to answer a set of questions

- Play games to review course content

- Answer an anonymous opinion survey

- Respond to visuals used as testing tools

- Respond to illustrated multiple-choice questions

- Respond to oral checklists

- Demonstrate, individually or in groups, learning through a hands-on activity.

Written testing may actually create job fear and a sense of isolation and competition rather than a sense of work place solidarity and cooperation. In addition, some argue that teaching people to pass a written test may be easier and cheaper than focusing on comprehensive education that can be applied at work.

The University of Alabama at Birmingham uses the methods on the following page as alternatives to written testing.

Method 1: <u>Skills Performance Checklists</u>

A skills performance checklist is used to ensure that all steps in a process, for example using a self-contained breathing apparatus (SCBA), are completed in the correct order. It lists all the procedures involved in the use of SCBA including inspection, donning, doffing, and air cylinder change. The same form can also help trainees to learn those procedures. Rather than argue, as some people do, about whether checklists are a training tool or a device for measuring the outcomes of training, try them -- and you'll find that they can be both.

Method 2: <u>Pictorial/Written Examination</u>

In conjunction with other changes in their site worker course, UAB/CLEAR eliminated its written final exam. Their reasons for eliminating the written exam were:

- Written exams discriminate against trainees who don't read and write well;
- Written exams don't incorporate well into the teaching/ learning process. At best, they serve strictly as a tool for measuring the outcomes of the process;
- Written exams give trainees the feeling of being tested for errors or failures. This can provoke *test anxiety* that may lower performance and render invalid exam results; and

UAB replaced its written exam with a pictorial/written exam (see Appendix), which offers these advantages:

- You can use it effectively with trainees of all literacy levels. If need be, you can make transparencies and give the exam using an overhead projector.
- You can present the exam as a class exercise or activity, rather than a test.
- You can review the entire exam with transparencies after trainees complete it, thus clearing up points of confusion and helping ensure that learning objectives have been achieved.
- The exam review is a part of the teaching/learning process. It serves as a springboard for valuable discussion.
- The examination process is relatively pleasant --sometimes even fun-- for trainees in comparison to a written test.

Method 3: <u>Final Field Exercise</u>

The class responds to a simulated hazardous waste site emergency on the training field. Before going into the field, all trainees are actively involved in assessing hazards and planning for the response. This requires decision-making and use of skills from the entire course and allows trainers to monitor trainee performance and provide assistance as needed. After the field exercise, the entire class reviews a videotape of the process, which is the basis for an analysis of techniques used.

UAB has found these methods appropriate for measuring the immediate outcomes of training. They place the trainee, rather than a written test, at the center of the measurement process. Interactive, trainee-centered methods also allow for the identification of unachieved training objectives while a course is still under way -- and can also thereby allow for immediate adaptation to achieve those objectives. These methods can, therefore, be considered a part of the teaching/learning process as well as the measurement process.

A primary purpose of safety and health training programs is to reduce, if not eliminate, the number of work-related injuries and illnesses. In this way of thinking, a low rate of OSHA-recordable injuries is a sign of a safe work place, and one important measure of a training program's impact is evidence that it has contributed to lowering this rate.

Having zero worker injuries is a worthy goal. But creating a safe work place requires more than simply reducing the number of injuries. For example, the OCAW reports that the great majority of potentially catastrophic chemical releases and fires do not result in OSHA-recordable injuries. Keeping track of only the OSHA-recordable rate then gives one a distorted and understated view of the hazards workers face on the job. For a truer picture of the impact of safety and health training programs on the work environment as a whole, one should keep track of a number of other safety measures, including:

- Back-logged work orders

- Contractor injuries

- Fires and explosions

- Hazardous chemical releases

- "Near misses"

- Safety complaints and/or suggestions

- Slips, trips, and falls

- Spills.

Keeping track of these other dimensions of the work environment provides the data necessary for a more accurate assessment of the impact of a training program on the goal of ensuring, in the words of the general duty clause of the Occupational Safety and Health Act, that every work place is "free from all recognized hazards."

How to Ensure the Believability of Your Results

Test developers need to determine the relative weight of the test's different components; for example, to identify aspects of job performance that are critical to preventing accidents. Even when a test requires behaviors or actions identical to those that test users want to predict -- such as the donning and doffing of personal

protective equipment -- it is still necessary to establish how well test performance predicts behavior outside the testing situation.

After you've worked hard and spent time and money to complete an evaluation, you certainly want people to use it and believe it. Actually, there are three basic concepts in evaluation that need attention: verifiability, reliability, and validity.

<u>Verifiability</u>. You, and any reviewer, should be able to verify the results of your evaluation. This simply means that if another evaluator were to use your same methodology that similar results would be achieved. If you develop a careful step-by-step approach to your evaluation process, then another evaluator should be able to repeat the process step by step and verify your findings.

<u>Reliability</u>. If an evaluation is reliable, answers to questions will be accurate in measuring what they are supposed to measure. For example: if the answers to questions change depending on who asked them, how they were asked, or how tired students were when they responded, the series of questions would not be considered reliable.

<u>Validity</u>. If an evaluation is valid, questions will measure what they are intended to measure. For example: if a questionnaire was used to find out how useful a class was for students, but instead was measuring how much students supported the organization that was sponsoring the program or how much they liked the instructor, the measure would not be considered valid.

Peer Training

Many workers learn best from other workers. Peer training often utilizes an active learning approach, based on the assumption that adults learn best this way. Peer training also increases the number of workers reached through training, since each peer trainer can in turn hold many training classes. In addition, by creating a program in which worker teaches worker, the likelihood increases that safety and health training can be sustained if outside funding is no longer available.

Peer training offers a learning atmosphere that is less threatening than a traditional classroom, because trainees feel nearly equal to trainers. This puts trainees at ease, and when learners feel more at ease they're likely to participate more fully in the learning process. Peer training programs build on the work experience and knowledge that the participants and trainers share. The effectiveness of training delivery is strengthened by worker-trainers who have specific work place knowledge and experience. Although an outside instructor can discuss general rules, principles, and approaches, a peer trainer can discuss their application to a trainee's work place. And significant value is added by a peer trainer's continuing availability at the work site where he or she serves as a resource for co-workers.

Evaluations of peer training repeatedly show that it builds trainees' confidence. Some indicate that peer training is an effective way to help workers feel more empowered to help themselves and to engage in labor-management efforts to improve the work place. Peer-training programs can play an important role in building partnerships between labor and management. When both union and management support health and safety training, it encourages workers to act to protect health and safety -- their own, as well as that of co-workers and community members.

The ability of peer-training programs to reach and train large segments of workers was demonstrated in the 1970's by the Occupational Safety and Health Administration's (OSHA) New Directions training program. Under that program, OSHA provided funds to unions, public interest groups, institutions of higher learning, and employer associations to develop their institutional capability to conduct training and related job safety and health services. New Directions built on existing efforts by the United Auto Workers, the United Steel Workers of America, and the building and construction trades unions to provide job safety and health services, including peer training. NIEHS's training experience in the 1980's and 1990's has reconfirmed the value of peer training.

Many NIEHS awardees use peer training, among them: the George Meany Center for Labor Studies' Railway Workers' Hazardous Materials Training Program; International Association of Fire Fighters; International Chemical Workers Union; Laborers/AGC; Midwest Consortium; Oil, Chemical, and Atomic Workers International Union (OCAW); Service Employees International Union; United Auto Workers (UAW); and United Brotherhood of Carpenters.

Union participation drove the establishment of the three peer-training programs profiled below, and their establishment was aided by government support. Hazardous materials training of the OCAW, the UAW, and the Rail Program are just three examples of peer training, with programs designed and developed to use sound adult education techniques and capitalize on worker-trainers' education skills to deliver effective safety and health training to a maximum number of workers. The OCAW and UAW programs began about 20 years ago; the Railway Workers' Hazardous Materials Training Program began in 1994.

OCAW Worker-to-Worker Training Program

Union members created OCAW's Worker-to-Worker Training Program. In the belief that workers learn best from other workers, OCAW trains rank-and-file workers, called Occupational Safety and Health Education Coordinators (OSHECs), to deliver safety and health training to co-workers. OSHECs attend train-the-trainer programs and technical workshops, then provide training in initial and follow-up hazard recognition and emergency response classes.

OSHECs guide participants through a non-lecture approach, referred to as the Small-Group Activity Method (see box on next page), that promotes trainee participation and involvement. This learning methodology enables trainees to share information and build on their skills and experience by identifying and solving problems.

The Small Group Activity Method (SGAM)

Basic Structure
The Small Group Activity Method is based on activities. An activity can take from 30 minutes to an hour. Each activity has a common basic structure:

> Small Group Tasks
> Report-Back
> Summary

1. Small Group Tasks: The workshop always operates with people working in groups at tables. (Round tables are preferable.) Each activity has a task, or set of tasks, for the groups to work on. The idea is to work together, not to compete. Very often there is no one right answer. The tasks require that the groups use their experience to tackle problems, and make judgements on key issues. Part of the task often includes looking at factsheets and reading short handouts.

2. Report-Back: For each task, the group selects a scribe whose job it is to take notes on the small group discussion and report back to the workshop as a whole. During the report-back, the scribe informs the entire workshop on how his or her group tackled the particular problem. The trainer records these reports on large pads of paper in front of the workshop so that all can refer to it. After the scribe's report, the workshop is thrown open to general discussion about the problem at hand.

3. Summary: Before the discussion drifts too far and wide, the trainer needs to bring it all together during the summary. Here, the trainer highlights the key points, and brings up any problems and points that may have been overlooked in the report-back. Good summaries tend to be short and to the point.

Source: Oil, Chemical & Atomic Workers Union

Individual students and groups rate OCAW Worker-to-Worker Training Program activities using Activity Evaluation Forms. Follow-up telephone interviews are conducted and an impact questionnaire is sent to each participant six months after training. Both the interviews and survey gather specific data about the effects training had on the "culture of safety" at work. Overall, participant evaluations of the program, instructors, and materials have been positive. Results of the impact evaluations indicate that participants became more effective health and safety advocates and contributed directly to work place change.

At a refresher course six months after the initial training, and after having presented at least one training course, OSHECs discuss strengths and weaknesses of program design and materials. Interviews about their training experiences reveal that OSHECs view the Worker-to-Worker Training Program as highly successful and very important to union members.

UAW Hazardous Materials Training Program

The worker-trainers at UAW's Hazardous Materials Training Program are called Local Union Discussion Leaders (LUDLs). After they conduct work place inspections to identify specific training needs, these union-appointed peer trainers arrange and deliver health and safety training programs within their own work places or regions.

LUDLs attend train-the-trainer programs to reinforce their knowledge of health and safety technical information and to develop their skills in using adult-education techniques. They practice training delivery and receive feedback from UAW and University of Michigan Labor Studies Center instructional staff who assess both their delivery methods and their technical knowledge. Group development and networking grows from the train-the-trainer sessions. These are the foundation of an informal LUDL support system.

The University of Michigan Evaluation Group evaluates the effectiveness of the LUDL program. Evaluation data show consistently high ratings of overall program content and LUDLs' confidence in their ability to deliver health and safety training programs.

Action Planning exercises familiarize LUDLs with a process for planning an action agenda and identifying barriers to training. (See excerpt of the form that follows; see Appendix for full instrument.) The Action Plan is primarily a tool for assessing LUDL success in meeting short-term goals and devising solutions to problems. The first question asks LUDLs to list a goal that they would like to accomplish immediately. In the second question, LUDLs need to choose specific (realistic) actions they can take over the next three months to accomplish the listed goal. Using any action listed in response to the second question, the specific steps needed to successfully carry out the action are planned using the tool on the following page.

Follow-up data show that LUDLs promote improvement of health and safety in the work place and have a presence that strengthens health and safety activism within their union.

Trainees complete written evaluations of the overall training program, as well as the instruction and materials, at the conclusion of LUDL training.

LUDL ACTION PLAN

Identify and list one action below and briefly respond to the following questions. Keep track of target dates in the spaces provided.

ACTION: _____

Target Dates

How will you get started? What are the first steps?

Do you need help? How can you get help? Who can help?

What other resources do you need?

What do you need to pull everything together?

How will you stay active, continue on, in the face of the problems or obstacles which you might encounter?

Source: University of Michigan for United Auto Workers

George Meany Center Railway Workers' Peer Training Program

The Railway Workers' Peer Training Program, sponsored by the George Meany Center for Labor Studies, draws on a partnership -- the Meany Center, the Transport Workers Union (TWU), the Transportation Communications International Union, Brotherhood Railway Carmen Division (TCU), and Conrail. It's the first joint labor-management initiative to provide delivery of hazardous materials training in the rail industry.

At the outset, labor and management representatives selected 34 workers from 19 locations on the Conrail system to create a Hazardous Materials Skill-Specialty Team. Team members received their initial instructor training at the Meany Center. Their practice sessions were reviewed to ensure that they had developed skills adequate for effective training delivery. Team members now return to the Center each year for sessions to refresh and advance their technical and teaching skills. Throughout the year, the peer trainer team is updated about regulatory developments and the availability of new resource materials.

Evaluation of the peer training program includes pre- and post-test questionnaires, follow-up questionnaires, and follow-up telephone interviews. Results show that peer trainers' efforts have made improvements in actual work place programs and procedures. Anecdotal evidence also indicates improvements in awareness, attitude, and knowledge among peer trainers. Peer trainers specifically reported that because of the training they were able to play a positive role in limiting or preventing hazardous materials incidents. For example:

> After becoming a peer trainer, one rail worker, while at work, smelled something unusual from a car with a leaky dome lid in the yard. Because of training, he knew to report the leak to the local fire department. As a result, the yard was evacuated. The material leaking was anhydrous ammonia. The trainee said that if no one at the yard had had training, the situation could have been very grave, potentially resulting in lost work days, injuries, or even fatal exposures.

The peer trainers feel peer training is particularly effective because trainees have more respect for peer instruction and, therefore, are more likely to learn and retain what is taught. Besides sharing skills and knowledge through formal training, the peer trainers also share information with co-workers through informal work site exchanges.

Training for Those with Limited Literacy or English as a Second Language

As many as 90 million adults in the U.S. have no more than basic reading, math, and reasoning skills. Some people are literate in another language, but not in English. As a result, some health and safety trainers have found that having learners read material and write on a blackboard may not be successful. One trainer said: "People had trouble reading the materials. They weren't participating, and several people left the room. The activity didn't work."

When workers have limited literacy in English, training strategies include:

- Encouraging teamwork in training activities;

- Avoiding, or at least minimizing, a gap between trainees' reading ability and the reading requirements of materials designed to train them. Technical materials that are full of unclear jargon miss the mark. Organize text into short, logical sections. Use words that are easy to understand. Keep sentences short and simple. Use illustrations to help explain text. Illustrate the correct way to do things, not the wrong way. Use pictorial representations rather than abstract graphs (see example below from University of Alabama materials).

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Using Illustrations to Support Text: Examples

11. You must work on the Olin/McIntosh site in August. You are sampling drums in the hot sun, wearing an APR and splash apron. List three things you can do for yourself to prevent being in the situation pictured below.

1._____

2._____

3._____

12. You are going into each of these. Circle the ones for which you need a confined space permit.

Storage Tank   Pipeline   Silo   Manhole

Source: University of Alabama at Birmingham.

- Evaluating materials for readability. The Right to Understand: Linking Literacy to Health and Safety Training, a guide developed at the University of California at Berkeley (see annotated bibliography), provides a useful checklist (see excerpt that follows) and tells about measuring the readability of materials.

Workers can be involved in shaping learning goals and objectives. They often learn and demonstrate application of their learning through simulations, group exercises, and other observable activities. Many worker training programs have moved toward these more participatory evaluation formats.

Checklist

This checklist can help you evaluate the writing, design and illustration of your health and safety materials. We have also including a scoring system. This can help you identify possible problem areas.

Begin by choosing one page of a curriculum, factsheet, or other written material that you want to evaluate. Choose a page with an illustration.

As you answer the following questions, fill in each blank with one of these numbers: yes = 2, somewhat = 1, no = 0.

Verbs

Scoring System: yes = 2, somewhat = 1, no = 0.

1.   Do most of your sentences have **active** verbs?   _____

        Active: She did it.

        Passive:It was done by her.

2.   Do your sentences have many verbs that are
        commands or in the **present tense**?   _____

        Command: Write sentences in the present tense.

        No command: You should write your sentences in the present tense.

Now review your score for each question. The number "2" represents the best score in all categories. Go back to questions scored with 1 or). Make changes to help raise your score and improve your materials.

Adapted from The Right to Understand, University of California, Berkeley.

Stakeholders: Multiple Interests and Perspectives

Evaluation evolves through a series of decisions -- with each decision affecting other decisions. Wherever you start, there's more than one route that can lead to development of an effective evaluation plan. Consideration of stakeholders is important in any evaluation. In worker training evaluation, work place changes are the ultimate outcome.

Sound evaluation choices take the answers to these questions into account:

- Who are the people with interests in program outcomes?

- How do their roles -- as trainees; instructors or other program staff; company managers; representatives of outside funding organizations; trade unions; trade associations; or community organizations -- influence their points of view about training and its outcomes?

- How much variation of interest is there among the people in each role? Do trainees, for instance, share similar wishes and expectations for the program? Do managers?

- What are their main interests? If, for example, a funding agency has several interests, does the agency representative who is liaison to your program seem to emphasize one or two of those? If so, how will you proceed?

- Can at least everyone's main interests be accommodated? If so, how?

- What will make evaluation as useful and valuable as possible to trainees, instructors, and other program staff? To improvement of the program itself?

Every training program (including its evaluation) takes a point of view. Evaluation will emphasize some interests and downplay or ignore others. Often, the prevailing factor in decisions about the purpose and scope of an evaluation is the need to satisfy a funding source. It's reasonable for a funding source to influence decisions about evaluation, but exclusive attention to this interest may undermine support for evaluation from others. Instructors, staff, or trainees may come to view evaluation as a bureaucratically-imposed, organizational burden rather than a useful tool.

Funding agency representatives, policy makers, program administrators, evaluators, instructors, other staff, and especially worker-trainees, each have a potentially unique point of view and interest in an evaluation. Sometimes these interests complement each other; at other times, they may be at odds. Funding agency representatives, program administrators, and program evaluators need to recognize that evaluations usually need to address a number of interests at the same time.

When instructors were asked, in a needs assessment conducted for this Resource Guide, how they and their colleagues felt about evaluations for their programs, one instructor summed up his frustration by saying:

> It's directly dependent on where the evaluation came from. Those by an outsider are really looked down on. They [instructors] say, "How long will it take to get this [person] out of here?" They're going to stroke them

> [outsiders] -- get through this evaluation and then go back to doing it the way they want to. [But] When evaluators give good useful feedback, good instructors put it to use.

Putting the matter in positive terms, another instructor commented:

> Instructors ought to be involved from the beginning and should help design the evaluation of courses they deliver.

So, evaluation, like other aspects of worker training and education programs, has the potential to either foster or diminish the sense of ownership among those participating in the program, a sense that is usually vital to program success. The potential of a program evaluation to provide information to help programs improve, grow, and prosper is perhaps equaled by its potential to foster alienation among key program constituents. None of those who contributed to the needs assessment survey conducted for this Resource Guide were totally cynical about program evaluation; they simply recognized that without input from a variety of stakeholder interests, evaluations won't serve their programs' best interests and goals.

The chart on the following page represents what various groups of people (stakeholders) often want to achieve from different program evaluation focuses.

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Perspectives: What People Want from Program Evaluation

Who ▸ Evaluation Focus ▾	Worker-Trainees	Employers	Instructors	Program Administrators	Funding Agency and Representatives
To Improve the Program	To get the program on the right level and useful in real-world situations.	To focus learning on site-specific issues.	To improve up-coming sessions.	To determine pro-gram strengths and weaknesses.	To get the program up and running and producing results quickly.
To Find Out What Happened During a Program	To find out what is being done well at different work sites and to share that information.	To be sure most important lessons are learned.	To be able to say that training is effective because of how it was delivered.	To show funding agency reps. that the program was carried out as stated in the grant proposal.	To document that the program met grant requirements.
To Find Out About Short-term Effects	To show that what was learned is making work places safer.	To get better compliance with safety rules and use of PPE.	To show that trainees are learning something worthwhile, and developing rele-vant skills.	To document the value of the pro-gram to union leadership.	To show that work-places are increasing compliance with relevant OSHA regulations.
To Find Out About Long-term Effects	To show company decision-makers that education and training programs are in their interest too.	To find ways to eliminate hazardous materials incidents.	To document formally that in-creased aware-ness created by the program contributes to improved conditions in the work place.	To determine whether students have been motivated to take action, and are working together.	To show policy makers that the overall program approach leads to reduced injuries and illnesses.

Adapted from Tom McQuiston.

SECTION IV
METHODS OF EVALUATION

There are many good ways to evaluate a training program, but it's important for evaluators to find methods that are consistent with program principles and style and that provide useful, understandable results.   These methods include surveys, questionnaires, observations, and more. Some methods of evaluation are quantitative; i.e., they count how many or how much. Other methods are qualitative and more open-ended. After you determine a conceptual design for your evaluation (based largely on the five bullets below), you should then turn to the details of the technical design, or specific methods, or framework to be used.

A. CONCEPTUAL DESIGN

Much of the last section discussed conceptual design, without using that term. Conceptual design is the framework established early in evaluation planning that gives direction to the technical design. Representatives of all major stakeholders should agree on the conceptual design before evaluators proceed with development of the technical design.

Basic Questions for Conceptual Design include:

- Who are the primary stakeholders and interest groups involved in to this program and its evaluation?

- What are the program's goals and objectives?

- What outcomes are sought?

- What is the primary evaluation question to be asked?

- What political considerations need to be taken into account?

B. TECHNICAL DESIGN

Once major stakeholders agree about the framework, or conceptual design, for an evaluation, design decisions become increasingly specific. The technical design process begins with determination of answers to a list of basic questions. It then moves to selection of the evaluation activities, instruments, and special questions that will be used.

Basic questions to consider when developing methods for evaluation are: [*]

- What are the units of analysis -- individual workers, groups of workers, organizations, program components?

- What is the sampling strategy? Will the evaluation include all trainees? If not, how will a representative group be chosen?

- What types of data will be collected?   From whom will data be collected and what instruments will be used? Data collection may be quantitative, qualitative, or both.

- What comparisons, if any, will be made?

- What analytical approaches will be used?

- How will validity of, and confidence in, the findings be addressed?

- What statements of findings will result from the analysis -- reports to funders, reports to participants, presentations to managers or at professional meetings, or journal articles?

- When will the evaluation occur?

- Will the evaluation be sequenced or phased? How?

- How will logistics and practicalities be handled?

- How will ethical issues and confidentiality be handled?

- What resources will be available? What will the evaluation cost?

Design Options

Five possible design options are discussed below:

Design Option 1:   Comparing information collected from one group at two points in time, typically before and after program participation.

This design provides for a comparison of those participating in a program with themselves at some later point in time. For example:

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[*] Provided by a group of public health specialists, led by Professor Barbara Israel, University of Michigan, and cited in the list of other resources at the end of this Guide.

- Information gathered immediately before a program can be compared with that collected immediately after the program; or

- Information collected immediately after the program can be compared with that collected three, six or twelve months after the program.

This design allows evaluators to determine what factors have changed. When comparing information collected after class with information collected months later, a problem may arise from different rates of response to the program and at follow-up. Large differences in the rates of response make comparisons complicated. If evaluators aren't careful, biases created by response differences may affect conclusions that can be drawn from the study.

The following are examples of NIEHS awardee programs that have used the one-group design with two or three separate points of information collection:

Example 1:

In 1992 the Midwest Consortium for Hazardous Waste Worker Training asked participants a series of questions before and after a program. The study found that student awareness and concern about hazardous waste health and safety issues increased; student beliefs about the risks of hazardous materials changed; and concerns about getting sick from exposure to these substances were raised.

Example 2:

Several NIEHS awardees use refresher training as an opportunity to assess impacts from training and to test knowledge retention. There isn't usually a one-to-one match between the individuals who were in a particular basic training class and those in a specific refresher class later, and some in the refresher classes may have taken initial training within another training institution, but the demographics are often quite similar. The International Union of Operating Engineers, for example, compared scores on questionnaires given to students just before an initial 40-hour course with scores on the same questionnaires given to students just before an 8-hour refresher course approximately one year later.

Evaluation during refresher training provides a way of making before and after comparisons without use of mail-back or telephone follow-up surveys. Conclusions from comparisons should be made with caution if the populations of the initial and refresher program groups vary substantially.

Design Option 2: **Relating different pieces of information collected from one group at one point in time.**

One of the most common evaluation designs is to gather information from a single group at a single point in time and then examine different pieces of that information to find possible relationships. For example, a survey six months following a program might ask whether the actions that workers took to get needed work site health and safety changes were related to their ongoing use of a manual and materials supplied during training.

When relationships between two factors are found this type of study usually doesn't permit evaluators to say that one factor caused the other. In the example above, it couldn't be shown whether use of course materials increased the likelihood that students would take action or whether taking action led students to use the material. Evaluators would only know the two had occurred together.

Design Option 3: Information from one group without comparisons.

In this design option, information from a single group is only gathered once, after a program has been completed. The evaluation may ask participants about their perceptions of the quality of the training or of changes that took place following the program. Because this design doesn't make comparisons, it's not considered as strong as the previous two designs for confirming that changes occurred. This design may be strengthened by studying more than one group.

Every person interviewed in an evaluation has a unique point of view. Interpretations and memories of events that happened weeks or months earlier vary. When groups with different points of view provide similar information about what happened, it may add strength to an evaluator's observations and conclusions.

> An International Chemical Workers Union (ICWU) evaluation of its NIEHS Hazardous Waste Worker Program was based on a follow-up study of sites where workers had attended a hazardous waste education program. The study was designed without a comparison group or pre-program information with which the follow-up survey results could be compared. Instead, workers were directly asked what had changed at their work sites in the twelve-month period after their training.
>
> To help reduce doubts that some people might have about information gathered exclusively from union members about a union program, a second point of view was obtained by asking the same question to a group of managers who'd also attended ICWU education programs. Information from the managers provided an additional data source that could be used to draw conclusions in the evaluation of the training program.

The simplest type of data collection instrument, the so-called "smile sheet" asks students to evaluate instructors and programs. One example, used by the California-Arizona Consortium (see Appendix) uses a scale of 1-4 to rank four aspects of instructor quality: how well they knew their materials, how well they explained their materials, how well organized they were, and how well they were able to get the class to participate in discussions. It expands on the closed-ended format of most smile sheets by providing space for students to write additional comments.

Assessing competency through knowledge-based tests is an important quantitative method. Many examples of knowledge-based testing can be found in the Appendix. Some are general HAZMAT awareness questions and others are specifically designed to assess trainee knowledge of such subjects as confined space practice, air monitoring instruments, respiratory procedures, or workers' rights.

Design Option 4:   Using a delayed program-group comparison.

When presenting a program to a number of different classes and reaching them all will take a significant amount of time, it may be possible to conduct an evaluation by comparing those who received the program in its initial or early phases with those who received the program in a later phase. This design requires a great deal of up-front administrative work, and program planners need to have a good idea of who'll attend the program over a period of time. It's often considered one of the fairest ways to conduct a comparative group evaluation because everyone receives the program more or less as they would have without the on-going evaluations. This design also creates an opportunity to assign groups to the different phases of the program, allowing for some control over group homogeneity, thus helping to strengthen conclusions that can be drawn from the comparisons.

Design Option 5:   Comparing program participants with a group that did not participate in the program.

Sometimes it's possible to locate a group which either participated in a different training program or were not training participants, but who are similar in characteristics/demographics to your program participants. If there are substantial differences aside from the fact that one group participated and one didn't participate in the program, and if the possibility exists that these differences could affect the impacts being studied, the differences need to be identified. Then steps need to be taken to answer why changes are attributable to the program and not to the differences or other factors.

> At a large facility where the United Auto Workers trained only a portion of the workforce, comparisons were made between the workers trained and those not trained. Information was collected both before and after the training program. Before the program, no differences were measured between those who received the training

and those who hadn't. At the time of the follow-up evaluation, however, 47 percent of the trainees reported changing work practices, but only 18 percent of the non-trainees reported similar changes.

Each of these design options generates useful evaluation data. Choose the one that best suits your program, resources, and program objectives.

Deciding Whether Your Evaluation Should Be Quantitative, Qualitative, or Both

Quantitative Methods

In general, quantitative methods seek to answer questions about a program by counting. These methods usually involve telephone, mail, or in-person surveys using standardized questionnaires, observation, or tests made up primarily of questions with pre-determined, limited responses.

Quantitative measures often include multiple choice and true-false questions, checklists, and rating scales. Most evaluations focus on quantitative methods and use instruments that tell how many people learned how much. These methods:

- Stress objectivity (making measurements, objective, valid and reliable, in part by ensuring that the evaluator isn't directly involved in the program)

- Use ratings and scales (numbering categories to measure attributes of the program and/or those affected by it), and

- Involve surveys of groups, fixed choice questionnaires, and statistical tests.

Qualitative Methods

Some evaluations seek a more in-depth approach than most quantitative methods allow. Qualitative methods are especially useful when trying to discern why a program, or an aspect of a program, is successful or not. Qualitative methods emphasize:

- Discovering what's happening in a program, how, and why

- The participants' view -- the program's meaning to those who are part of it

- Circumstances or context in which the program operates and the participants live and work, and

- A focus on specific cases that don't necessarily permit generalization to others.

Qualitative methods may involve:

- Observations and narratives about a program or actions taken as a result of a program

- Review of written documents or records to look for patterns and exceptions

- In-depth interviews of individuals or groups using open- ended questions (that people can answer in their own words), and

- Questionnaires to supplement other data.

Trainers who focus on hands-on and participatory methods are likely to have a more qualitative approach to evaluation. Said one trainer: "We base our assessment of what workers have learned on two things: their performance during the training and changes they make in the work place after the training."

Combining Quantitative and Qualitative Methods

Most evaluators who use both quantitative and qualitative approaches find strengths and weaknesses in each. Some evaluators favor using both approaches, in the belief that the strengths of one approach can offset weaknesses of the other.

Overview of Methods for Collecting Information

Surveys: Questionnaires and Interviews

Evaluators focusing on quantitative evaluation are likely to conduct telephone, mailback, or in-person surveys using primarily multiple choice, yes/no, and checklist question formats. These surveys may take place immediately before the program; immediately after the program; or after a 3, 6, or 12-month interval.

Gathering quantitative information is frequently accomplished at the training site, through questionnaires that participants mail back, or through questionnaires that guide evaluators in face-to-face or telephone interviews with participants. These methods may be combined to obtain a more cost-effective and efficient survey. Often, if there's time and money, telephone surveys are used to follow-up with people who haven't responded to mail-back surveys. Sometimes, people who are to be interviewed (by telephone or in person) may be sent an advance copy of a

questionnaire so that they'll have time to look it over, think about the questions, and gather needed information. Advance copies are particularly useful if open-ended, qualitative telephone interviews will be conducted.

A prime method for gathering information in a quantitative study is to use a specifically designed survey questionnaire. Typically, sets of answers for questions are determined ahead of time, and trainees select among these. Their responses are then given numbered values. The values make it possible for evaluators to count or add responses and to calculate statistical measures such as averages. People who are knowledgeable about statistics can calculate measures of how much answers vary and the relationships between different factors measured by the questionnaires.

To count, one usually must use pre-established answers for questions (that is, multiple choice, fill-in, or checklists) providing a different type of information than that gathered in interviews using open-ended questions. In an open-ended, person-to-person interview, evaluators can ask follow-up questions to get a clearer picture of what one is trying to find out. When using written questions with specific choices for answers, getting such a clear picture can be more difficult.

To clarify what constitutes an open-ended question, compare these examples:

- <u>Open-ended question</u>: How did the training affect your work practices once you returned to the work site?

  _____

- <u>Closed-ended question</u>: Did the training affect your work practices once you returned to the work site?
  Yes _____ No _____

- <u>Blended question</u>: Did the training affect your work practices once you returned to the work site?
  Yes _____ No _____
  Please explain:

  _____

In designing a questionnaire, there are many pitfalls to avoid. In the box on the next page is a summary of some specific types of questions to avoid, and how to avoid them.

NOTES_____

Questionnaire Design: Pitfalls to Avoid

- Avoid Double-Barreled Questions. A double-barreled question is one that asks two questions at once with each question possibly having a different answer. Such an item may leave a person confused about which question to answer.

  Example: What factors contributed most to your decision to use the quantitat ive and qualitative sections of this evaluation manuals?

  Solution: Convert this kind of question into two: in this instance, one about the quantitative section; another about the qualitative section.

- Avoid Loaded Questions. A loaded question in one that words or phrases bias the person to select or reject possible answers.

  Problem example: What role do you think "so called" experts should play in conducting evaluations of worker education programs?

  Solution: In this instance, delete the negative phrase "so called." A reviewer who wasn't involved in question construction may be better at any detecting biased questions than the people who wrote the questions.

- Avoid Leading Questions. A leading question is one that encourages one set of answers over another.

  Problem example: How much did you like this evaluation manual?

  Solution: Delete the words "how much." Those words would lead a person to conclude that evaluators believe trainees should have liked the manual.

  Some evaluators suggest telling the person that you expect and accept a full range of possible responses; by saying, for instance: "Some people have told us they didn't like the manual at all. Others have told us they liked it very much. How about you?"

  Other evaluators claim that such wording doesn't make much difference. They recommend simply asking the questions directly using a balanced approach.

- Avoid Misrepresenting a Low Response Rate. If you rely on mail-back or telephone surveys, you may have problems getting enough trainees to respond. When you do evaluation on the spot at a training course, your response rate (the percentage of those you attempt to reach with a survey that actually respond), your response rate is likely to be high. A low response rate can lead to biases in the information collected, especially if the people who complete and return a mail-back questionnaire are different in some important way from those who don't. If a response rate is low, be very careful about what you say about the information which may not represent the whole group of trainees.

__Getting Desired Information__.   Getting the desired types of information from a questionnaire takes careful preparation. Slight wording changes in a questionnaire or in the order in which questions are asked may affect a trainee's responses. Questions need to:

- Be clear and precise

- Cover an adequate number of aspects of the program's key concepts, so that the questions elicit the desired information

- Be carefully worded and asked so that the answers don't vary based on who's asking them and how they're being asked.

To the extent possible, everyone should interpret a question the same way. Whether the questionnaire's questions are your own, someone else's, or a combination, the questionnaire should be reviewed to identify potential problems and make improvements. The reviewer should be someone who didn't write the questions and who knows something about the program and its potential trainees.

For other questions to ask when reviewing a questionnaire see the box that follows:

Questionnaire Review: Checklist

- Do the expected responses address program goals and objectives?

- Are the questions easy to read?

- Are the questions brief?

- Is the meaning of each question clear?

- Are the questions and possible answers as specific as possible?

- Is the use of technical language at the right level?

- Do questions need to be translated or rewritten to make the questionnaire clearly understood by a different language, ethnic, or cultural group?

- Does each item ask a single question?

- Does each question require a single answer? (*Note*: Even so, people will tend to provide as many answers as they answers as they wish.)

- Do questions put all the possible answers on an equal footing, to avoid steering the respondent to certain answers?

Refining and Piloting a Questionnaire

Once you have gathered, written, and assembled the major evaluation questions into a questionnaire, take steps to test and refine the questionnaire:

- **Get feedback**. Seek the advice of coworkers who have experience writing questions and questionnaires or who have an understanding of the objectives that the questionnaire is trying to meet.

- **Pilot the questionnaire**. Once a suitable draft of the questionnaire has been developed, conduct a pilot test before using it. The pilot should be conducted with a small number of people similar to those who'll be asked to answer in the actual evaluation. To the extent possible, the way the questionnaire is piloted should match the way it will be used in the evaluation.

- **Conduct follow-up interviews**. If resources permit, consider contacting those who completed the pilot questionnaire and review it with them item by item. Ask them about their interpretation of the questions, any points of confusion, and their general reaction to the questionnaire. Get their suggestions for changes, including their suggestions for items to add or remove. Sometimes it's useful to conduct these interviews with a small group of people who have just completed the questionnaire.

Consider using the pilot and follow-up interviews to check:

- The rate of completion for the entire questionnaire and whether there are questions people regularly choose not to answer or say don't apply.

- The amount of time that it takes people to complete the questionnaire.

- How easy it is to follow the instructions.

- The comprehensibility of the instrument (whether questions and responses are easily interpreted and interpreted as intended).

- The range of possible answers. It's important that options cover the range of answers that people want to give and that any open-ended questions will provide meaningful and useful answers.

If after a pilot test you modify a questionnaire, try to pre-test it again. Each change has the potential for solving one problem but creating another. Make sure that changes represent improvements.

Self-Evaluation Questionnaires. Sometimes the best person to evaluate achievement and learning is the person trained. A number of different types of instruments focus on self-reporting.

An alternative to the traditional pre- and post-test method of assessing a training program is the retrospective post-test. In this type of assessment, trainees self-report about their knowledge, skills, abilities, and attitudes only after they have completed training. Trainees provide two types of self-reports: 1) traditional post-training outcomes and 2) responses on how they believe they would have answered those same outcome items before training. Those who favor this method believe that training itself can alter an individual's internal standards for responding and that doing all the testing at one time provides more accurate and comparable information. For example, if trainees didn't know during a pre-test that specific chemicals in their work place could cause cancer, but did afterwards, these individuals could answer a retrospective questionnaire about health risk at work with greater knowledge and, therefore, more accuracy.

A consortium of community colleges uses a "Train-the-Trainer/Refresher Self-Evaluation" rating scale (see next page for excerpts and the Appendix for full instrument) that's distributed on the last day of training. It asks learners, in a retrospective post-test format, on a scale of 1 to 10 to rank what they knew, before and after training, about such subjects as rules and regulations, chemistry principles, personal protective equipment, emergency response, hazard control, and instructional techniques.

Preparing Interviewers. Telephone or in-person interviewers need to be acquainted with the program, its purpose, and methods. They also need to become familiar with the questionnaire, its purpose, and the range of possible responses they can expect.

Telephone interviewers must practice speaking slowly and clearly. Interviewers should have a chance to practice interviewing in role-plays, and be involved in survey pre-tests. They need to know how to:

- Put interviewees at ease

- Identify and clarify confusing questions or issues

- Record peoples' responses accurately.

Train-the-Trainer/Refresher Self Evaluation - Last Day (Exit Evaluation)
Rating Scale
1-----❷-----❸-----❹-----❺-----❻-----❼-----❽-----❾-----10

| Low knowledge subject matter | Average Knowledge on subject matter | High Knowledge on subject matter |

Knowledge On:	Before Train-the-Trainer	After Train-the-Trainer
Rules and Regulations		
Chemistry Principles		
Personal Protective Equipment		
Emergency Response		
Rights and Responsibilities		
Decontamination		
Monitoring Techniques		
Work Practices		
Hazard Control		
Hazard Recognition		
Safe Work Practices		
Hands On Applications		
Instructional Techniques		
Changed Attitude, Behaviors, Beliefs		

Source: Community College Consortium for Health and Safety Training

Protecting Participants' Rights: Anonymity, Confidentiality, Consent, and Ethics.
Anonymity exists when there is no way to connect a person with the responses he
or she provided. To assure anonymity, there are no names, identity numbers, or
lettered identity codes on questionnaires. Confidentiality, on the other hand,
allows for collection of personally identifiable information, but imposes strict limits
on who has access to it. Be sure that the questions you ask won't identify a person
due to sex, age, job description, etc.

Ensuring anonymity or confidentiality protects the rights of those who participate
in a program and respond to the survey. Notices and reminders of confidentiality
may also encourage people, to complete questionnaires and/or to speak more
frankly.

To ensure confidentiality, assign each participant a unique numerical or alphabetic
code (in no way associated with a person's department number), with both names
and corresponding codes recorded on a master list. The only personal identifier on

the questionnaire then becomes the individual's unique code. Keep the master list in a secure location separate from the questionnaires and data.

Confidential surveys offer advantages over anonymous surveys, especially with regard to follow-up. If questionnaires are anonymous, there's no way to identify who hasn't responded. A master list of confidential codes shows its custodian who has and hasn't contributed to different parts of the evaluation, and allows for follow-up contacts. The master list should be destroyed after the evaluation is complete -- or sooner if evaluators are sure that its information is no longer needed (for instance, when a response rate has reached or surpassed an acceptable level).

If information is collected at two points in time, names or numbers connected to responses enable evaluators to sort out possible response biases. Still, the advantage of anonymity over confidentiality is that it provides more privacy protection, and participants are likely to be most candid if anonymity is assured. No person should be pressured into responding to a survey or to any particular question.

An example of a confidentiality guarantee follows:

SAMPLE NOTIFICATION OF CONFIDENTIALITY

This survey is being carried out in joint cooperation with the UAW and the University of Michigan to study the effectiveness of the UAW Hazardous Materials Training Program. Your participation in this project is completely voluntary. You may decline to participate or choose not to answer any questions without penalty. The answers you give will be kept totally confidential. The UAW will not receive any information that makes it possible to identify individuals answers. The ID number is included only to see if your answers have changed since the first time you filled out the survey. Only [name of person or organization] will have the key that links your name and the ID number. The University will provide summary results of the information in a manner which does not reveal your identity or that of your employer or local union.

Evaluation surveys should include steps to help ensure that those participating understand:

- What information will be gathered

- How that information will be used

- Who will and won't have access to responses
- Any possible negative outcomes that could result from participation in the survey.

These procedures may help provide informed consent for those who participate. For some human-subject research, the written consent of participants may be legally necessary or advisable.

Ethical issues should be considered as well as legal ones. Many institutions usually have boards to review study procedures to ensure that they are ethical and protect the rights of participants. If your evaluation won't be reviewed by such a board, a review by colleagues who are independent of the evaluation may help you to identify and address issues of the rights of those from whom you plan to obtain information.

<u>Managing a Survey</u>. A well-managed survey will ensure that information is collected properly and within the allocated timeframe.

Choose carefully how to announce your survey. Options for announcing a survey include:

- Sending a pre-survey mailing to alert people that a mail-back questionnaire or a phone interview will be conducted in the near future

- Announcing a future survey at the end of a training class, and/or

- Having a leader from the organization sponsoring the training (perhaps a union president or work department manager) write a cover letter to accompany the survey.

Once information is collected, ensure that it is stored in a secure and orderly manner. This is especially important if people responding to the questionnaire were promised confidentiality or anonymity.

When considering the various methods of data collection for surveys, consider the points outlined in the table that follows on the next page.

EVALUATION INSTRUMENTS COMPARED

Instruments	Response Rate and Bias	Costs	Length	Interviewer Effects	Ability to Probe and to Clarify Questions
In-Class Questionnaires	With close to a 100 percent response rate, there's virtually no response bias (unless a select group of trainees leave before completing the course).	Costs are minimal, mostly for duplication.	If more than 12 pages may begin to lower participants' quality of attention and response.	None	Instructor is there to clarify questions.
Mail-Back Written Questionnaires	Can range from 10 to 80 percent. 60 percent is acceptable in surveys of the general public. Higher rates are possible with highly interested groups. Low response rates can limit the ability to make generalizations and bias comparisons between information gathered in surveys done at different times.	Low cost, especially if done at the education program. Costs for mail-back questionnaires may be $1 or more. If follow-up is needed to increase response rate, may increase costs.	If more than 12 pages, may begin to lower response rates.	None	None
Personal Interviews	80 percent is considered acceptable in surveys of the general public. Higher rates are possible with highly interested groups. Higher response rates will reduce the chances of response bias.	High cost compared to mailback and telephone.	Lengthier interviews (more than an hour) may be possible.	The presence of the interviewer may help motivate the person to respond; however, a person may try to give an interviewer what the person thinks are desirable answers.	The interviewer can read body language noting confusion, or respondent can ask the interviewer to clarify question.
Telephone Interviews	75 percent is considered acceptable in surveys of the general public. Higher rates are possible with highly interested groups. Higher response rates will reduce the chances of non-response bias.	Moderate to higher cost. May range as high as $30 if conducted by a research firm. May be less if done locally with existing staff or volunteers.	If more than 1 hour, may lower response rates.	Has some of the same privacy advantages of mail-back questionnaires.	Interviewer may be able to hear respondent's confusion, or respondent can ask the interviewer to clarify a question. Telephone surveys can be implemented and completed quickly.

Specific Qualitative Methods

Qualitative research aims to capture what people's lives, experiences, and interactions mean to them in their own terms and in their own settings. Qualitative evaluation research provides its depth and detail most often through careful descriptions and records of direct quotations. Qualitative methods focus on gaining a fuller understanding of the complexity of how and why a program functions. This differs from quantitative evaluations in which the evaluator develops the surveys and questionnaires with pre-determined choices for participants to select. Qualitative methods usually require more time and, therefore, more money than quantitative methods and analysis.

In qualitative methods, data to be collected include quotations from interviews, notes and documentation from program observation, or excerpts of program or training documents. Some of these data are analyzed quantitatively as well as qualitatively.[*]

Generally speaking, in qualitative research, more in-depth information is gathered from a smaller number of people than in quantitative research. As a result, carefully selecting people to participate is critical for qualitative evaluation. Who should be selected, like much else in qualitative study, is driven by the evaluation design. It begins with the evaluation questions and what you are trying to learn. You'll also need to consider what level(s) of the situation you're studying. For example, if you want to know how your training influences health and safety committees in local unions, then you are studying the organizational level. You may want to select health and safety committees from different locals. If you want to learn how training shifted individual work-practice behaviors, you'd study individuals and involve a different set of people.

Interactive Participation-Based Approaches

Participatory training methods focus on the experiences of participants. They encourage teamwork and group problem solving. They also encourage exchanges between workers and trainers. They can be used for evaluation as well as teaching; in fact, with this method, evaluation and training can coincide. By emphasizing "learning by doing" these methods are especially useful for workers with low literacy. Examples of participatory methods include: ice-breakers, risk maps, role playing, games, small-group exercises, brainstorming, demonstrations, and hands-on activities.

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[*] Some of the discussion is based on source material found in the "Annotated Bibliography and Other Resources" in the Appendix.

Managers involved with NIEHS-sponsored training through the SEIU attributed the success of their training program in part to participatory learning methods that involved managers and workers in discussing issues as part of the educational process. One supervisor commented:

> "What I liked about it, everybody got on the same wave length, all trying to do the same thing. Now not everybody's doing their own individual thing, everybody knows what's supposed to be done, and it's (not) just CYA... we're together on it finally."

Simulations. Simulation exercises can also be used for both teaching and evaluation -- perhaps best in an interactive participation-based approach. Simulation exercises contain a number of segments, each with a number of decision-point questions.

The idea behind simulations is to prepare trainees to cope in dynamic situations and to develop and test their critical skills, judgment, and decision making. The Midwest Consortium uses this technique with the help of evaluation consultants at the University of Kentucky. An exercise on buried drums, for example, involves risk identification as well as review of hazardous waste worker accident reports, personal interviews, incident site investigations, and government incident and injury data. At training centers of the Laborers'-AGC and International Union of Operating Engineers elaborate site simulations for hands-on training are a critical part of both training and evaluation.

Simulation is often a concluding activity for training programs conducted by the New England Consortium and the California-Arizona Consortium. The simulation is often a large-group activity that follows a small-group activity of developing a site emergency response plan, in which trainees put their plans into action:

> The class chooses task leaders for such jobs as entry team, back-up team, decontamination team, on-scene coordinator, science officer, and so on. The class is asked to respond to a simulated accident, requiring dress-out in chemical protective clothing and respiratory protection. The entire class is actively and collectively involved in the hands-on application of knowledge from the course. An incident recorder keeps a careful account of all decisions and incidents. The exercise is followed by a report-back session, focusing on proper and improper decisions and actions.

Assessment of the simulation and the report back are a basis for evaluating student competency.

Risk Mapping. Risk mapping is another participatory training method. It allows workers to identify health and safety hazards at their work places. Workers gather

around a large sheet of paper. One draws his/her shop's floor plan and marks the location of health and safety hazards, while others give advice. Using different colored markers to draw their specific work sites, workers identify risk factors as well as possible controls. The workers also set health and safety goals and priorities and then decide where they want to make changes first.

This method relies on the knowledge of workers and workers become both researchers and subjects. Red dots are used to mark physical hazards (noise, heat/cold, leaks, slippery floors, lack of guards on equipment, radiation); blue dots, for chemical hazards; brown dots, for ergonomic hazards; yellow dots, for infectious hazards; and purple dots for stressors. The size of the dots -- small, medium, and large -- indicate whether hazards are of low, medium, or high intensity. A further measure of the extent of the hazard is shown by writing the number of workers exposed to the hazard inside each dot.

Analysis for development of a risk map involves at least the following questions:

- How serious is the hazard: how badly could someone be hurt?

- What is the extent of the problem: how many people could be affected?

- What are the difficulties and costs of fixing the problem?

- How complete is the information available about the problem?

Sometimes in a health and safety training course, use of a risk map can be an "icebreaker." Workers can draw and talk about a risk map of a hazard at their work places, to introduce themselves.

Risk mapping has been used for a variety of audiences in a number of settings. These include the New Jersey Department of Occupational Health's Lead Training Program, the California Department of Health Services' Training for Radiator Repair Workers, the Massachusetts Department of Health's Training for Vocational Education Instructors, and the Labor Occupational Safety and Health Program at UCLA.

In evaluating the usefulness of this tool, the California-Arizona Consortium staff, in interviews three months after the development of risk charts during training, found that more than half of those interviewed had discussed needed health and safety changes with supervisors and/or other managers, with many achieving corrections for targeted problems.

<u>Small-Group Exercises</u>. Small-group exercises are an important part of worker education and emphasize learning through action rather than through more passive

classroom listening. Small-group exercises allow workers to draw on their experience and share information with others which generates new confidence and refines their problem-solving skills.

After a brief discussion of actions that workers can take to solve a work place safety and health problem, the class divides into small groups (3 to 5 people) who carry out an exercise and report results back to the class. A small-group exercise might be based on a "trigger" visual that shows health and safety problems at a work place. The report backs and class-wide discussions can be a basis for evaluating trainees' competency in a subject.

The Midwest Consortium uses small-group exercises as performance activities (see the Appendix for a sample from their manual). In one case, a problem is presented, giving details of a HAZMAT emergency incident on a highway. The exercise calls for trainees to identify the hazardous material, assess explosion danger, and plan and carry out first responder activities.

In a small group problem-solving exercise for hazardous materials safety and health training used by the New England Consortium, trainees explore information available about the physical properties of chemicals:

> After a brief lecture on how to use the <u>NIOSH Pocket Guide</u>, and what technical terms such as "vapor pressure" and "flashpoint" mean, trainees form small groups to discuss their responses to a series of questions concerning a variety of commonly encountered work place chemicals -- often chemicals with which they have experience. They are asked, for example, to use the <u>Pocket Guide</u> to find the vapor pressure of a chemical, then are asked to apply that information to a real work place situation such as entering a confined space. Each group's ideas typically prompt a discussion among class members about the appropriate response. During such an activity, the instructor is more likely to play the role of facilitator, serving as an integrator of knowledge rather than its source.

Interactive approaches to learning provide high quality training. They also provide opportunities for "on the spot" evaluation.

Interviews

<u>In-Depth, Open-Ended Interviews</u>. An open-ended question permits a respondent to create an answer unconstrained by pre-determined choices. The question is "open" to all possible answers. Open-ended questions allow experiences to be expressed in the manner in which the people involved with a program see them. The researcher discovers the meaning through the perspectives of the participant. Open-ended questions can be included in written surveys and in interviews with one or more trainees, in-person or over the telephone.

An interview guide is a list of questions that are used to lead focus group interviews. An interview guide is developed based on the information being sought in an evaluation. It provides a sequence of topics and questions aimed at getting the people being interviewed to talk about the desired information. The guide helps stimulate a flow of information to promote systematic data collection. Interview guide questions are carefully crafted to be open-ended and to encourage discussion and information sharing. An interview guide for qualitative interviews, will include probe questions that follow up on, and evoke more information, if not in the response to an initial question.

> Initial Question: What were your impressions of the sources of information made available at the training?

> Probe Questions: Was the information new? Was it practical and useful?

In addition, in a qualitative interview, something may be learned that was not thought about in the development of the interview guide. If new information comes up, asking a spontaneous probe question to learn more about the unanticipated information is useful.

> Initial Question: Does your team work according to a confined space policy?

> Initial Answer: Yes, we do. The supervisor just revised it.

> Probe Question: What influenced (prompted, caused) your supervisor to revise the confined space policy?

It's a good idea to pilot test your interview guide to be sure that it's appropriate for the people being interviewed and that it gets people to respond with the desired level of detail.

The information people share during interviews is the data that you'll study to find answers. Interviews can be documented by audio- or videotape recording, and/or detailed notetaking during the interview. If the resources are available, try audio-taping with a tape recorder that has a quality microphone. A microphone's quality is particularly important for a focus group interview (see section on focus groups which follows) because people will speak from various locations in the room. If an interview is tape recorded an evaluator can listen to it and a typewritten transcript can be created from it. A transcript makes interview information available for quicker access and easier sharing by evaluators within the bounds of confidentiality.

An interview can also be documented by extensive notetaking. This is difficult for one person to do even in a one-to-one interview. An interviewer has many tasks to pay attention to: going through the interview guide questions, listening well, thinking about unscripted probe questions as well as taking notes. A focus group interviewer must also moderate discussion, watch for non-verbal cues, and encourage everyone to share opinions, so extensive notetaking is more than one person can handle in a focus group. For notetaking in a focus group, have a two-person team, with one person having the moderator role and the other, note-taker. The note-taker should try to write down exactly what the participants say without paraphrasing their words.

Focus Groups. Focus groups are carefully planned discussions, with five to ten participants, designed to obtain perceptions about a specific topic in a non-threatening environment. Participants are encouraged to share their differing perspectives. Unlike individual interviews, the dialogue and discussion generated among focus group participants can foster new levels of thought and information. As one participant answers a question, the response provokes new ideas from other participants. Someone with good listening and facilitation skills moderates a focus group. The facilitator's job is to create a safe environment in which participants feel comfortable sharing their comments. The specific comments of individuals should be confidential.

Focus groups allow program planners to learn about their target audience's knowledge, attitudes, and practices regarding a particular issue. Information collected from focus group discussions can be used to decide:

- Who the primary audience for the training should be; who needs the information or skills the most.

- What the content of the training program should be; for example, should it be fact-oriented, motivational, or skills-building in nature.

- What the format of the training should be; for example, lecture, hands-on practice sessions, small group discussions, role playing, simulations.

- What the costs should be; for example, money, transportation, energy, time.

- Where the training should be held.

- What the best way is to promote the training program among the intended audiences.

The people in a focus group should be similar enough to each other that they have a common base of experience. For example, workers who participated in the training program may form the basis for a focus group. Depending on the information being sought, consider including workers from different work sites, or using a separate focus group for managers, or a separate group for people who participated in different types of training offered.

You might want separate focus groups for workers and supervisors at a public works department to find out the impact of a confined space training program. However, if you are interested in the experiences of local union representatives, you might have several representatives from different work places, but from within the same district, get together for a focus group.

Including people with a range of experiences enriches the data collected. For example, suppose you were forming a focus group of workers from Central City who had participated in training. To enrich the information collected, you'd invite Central City workers from several different departments and who work at different locations around the city. The discussion of selection of people for case studies (which follows in this section) has additional information about selecting focus group participants.

Focus groups have many advantages, including:

- They can be arranged and completed in a short time frame.

- They elicit a wide range of ideas because of the interaction among group members.

- They allow for clarification of ideas; i.e., the moderator can ask questions to make sure ideas are clear.

- They encourage spontaneous and open, honest expression among members.

Focus groups also have a number of disadvantages, including:

- They most often provide qualitative data, not quantitative data that can be analyzed statistically.

- They are not random samples so results from focus groups cannot be generalized to entire populations.

- They may not be representative of the population you intend to reach because the recruitment process may be both difficult and biased.

- The results often are dependent on the skill of the moderator.

Many of the awardees of the NIEHS Hazardous Materials Worker Training Program use focus groups as one of a range of evaluation instruments. The Community College Consortium uses focus groups for instructor self-assessment and also as a small-group discussion exercise during training (see excerpts that follow and Appendix for full instrument).

The Service Employees International Union, the Midwest Consortium, and United

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Focus Group Questions

The class is divided into four groups. Each group takes a separate question and is given fifteen minutes to discuss the question and come to consensus on the answers to the questions. An appointed group leader will present the group's opinions which will be discussed by the entire class.

1. What are the three hardest 29CFR 1910.120 concepts to teach?

2. What are three things that I can do to become better at presenting 29CFR 1910.120 training materials? (How can CCCHST help?)

3. List the three most important qualities of an effective 29CFR 1910.120 training program.

4. List the three most important qualities of a good trainer/instructor (as part of an effective training program).

Source: Community College Consortium for Health and Safety Training

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Brotherhood of Carpenters & Joiners use focus groups to survey trainees. The Alice Hamilton Consortium; the American Federation of State, County & Municipal Employees; and the California-Arizona Consortium use focus groups to collect anecdotal information on the outcomes of their training programs. A detailed focus-group evaluation protocol was developed by University of Michigan for use by the United Automobile Workers (see Appendix).

<u>Observations</u>. Qualitative research emphasizes studying people in their natural environment -- watching what goes on when people are doing whatever it is that they do. Qualitative research using observations can be used in training classes and it can be used at work sites to observe work place changes post-training. (Quantitative data can also be developed from observation.) For example, observing a small-group activity in a training class by sitting in with a group of learners can offer the researcher information about what actually goes on in the group -- and how the activity works or doesn't. The researcher can learn, if the trainees actually do the activity; whether they consult the training manual; how participants respond when the trainer visits the small group to check in or provide assistance; whether the learners are confused; whether the material is too technical; or whether its literacy level is appropriate. Lots of information can be gathered by watching. However, there's a lot more to observation than just watching passively.

Develop an observation guide to structure the observation and create a system for documenting what's seen. Base the guide on the information that the study is seeking. For example, suppose that a program recently shifted from a lecture method to a small-group method because program staff wanted students to be more active in their learning. In that case, besides asking questions about general classroom interactions, the observation guide would direct the researcher to look for key points related to active learning. The observer would track student interactions with each other, students sharing incidents from their own experience, the number and types of questions students asked and of whom, and what happened in hands-on activities. During observation, evaluators take detailed notes or complete checklists while observing program activities.

Observations should be recorded in a systematic way through notetaking, drawings, diagrams, photographs, or video- or audiotapes. Photos or descriptions of a classroom interaction may be included in an evaluation report.

Evaluators for the UAW Workers Hazardous Materials Training Program observe and evaluate all program trainers (see the Appendix for the observation protocol). Key subjects for observation in the UAW protocol are group instructions, report back, discussion, and summary -- plus a section for general comments. The observation form has a guide with issues for the observer to consider. The New England Consortium requires each trainer to conduct peer observations and review

sessions at other courses. The consortium has developed guidelines and report forms for those observations (see Appendix).

<u>Case Studies</u> A case study design is useful if your research question is trying to explain something or answer a "how" or "why" question. Case study design is particularly useful in real-world contexts such as the work place safety and health arena, in which the evaluator has little or no control over the work place. All qualitative methods can be used in a case study. The Service Employees International Union, for instance, uses focus groups and interviews with workers, managers, and local union representatives in a case study approach.

Selection of cases is driven by the same criteria: the purpose, the level you want to study, any underlying beliefs you may have, and choices made to strengthen your design may influence your selection. Qualitative studies don't use random sampling and other scientific methods that can root out bias. So, if you're concerned that some people may say that you only selected participants favorable to your project, select participants who clearly wouldn't have that bias. For example, if you think critics will say that your participants all said positive things about training because they're in the union and your training was union-sponsored include some workers who aren't in the union.

<u>Work Site Visits</u>. The ultimate goal of worker training programs for safety and health is to make the work place safer and more healthful. Therefore, work site visits as a follow-up to training are a useful and strong outcome-assessment tool. Of course, not all important changes are apparent on a routine visit, but indicators of change and compliance may be observed. A work site visit for observation may be combined with follow-up interviews.

<u>Debriefings</u>. The UAW uses debriefings to evaluate the training process, procedures, and instructors associated with their courses. Debriefings may be similar in many ways to follow-up interviews.

Documentation

<u>Post-Training Use of Written Course Materials</u>. Trainees from a range of NIEHS-sponsored worker training programs use written manuals and other materials from training when they go back to their work places. This is one measure of the effectiveness of training and materials.

<u>Systematic Collection of Anecdotes</u>. Collection of anecdotes can be done in a number of structured ways -- often at refresher training or through telephone interviews or focus groups. These anecdotes document work place changes, incidents averted, the effect of training on decision-making in an emergency, etc.

<u>Documenting Near Misses: An Intermediate- to Long-Term Outcome Measure</u>. Sometimes in outcome evaluation, it's possible to identify lives that have been saved, injuries prevented, or health protected. But simple cause and effect relationships are not typical. Often, you can only identify and document "near misses" and hazardous situations and incidents that could have caused health or safety problems, and for which training could have made a difference or did make a difference.

A safety and health specialist, who at a young age went out to sea, working with dangerous cargo, but without adequate training had these near-miss experiences:

- I had received absolutely no training of any kind. I swabbed, chipped and painted, and meticulously cleaned and wiped-down the main engines. I used chemical cleaners, wading thigh deep in waste oil and other by-products of engine room operations in the bilges, and operated machinery and tools for which I was untrained and unqualified. I never realized the hazards to which I was exposed.

- One night, early in dry-dock work, two of us were tasked with cleaning out a diesel fuel tank, which had been filled with an especially refined and pure diesel fuel. One of the engineers was responsible for pumping the fuel out of the tank and ensuring that the tank was indeed empty before I popped the hatch. Upon receiving the go-ahead, I unbolted the hatch and was immediately struck by an overpowering wave of diesel fumes. There was no ventilation, and we didn't set up a blower or undertake any of the practices one should when entering confined space. When I took a break, I unwittingly lit a cigarette and continued to smoke by the diesel fumes and the hatch to the tank.

- Another time I was asked to muck out the main engine sump, the space under the main engine which contains the oil which lubricates the engine. In order to get to the main engine sump one has to actually climb into one of the engine cylinders and use a ladder to clamber down into the sump. The sump, itself, is a space approximately 3 feet high running the entire 50-foot length of the engine. I later learned that we were supposed to open all the main engine doors to allow for some ventilation. I was immediately struck by the fumes and oppressing heat. I began to feel faint.

The three problems above could have led to disastrous outcomes. With training, the worker could have taken steps to significantly reduce the hazards he faced.

Hands-on and Field Exercises. For hazardous materials safety and health training, the most common type of hands-on exercise is "dress-out," when trainees suit up in chemical protective clothing and respiratory protective clothing. During an exercise they practice taking samples from drums, hazard recognition, communication while wearing protective clothing, and monitoring the work environment. Such exercises might take 4 hours, with 1 1/2 hours dedicated to self-critique under the guidance of instructors.

Employer and Contractor Reports. Sometimes training is done in close conjunction with employers and contractors. In these cases, management can be of great assistance to the overall evaluation with their reports of what employees have learned and how effectively that knowledge is being used in the work place.

Review of Existing Documents and Records. Evaluators may take detailed notes or fill in checklists from information found in the review of program documents. Written documents that may be reviewed cover a wide range:

- Correspondence

- Grant proposals and reports

- Legislation/regulations

- Marketing materials

- Minutes of meetings

- Newsletters

- Other program records

- Phone logs

- Policy and procedure manuals

- Registration forms

- Strategic plans
- Trainee evaluation forms, and

- Training manuals.

When reviewing such documents, remember the goals, objectives, and questions the evaluation is trying to answer. To record findings take notes, highlight, or copy key sections that provide pertinent data. These excerpts become part of the evaluation data.

Data Analysis

Data analysis means organizing raw data in order to identify patterns, categories, or other describable units. The data analysis process is much like a mystery which has an inspector looking for clues, trends, and patterns -- except that steadfast work, rather than intuitive leaps, will bring answers for program evaluation.

Analyzing Qualitative Data

Qualitative analysis is complex and happens at many levels. It usually involves volumes of paper and data that make the task seem daunting at first. Analysis begins with examination of the raw data. This means thinking about the actual words that participants used as well as what those words mean and imply. Consider the context in which the data were collected.

Clarify what the participants said, based not only on their actual words as well as consideration of the big picture that comes from individual comments, but also from the accumulation of evidence and intensity of comments. For example, in one evaluation of a peer-trainer program, telephone interviews were conducted with participants six months after training to learn whether there were any changes at the work site. In addition to the wealth of information collected about the evaluation questions, everyone interviewed (during a pilot test of the interview guide) brought up their very positive response to participating in a worker-trainer led program. Because there were so many comments about this, and because they were expressed "off-topic" in the context of the interviews, it became clear that an important pattern was emerging.

In qualitative research, categories or themes arise from the data themselves. The categories reflect the vision of participants, their feelings and words. This type of analysis is called inductive. The categories or themes are identified by reading through all the data and noting any patterns that emerge about what participants said, or from what is revealed in observation notes or excerpts from written documents. Describe the patterns or themes you find in the raw data. Write them out in numbered, descriptive statements.

After broad themes have been identified the evaluator uses a system to go through all the data sources -- interview transcripts, observation notes, and excerpts from written documents -- to identify and number each relevant section that corresponds to the themes. This is called "coding," which is a systematic process for bringing order to the data. Once the data's all been coded, the researcher reorganizes it by the codes to learn more about the meaning of the data.

Coding can utilize low or high tech approaches depending on time, other resources, and level of detail required. An easy low-tech method uses colored markers. Assign a color to each theme you identify in your data. For example, say that you're analyzing the evaluation data from an ergonomics training program. After reading the data, you identify four primary themes that participants talked about: line speed, management behavior-modification programs, repetitive motion injuries, and fear of job loss. You assign each theme a color: line speed will be green; management behavior-modification programs will be red; repetitive motion injuries will be blue; and fear of job loss will be hot pink. You can then go through all of your data and in the left hand column you can mark each block of text that relates to that theme. When you are finished, you'll have a rainbow of colors in the left column.

Now review your data by theme. For example, to figure out what participants said about line speed, you'd read through all the parts of your data marked in green. Then you'd decide whether there's another, deeper level of analysis. When you review all that was said about line speed you may find, for example, that people were talking about three sub-themes. You can go through the line speed data to mark these sub-themes within the theme of line speed. This process is repeated as often as it takes to craft sufficiently accurate and detailed findings.

High-tech options speed the processing of data analysis -- whether qualitative or quantitative. If a computer data base is used, answers may need to be assigned a numbered value for entry into the computer. An additional review of data entered will sometimes be needed to find and correct errors. Questionnaires can be written so that some answers already have assigned numbered values.

Analyzing Quantitative Data

<u>Statistics and the Analysis of Information.</u> Statistics are estimates of characteristics of a group or population. Statistical methods are mathematical calculations used with quantitative data to:

- Describe the data (for example, give an average)

- Compare groups, and

- Examine associations among specific items.

While statistics are useful to get a better picture of data from groups that otherwise would have to be described case by case, statistics has its own language that can seem alien and intimidating. Although this Resource Guide does not attempt to teach statistics, a basic understanding of fundamental statistical concepts can help evaluators consider options, know when to get help, and understand possible pitfalls. So, this Guide describes several basic statistical concepts and defines some basic terminology.

<u>Basic Descriptive Statistics</u>. Descriptive statistics are those that are used to characterize a set of data. The most common descriptive statistics are:

- Range is a description of high and low values; for example: "The size of hazardous materials spills reported in the six months immediately following training varied from 10 gallons to 10,000 gallons."

- Mean is term for describing the average of the values of a group of data. It's a simple, single value that describes a number of scores or values. It's easily calculated by adding all the scores and dividing by the number of scores. A mean doesn't always provide a good description of data. If a few values are very different from the others they may distort the view of the data. These highly unusual values are called "outliers." Sometimes, outliers should be removed from calculation of a mean and then be noted separately.

  For instance, if the size of 29 of 30 spills reported were between 10 and 50 gallons and the 30th spill was 10,000 gallons the mean size of the spills was 360 gallons. This value does not describe the data accurately.

- Median is the middle value or score. Sometimes, it does the best job of describing a group of data. Half of the values should be equal to or greater than the median and half should be equal to or less than the median.

  The median of the 30 spills described above might be 32 gallons, giving a very different picture than the mean (average) of 360 gallons. A good description of these spills for the general reader might be: Thirty of the sites where workers attended the education program reported chemical spills in the first six months following the program. Of the 30 spills reported, 29 were between 10 and 50 gallons. The 30th spill was 10,000 gallons. The average for the 29 smaller spills was 30 gallons. Half of the spills were over 32 gallons.

- Variance and Standard Deviation describe how much variation there is in the data. There is a formula to calculate each. A group of data with a large variance and standard deviation would be highly varied, with say, some of the spills under 10 gallons, some 10-50, some 50-100, some 100-1000, some 1000-5000, and some 5000-10,000. Lower values for the variance and standard deviation would indicate that the values of the data are more closely grouped together, say if 30 spills were all between 10 and 50 gallons.

These four simple statistical measures tell a lot about the "central tendency" of data. They help organize data in a meaningful way, and are often the basis for tables and graphs, for both analysis, and data presentation.

<u>Comparative Statistics</u>. This Guide does not probe the use of statistics to make comparisons, except to describe one much-used and important test -- the t-test, which is used to determine the significance of a statistical finding.

While a number of statistical tests compare groups or study how certain items are associated with each other, perhaps the most commonly used statistic for comparing groups is the "t-test." The t-test could be used, for example, to see whether an average score that measures awareness of hazards for those trained is different from the average score of those not trained. When comparison is made using the t-test, there's a possibility that a difference or no difference occurred by chance. When the probability that the finding was caused by chance is less than a certain percentage (often 5 percent), the difference may be referred to as "statistically significant."

If you're interested in a more detailed discussion of statistics, consider referring to the Guide's "Annotated Bibliography and Other Resources" for information on an easy to read and easy to follow UCLA <u>Program Evaluation Kit</u> book, entitled <u>Vol. 8 - How to Analyze Data</u>.

<u>What Statistics Can Do; What They Can't</u>. Statistical tests, if used well, help create a clear summary of a large amount of data that otherwise would be overwhelming. The use of statistical tests is, however, easily abused. Even the few basic examples above show how statistics can create a distorted picture. And, technical terms and "statistically significant" results can't make up for poorly designed studies, poorly worded questions, or biased samples. The first test of significance of an evaluation study should be whether the information from an evaluation helps improve understanding of what happened in a program, the results it produced, and how the results contribute to the health and safety of workers. A good evaluation is one that is useful.

If you're not getting results that you believe are representative or reliable, the problems may be with the evaluation design itself. A group at the University of Alabama at Birmingham describes, on the pages that follow, how it reevaluated its evaluation process and improved it.

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Case Study: Turning Around an Evaluation Process

The University of Alabama, Birmingham's Center for Labor Education and Research (UAB/CLEAR) developed a new and improved evaluation format after program administrators there found conventional course evaluation formats inadequate. UAB/CLEAR has conducted NIEHS-funded Hazardous Waste Operations and Emergency Response (HAZWOPER) courses for nine years. During most of that time, the Center used conventional course evaluation forms to get feedback from trainees.

In the conventional approach, each trainee completes and turns in a course evaluation at the end of each course. A UAB educator explains: "Over several years of training, we gradually became aware of major problems in our course evaluation process. These problems were related to the basic concept and format of our course evaluation form." Section by section, instructors describe problems with the conventional evaluation form:

Section 1: Rating Overall Effectiveness of Training . This section simply asks, "After taking this course will you be able to perform your job better?" This is obviously an important question. However, wouldn't a better question be, "After taking this course will you be able to perform your job more safely?" This may seem like a minor point. However, better and safer may not be synonyms for everyone.

Section 2: Rating Instructor Presentations . In our program, this section functioned mainly as an instructor popularity contest. Our worst instructor consistently received superior presentation ratings.
He joked with trainees during class, smoked with them during breaks, and organized recreational events after hours.

Section 3: Rating Coverage of Topics . In some cases, topics would appear which had not actually been covered. In such cases, UAB instructors would remind trainees not to evaluate those topics. Regardless, almost all trainees would evaluate the topics which had not been covered. This caused UAB evaluators to doubt the validity of the student feedback they were receiving.

Section 4: Rating Course Interest Level, Materials, and Quality . The results were too general, for example, do poor ratings on audiovisual materials apply to the course as a whole? If not, then which topics do negative ratings refer to? Evaluations, which fail to answer questions such as these, provide little guidance for improvement.

Section 5: Rating Time Spent on Topics . Students sometimes indicated that time spent on topics was too short or too long. However, they rarely specified which topics they were referring to. Thus, feedback was not very helpful in making time adjustments.

Considerations for Improvement

UAB/CLEAR began an effort to improve the course evaluation process. Bad evaluation produced results which were overly subjective, confusing, and sometimes bad for instructor morale. Moreover, bad evaluation provided very little guidance for improvement of training. UAB staff threw out its old evaluation form, but did retain the few questions that sometimes provided useful information. The UAB staff then identified additional questions that it wanted its evaluations to answer. Staff rewrote the questions several times to make them easier to read and understand. These questions served as the basis for a new evaluation format.

A New and Improved Evaluation Format

Initial efforts at improvement resulted in a new evaluation form. It is designed to provide answers to questions about how students experience the UAB courses. The new evaluation format consists of three parts:

Part 1: Trainee Education and Work Experience. This section provides information on educational level, and work experience for each respondent. UAB staff plans to correlate this information with trainee responses on the evaluation.

Part 2: Evaluation of Course Modules. This section allows trainees to provide basic feedback on all modules of the course. UAB staff asks that they do this as the course progresses rather than waiting until the end, so they don't forget topics over a long course.

This section is completed by answering "Yes" or "No" to the following set of questions for each module.

- Was this part of the course interesting?

- Did you have a chance to really take part?

- Were you able to follow what was taught?

- Did you learn things that can help you stay safe and healthy on the job?

- If No, why not? Check One.
  ___ Couldn't understand the material
  ___ Already knew all I needed to know about the topic
  ___ Information did not pertain to my job

- Should we take more time to cover this material?

- Could we have covered this material in a shorter time?

Part 3: Overall Impressions of Course and Comments. This section is intended to provide feedback on the course as a whole. Was it worthwhile? Did the modules fit together well? Was the learning environment comfortable? What parts were especially liked or disliked, and why?

Also, what evaluation form would be complete without a "comments" space? This serves as a place for comments which didn't quite fit in elsewhere.

Conclusion

UAB has only recently begun using its new evaluation format, and staff don't know yet if it will solve all the problems. However, early indications have been good. Course evaluation is problematic by nature. Thus, as glaring problems are corrected, more subtle or insidious difficulties may become apparent. Improvement of evaluation is an ongoing, evolutionary process. However, UAB took a valuable first step in that process.

Source: University of Alabama, Birmingham, Center for Labor Education and Research.

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A Final Comment on Methods and Evaluation

If you should use quantitative methods, don't avoid them because you don't have the technical skills. The hardest parts of evaluation are conceptual design, gaining agreement among the stakeholders, and setting a stage for unbiased questions. You can always hire someone to check statistical validity before implementing an instrument and to calculate and analyze the statistical results afterward.

Be creative in your choice of instruments. Probably the best evaluation will include a variety of methods and a combination of both quantitative and qualitative measures. Your evaluation may be elaborate, but it need not be. Some evaluation, even at very low budget, is an important part of program development, improvement, and growth.

NIEHS awardees have used evaluation to improve the quality of their training. Evaluation shows that safety and health training encouraged activities among workers and their employers that have saved lives, and prevented work place injuries and illnesses, protected plants and equipment, and promoted community well-being.

ANNOTATED BIBLIOGRAPHY AND OTHER RESOURCES

Evaluation of Worker Training

National Clearinghouse for Worker Safety and Health Training, "Papers Presented to Participants at NIEHS Spring Workshop: Measuring and Evaluating the Outcomes of Training," March 1996. More than a dozen articles on evaluating worker training programs, presented by NIEHS awardees and invited guests of the technical workshop. Articles focus on methods, ethics, peer training, trainers, descriptions of evaluations, and evaluation summaries of specific training programs. Copies of the papers may be ordered from the Clearinghouse for $25. Call 301-431-5425 or e-mail <chouse@dgs.dgsys.com>.[*]

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National Clearinghouse for Worker Safety and Health Training, "1996-97 Annual Compendium of Articles, Conference Reports, and Research." May 1997. Four articles all dealing with evaluation of worker training. Copies of the Compendium may be ordered from the Clearinghouse for $25. Call 301-431-5425 or e-mail <chouse@dgs.dgsys.com>.[*]

Evaluation Resources

UCLA-Center for the Study of Evaluation, Program Evaluation Kit, Sage Publications, Newbury Park, 1987. The Program Evaluation Kit consists of 9 volumes of practical guidelines for designing and implementing evaluation:

Volume 1, The Evaluator's Handbook, provides dozens of useful checklists of guidance for those performing evaluation.

Volume 2, How to Focus an Evaluation

Volume 3, How to Design a Program Evaluation

Volume 4, How to Use Qualitative Methods in Evaluation

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[*] Copies as available on the Clearinghouse web page <http://www.niehs.nih.gov/wetp/clear.htm>.

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Volume 5, <u>How to Assess Program Implementation</u>

Volume 6, <u>How to Measure Attitudes</u>

Volume 7, <u>How to Measure Performance and Use Tests</u>

Volume 8, <u>How to Analyze Data</u>

Volume 9, <u>How to Communicate Evaluation Findings</u>.

Books may be ordered individually or as a set. To order, contact SAGE Publications, Inc., 2455 Teller Road, Newbury Park, CA 91320, or e-mail <<u>order@sagepub.com</u>>.

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Suggestions for further reading on <u>Qualitative Measures</u>:

- Robert C. Bogdan and Sari Knopp Biklen, <u>Qualitative Research for Education: An Introduction to Theory and Methods</u>, Allyn and Bacon, Boston, circa 1980.

- N.M. Clark and K.R. McLeroy, "Creating capacity through health education: What we know and what we don't," <u>Health Education Quarterly</u>, 22(3), 1995, pp. 273-289.

- Richard Krueger, <u>Focus Groups: A Practical Guide for Applied Research</u>, Sage, Beverly Hills, CA, 1988, p. 18.

- Robert K. Yin, <u>Case Study Research: Design and Methods</u>, Applied Social Research Methods Series, Sage, Beverly Hills, CA, Volume 5, 1984, p. 28.

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For further discussion of written testing see:

Michael Merrill, "No Test Know-How: Deficiencies of the Proposed OSHA Standard on the Accreditation of Training programs for Hazardous Waste Operations," <u>New Solutions</u>, Fall 1991, pp. 53-54.

Literacy

Elizabeth Szudy and Michele Gonzalez Arroyo, <u>The Right to Understand: Linking Literacy to Health and Safety Training</u>, Labor Occupational Safety and Health Program, University of California at Berkeley, 1994. Learn about the nature of literacy problems facing workers and trainees and strategies to make training work for low literacy individuals. Participatory training techniques that are outlined in some detail include: ice-breakers, risk maps, role playing, games, small group exercises, "trigger" visuals, brainstorming, demonstrations and hands-on activities, and participatory lectures. For more information about how to obtain this guide, contact the Labor Occupational Health Program, University of California at Berkeley, 2515 Channing Way, Berkeley, CA 94720.

Training Resources

For model curricula of hazardous waste training courses contact:

The National Clearinghouse for Worker Safety and Health Training, for Hazardous Materials, Waste Operations, and Emergency Response. Call 301-431-5425 or e-mail <<u>chouse@dgs.dgsys.com</u>>. The Clearinghouse has copies of all curricula of awardees of the NIEHS Worker Training Program.

Worker Participation

David Fetterman, Shakeh Kaftarian, Abraham Wandersman, eds. <u>Empowerment Evaluation: Knowledge and Tools for Self-Assessment & Accountability</u>, Sage Publications, Thousand Oaks, CA, 1996. Exploration of a method for using evaluation concepts, techniques, and findings to foster improvement and self-determination. Book includes an examination of empowerment evaluation and focuses on contexts in which it is conducted, ranging from resistant environments to responsive environments. Case studies include substance abuse prevention programs of the U.S. Department of Health and Human Services.

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UCLA-Labor Occupational Safety and Health (LOSH) Program, <u>A Group Method for Improving Workplace Health and Safety: Risk Mapping</u>, UCLA, Center for Occupational and Environmental Health and the Center for Labor Research and Education, Los Angeles, 1996. This guide to risk mapping suggests how to use the technique for accomplishing workplace change as well as for education and training purposes. It provides a step by step process for doing risk mapping as well as citing several examples

from government, business, universities, and organized labor. To obtain this guide or receive more information, call UCLA at 310-794-0383. The guide costs $5 plus postage and handling.

Worker Training Programs

The George Meany Center for Labor Studies, Silver Spring, Maryland provides a comprehensive array of worker training programs for trade union leaders across the United States. For more information, call the Center at 301-431-6400.

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National Institute of Environmental Health Sciences, Hazardous Materials Worker Training Program, Research Triangle Park, North Carolina. For more information about the program and training programs offered by its 20 awardee organizations and consortia, comprising over 100 individual organizations, contact: National Clearinghouse for Worker Safety and Health Training, call 301-431-5425 or e-mail <chouse@dgs.dgsys.com>.

APPENDIX A
NIEHS WORKER TRAINING AWARDEES*

Alice Hamilton Occupational Health Center •▲★
Silver Spring, MD
301 565-4590

> University of Maryland
> Alaska Health Project
> North Carolina Committee on Occupational Safety and Health
> Maine Labor Group on Health
> Howard University
> WASHCOSH
> Bricklayers/IMI
> UNITE (Textile Workers)
> Boilermakers International Union

AFSCME Training and Education Institute •
Washington, D.C.
202 429-1232

> New England Consortium
> University of Maryland at Baltimore
> Greater Cincinnati Occupational Health Center
> Coalition of Black Trade Unionists

CA/AZ Consortium •
Los Angeles, CA
310 794-0369

> University of California at Berkeley, Davis and San Diego
> Rio Hondo Community College
> Arizona State University

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* As of September 1997.

Center for Worker Health & Safety Education •▲
International Chemical Workers Union
Akron, Ohio
513 621-8882

    United Steel Workers of America
    International Association of Machinists
    USWA Rubber/Plastic Industry Conference
    American Flint Glass Workers Union
    USWA Aluminum, Brick and Glass Workers Division
    Coalition of Black Trade Unionists
    Greater Cincinnati Occupational Health Center
    University of Cincinnati

Clark Atlanta University ★
Atlanta, Georgia
404 880-6911

    Laborers-ACG Training Fund
    Xavier University

Community College Consortium •
Cedar Rapids, IA
319 398-5677

    Supports Partnership for Environmental Technology Education (PETE)
      colleges nationwide

Depaul University •★
Chicago, Illinois
312 362-6022

    Center for Workplace Education
    People for Community Recovery

International Association of Fire Fighters •▲
Washington, D.C.
202 737-8484

IUOE HAZMAT Project •▲
Beaver, West Virginia
304 253-8674

Jackson State University ★

Jackson, Mississippi
601 968-2466

University of Alabama at Birmingham
Laborers International Union of North America (Local #145)

Laborers-AGC Education and Training Fund •▲★
Pomfret Center, CT
860 974-0800

International Brotherhood of Teamsters
Laborers Health and Safety Fund
Clean Sites Inc.
Building and Construction Trades Department (AFL-CIO)
Cuyahoga Community College
San Francisco State University

Midwest Consortium •
Cincinnati, OH
513 558-0528

Southeast Michigan Coalition on Occupational Safety and Health
Greater Cincinnati Occupational Health Center
Universities of Illinois, Kentucky, Tennessee, Minnesota, Louisville
Michigan State University
Lakeshore Technical College

New England Consortium •
Lowell, MA
508 934-3257

Massachusetts Coalition for Occupational Safety and Health
Western Massachusetts Coalition for Occupational Safety and Health
Connecticut Council on Occupational Safety and Health
Rhode Island Committee for Occupational Safety and Health
New Hampshire Coalition for Occupational Safety and Health

NY/NJ Consortium •▲★
Piscataway, New Jersey
908 235-5064

New Jersey Department of Labor
Hunter College, School of Health Sciences
New Jersey State Police
New York Committee for Occupational Safety and Health
State University of New York at Buffalo
New York Carpenters Labor Technical College
New York City Environmental Justice Alliance

Oil, Chemical & Atomic Workers International Union •▲
Lakewood, Colorado
303 987-2229

The Labor Institute
University of Massachusetts at Lowell

Railway Workers' HAZMAT Training Program •
Silver Spring, Maryland
301 439-2440

University/College Labor Education Centers
ICWU Center for Worker Health and Safety Education
AFL-CIO Department of Occupational Safety and Health
AFL-CIO Transportation Trades Department

SEIU Education & Support Fund •
Washington, D.C.
202 898-3446

International Union, **UAW** •
Detroit, Michigan
313 926-5563

University of Michigan

University of Alabama at Birmingham •
Birmingham, Alabama
205 934-8015

> United Paperworkers Union International
> International Union of Electronic, Electrical, Salaried, Machine, and
>   Furniture Workers
> Johnson C. Smith University

United Brotherhood of Carpenters and Joiners Health and Safety Fund •▲★
Washington, D.C.
202 546-6206

> Ironworkers National Training Fund
> Painters and Allied Trades Labor-Management Cooperation Fund
> Sheet Metal Workers National Training Fund
> Operative Plasterers and Cement Masons International Association
> International Brotherhood of Boilermakers
> Roofers and Waterproofers Research and Education Joint Trust Fund
> Asbestos Workers International Apprentice Fund
> National Association of Minority Contractors
> University of Kentucky
> University of Cincinnati

- EPA
▲ DOE
★ Minority Worker Training

APPENDIX B

EVALUATION INSTRUMENTS