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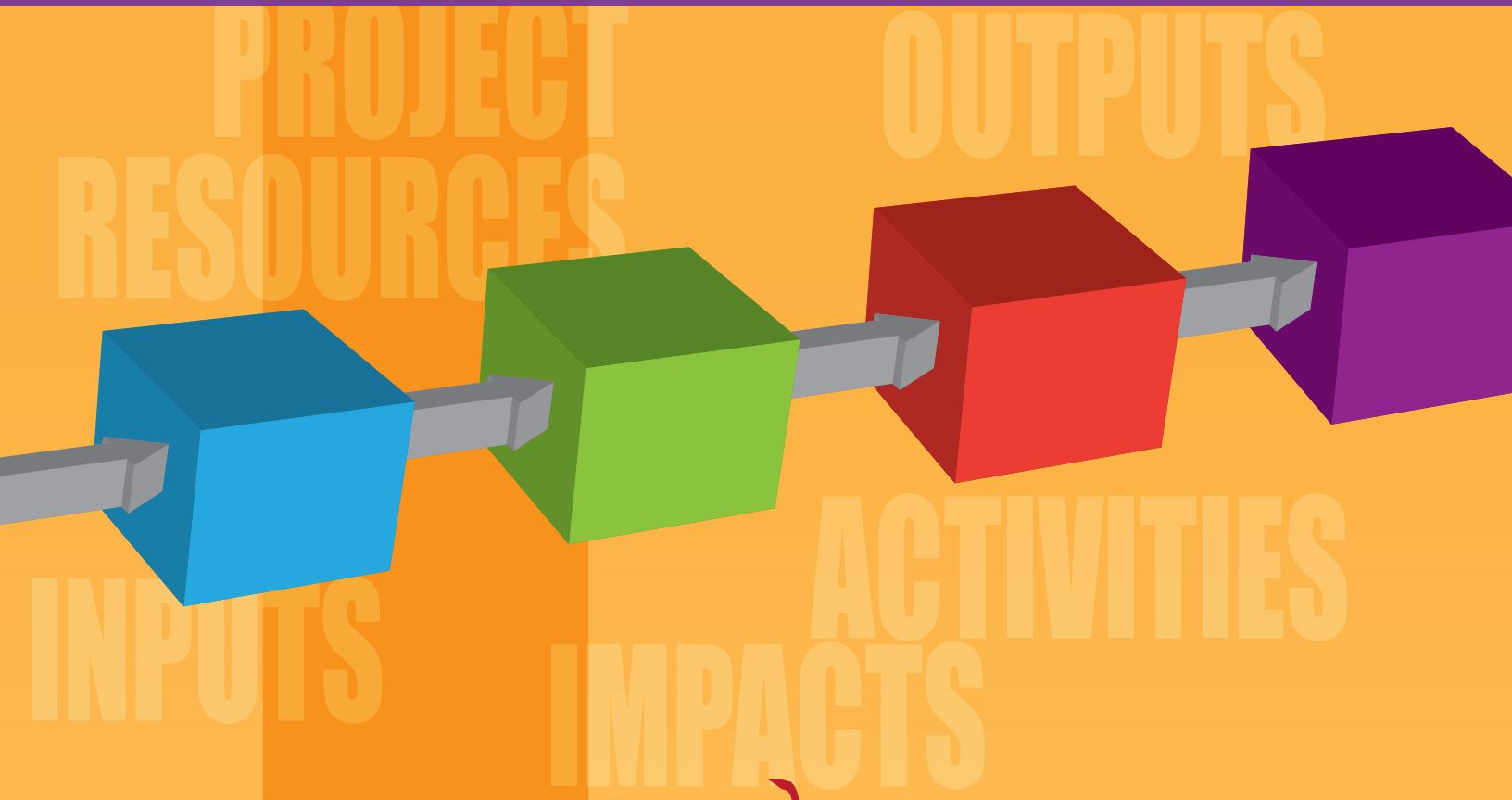

Prove It Makes a Difference:

Evaluation Best Practices for Health and Safety Training

EVALUATION WORKSHOP REPORT

Sponsored by:
Worker Education and Training Program
National Institute of Environmental Health Sciences

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NIEHS WETP BACKGROUND

National Institute of Environmental Health Sciences Worker Education and Training Program (NIEHS WETP) maintains a major responsibility for initiating a training grants program, as provided by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The primary objective of the WETP is to provide funding support to non-profit organizations with demonstrated track records of providing occupational safety and health education to develop and deliver high quality training to workers who are involved in handling hazardous waste or respond to emergency releases of hazardous materials. Since its inception in 1987, the NIEHS WETP has worked to develop a strong network of non-profit organizations committed to protecting workers and their communities by delivering high-quality, peer-reviewed safety and health training to target populations of hazardous waste workers and emergency responders. Since 1987, over 2 million workers have received NIEHS supported safety and health training. More information about the NIEHS WETP can be found on the WETP website at: *http://www.niehs.nih.gov/careers/hazmat/index.cfm*.

The NIEHS WETP provides support through the following program areas:

- **Hazardous Waste Worker Training Program (HWWTP)**
  The HWWTP provides model occupational safety and health training for workers who are or may be engaged in activities related to hazardous waste removal, containment, or chemical emergency response.

- **Minority Worker Training Program (MWTP)**
  The MWTP delivers comprehensive training to disadvantaged minority inner-city young adults to prepare them for employment opportunities related to environmental restoration and hazardous materials.

- **NIEHS/DOE Nuclear Worker Training Program (DOE)**
  The DOE program focuses on training workers engaged in environmental restoration, waste treatment and emergency response activities at sites in the Department of Energy's nuclear weapons complex.

- **Hazmat Disaster Preparedness Training Program (HDPTP)**
  The HDPTP provides enhanced safety and health training to current hazardous materials workers and chemical responders and trains skilled support response personnel. It creates materials and delivers training to weapons of mass destruction response workers, and augments prevention and preparedness efforts in a wide variety of high risk settings.

- **Advanced Training Technology Program (ATT)**
  The ATT program helps to facilitate the development of safety and health training products for hazardous materials (HAZMAT) workers, emergency responders, and skilled support personnel. The ATT program also includes the Small Business Innovative Research and Small Business Technology Transfer (SBIR/STTR) programs.

National Clearinghouse for Worker Safety and Health Training

The National Clearinghouse supports the work of WETP by facilitating national workshops on pertinent safety and health topics and by maintaining a website containing an extensive database of information about protecting workers from workplace hazards, organized by subject matter. The website also contains training materials developed by WETP grantees, including curricula in accordance with OSHA's hazardous waste worker standard (1910.120). The information and training curricula are available to other training organizations for free download on the WETP website.

HISTORICAL BACKGROUND: NIEHS WETP'S EVALUATION HISTORY

Evaluation a Key Part of "Minimum Criteria"

Program evaluation has always been a core part of the WETP's mission. The *Minimum Health and Safety Training Criteria (Minimum Criteria)* document, which serves as the quality control basis for the training grants awarded by WETP, requires the following evaluation components:

- "The training must be followed by a proper evaluation to document the knowledge, skills or attitudes were acceptably transmitted and that the worker possesses the necessary abilities to perform the tasks." (Number 8 of the Guiding Principles)
- The Training Director is responsible for program evaluation (9.3.1)
- "An annual evaluation of instructional competence by the training provider" is required (9.3.3)
- Particular attention should be devoted to, among other things, "Evaluation methods and criteria for satisfactory completion of the course" (9.3.4)
- A written Quality Control and Evaluation Plan is required (9.3.10)
- A written training plan that includes evaluation is required. Auditors are instructed to review the evaluation process and implementation of required modifications. (10.2)
- The written quality control and evaluation plan should consider instructor performance; course evaluations, including feedback, updating and corrective actions: the role of trainee evaluations to provide feedback for training program improvement, among other things. (10.6)
- Key questions for evaluating the quality and appropriateness of the overall training program. (10.10)

Special Issue Journals on Safety and Health Training

Since the early 1990s, NIEHS grantees have published their approaches to training and evaluation.

- Empowerment Approaches to Worker Health and Safety Education (1992). American Journal of Industrial Medicine (Special Issue). Volume 22, Issue 5 (Articles can be found online at: *http://www.ncbi.nlm.nih.gov/pubmed*)
- Occupational Medicine: State of the Art Reviews with Occupational Health and Safety Training (1994). American Journal of Industrial Medicine. Volume 36, Issue 5 (Articles can be found online at: *http://www.ncbi.nlm.nih.gov/pubmed*)
- New Solutions, Special Section: Health and Safety Training, Winter 1995
- *New Solutions Special Issue Worker Health and Safety Training (2012)*

NIEHS Workshops and Reports on Training Evaluation

In 1995, NIEHS appointed a commission of well-recognized national experts to review and evaluate the overall NIEHS Worker Training Program. The panel concluded that "there is a high probability that occupational injuries and diseases are being prevented as a result of the NIEHS program, and the prevention of even a few catastrophic events easily justifies the investment in training." The experts also recommended that NIEHS increase its emphasis on the evaluation of training impact, by tracking post-training employment and the short and long-term effects of training on improving workplace safety and health conditions.

In March 1996, NIEHS held a workshop entitled ***Measuring and Evaluating the Outcomes of Training*** to examine the methods developed by various programs to document the effectiveness of training activities. Public health experts in the evaluation field and awardee representatives spent two days exploring the methodological issues that underlie 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 *Resource Guide for Evaluating Worker Training: A Focus on Safety and Health* was a product of the workshop to benefit other organizations grappling with safety and health training evaluation issues as a means of more effectively measuring training program quality. The ***Resource Guide*** summarizes the insights and methodologies of the NIEHS WETP awardees in conducting formative and summative program, training, instructor and trainee evaluations. Papers on measuring the outcomes of training presented at the workshop were also compiled into a separate resource document.

In 1997, NIEHS funded a Self-sufficiency Research and Evaluation Pilot Project (SREPP). This three-year multi-union learning, action, and research collaborative offered a new model of participatory learning and action in the area of worker safety and health. This project sought to facilitate participatory learning across programs and workplaces from a union-centered perspective and built upon the recently expanded role of workers in many safety and health training programs. It expanded worker-trainer roles to include evaluation, thus institutionalizing a new base of worker-produced knowledge for improving safety and health.

In April 2001, *On the Cutting Edge: Best Practices of the Worker Education and Training Program* was released by the National Clearinghouse. This document includes a large section on Sharing of Experiences and Evaluation.

Post-Training Job Placement and Potential Exposure Tracking

NIEHS operates an automated data system for the electronic submission of all training data from awardees. These data include the course, number of trainees, and number of contact hours. In addition, each awardee collects data on the types of work that trainees do and other data relevant to tracking the association of trainees to hazardous materials exposures. Each awardee has its own tracking system to identify, to the best of their ability, where those trained have worked and are working. (*On the Cutting Edge: Best Practices of the Worker Education and Training Program*, April 2001.)

EVALUATION WORKSHOP SUMMARY

"Rigorous program evaluation is essential in determining whether health and safety training has led to substantially improved protection aimed at reducing occupational illness and injuries and their attendant social and financial costs"

—Tom McQuiston, "Multi-program Evaluation: A Descriptive Review"

Purpose

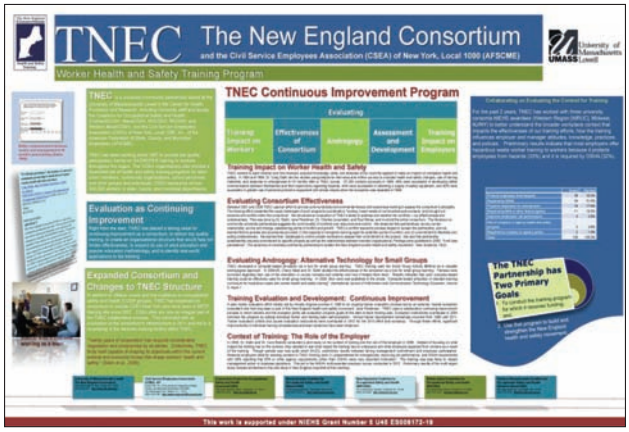
The purpose of the Evaluation Workshop was to bring together WETP awardees and others interested in evaluation of worker safety and health training to explore the types of evaluation tools being used by WETP awardees across their training programs, and to look at metrics used by other federal agencies to evaluate training. The primary goal of the workshop was to facilitate the exchange of ideas and to empower participants with increased insight into effective approaches to evaluation.

Workshop Kickoff: The Importance of Evaluating Safety and Health Training

The 2012 Evaluation Workshop began with a poster session where awardees shared the evaluation processes they've used to enhance NIEHS-supported training.

WETP Director, Joseph "Chip" Hughes, welcomed participants to the workshop, recalling that exhibiting the impact of the WETP and demonstrating its value to the nation has always been a key goal of the program. Hughes highlighted the importance of evaluating safety and health training to accomplishing this key goal. He briefly called attention to grantees' contributions to the development of multiple approaches to training evaluation, including the following:

- Building on the principles of adult learning theory, grantees have been using both an individual and group focus for evaluating training impact and efficacy.
- Creating and validating instruments for pre- and post- testing for judging knowledge gain and skills retention in classroom, hands-on and e-learning contexts.
- Innovative evaluation methodologies that are both qualitative and quantitative in their approach.
- Data collection and approaches that have varied from a focus on trainee performance and learning, trainer effectiveness, longer term training impact, and overall training program effectiveness.



Hughes also underscored that the program's grantees new evaluation findings have been key to sustaining and broadening the WETP. He observed:

- Grantee findings have produced research results that are both descriptive and inferential.
- Evidence-based approaches have made important contributions to the peer reviewed literature for validating training metrics and measuring training efficacy.
- Much of the evaluation work has depended on creating newly validated metrics to capture longer term impacts.
- Building new outcome measures has demonstrated the value of HAZMAT safety and health training.
- Innovative ways have been explored to incorporate the Kirkpatrick[1] training evaluation measures into the safety and health training context.

In addition, Hughes asserted that understanding the empowerment process in training evaluation has been a key contribution of this program to the evaluation literature and community. Hughes summarized:

- A key program innovation has been the creation of participatory evaluation methods for teaching worker-trainers evaluation skills.
- Empowering worker-trainers in all steps of evaluation, and creating a forum to develop and share evaluation skills and techniques has improved training efficacy.
- Bringing the political context of empowerment into the training evaluation process has created new outcome measures on training effectiveness.
- Impacts on the workplace as a key training outcome measure have become an essential dimension for evaluating training effectiveness.
- Research basis is contributing to peer-reviewed literature on training evaluation.

"Training is but one component of an overall safety and health program and is not a substitute for other preventive strategies such as the application of engineering and administrative controls."

—Michael Colligan and Raymond Sinclair, 1994

Current and Future Safety and Health Training Expectations Under 21st Century Workplace and Socioeconomic Conditions

The keynote address centered on the issue of current and future safety and health training expectations under 21st century workplace and socioeconomic conditions. Dr. Craig Slatin, UMass, Lowell-The New England Consortium, cautioned against using training as a panacea for safety and health issues in the work place. He noted that safety and health training is not a control, but rather a measure to inform workers of the hazards and to give them information to help eliminate or minimize those hazards.

Dr. Eula Bingham, former Assistant Secretary of Labor for Occupational Safety and Health talked about starting the New Directions[2] training grant program at OSHA after learning the importance of worker training from

1 Donald Kirkpatrick is best known for creating a highly influential 'four level' model for training course evaluation. The four levels are designed as a sequence of ways to evaluate training programs (reaction, learning, behavior and results). Kirkpatrick's ideas were first published in 1959 in a series of articles in the US Training and Development Journal. Kirkpatrick's evaluation model is perhaps the best known evaluation methodology for judging the learning process.

2 OSHA established its discretionary grant program in 1978 entitled New Directions. Grantees were awarded for up to five years, with grantees increasing its share of support with the goal to become self-sufficient. Many of the grantee organizations continue to offer occupational safety and health training to this day. In 1990 the grants were restructured, due to reductions in funding. (*http://www.osha.gov/dte/sharwood/overview.html*)

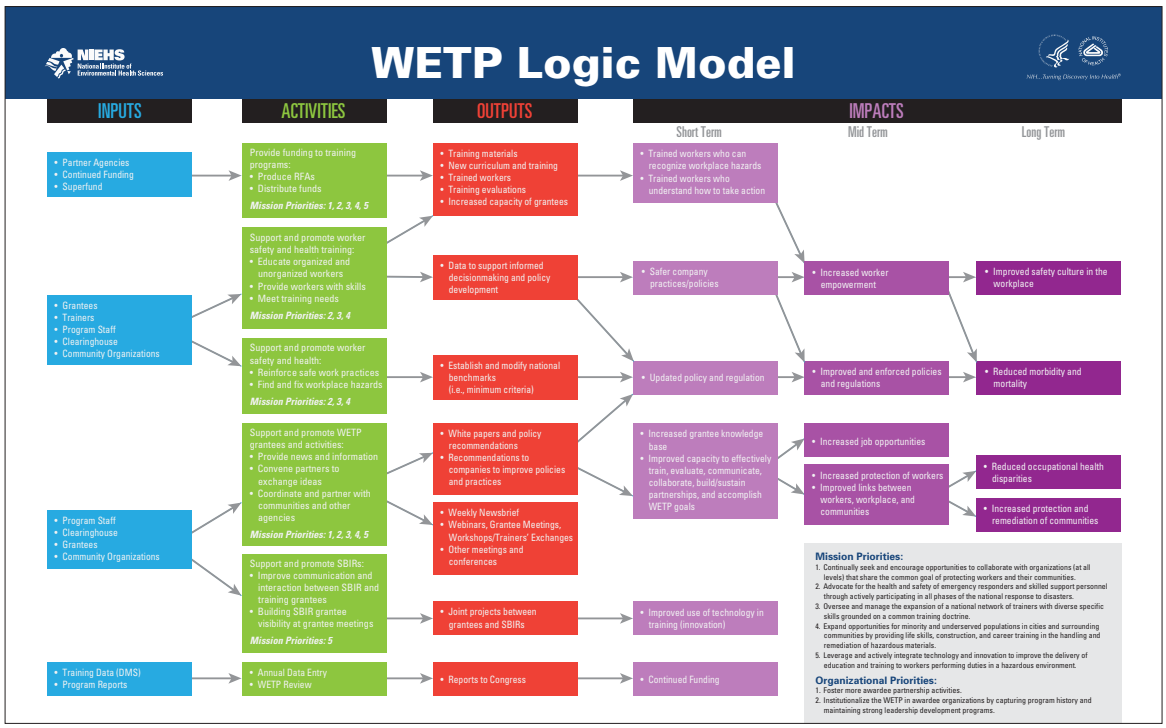
Tony Mazzocchi. Dr. Bingham urged participants to communicate to others how training has helped to save lives. She also urged participants to emphasize the economic savings to employers and others when training is provided to workers.

The WETP and Evaluation – Present

Logic Models

Dr. Kristi Pettibone, NIEHS, provided an overview of logic models and how they can serve as a valuable tool in developing performance metrics for a program. Pettibone shared that logic models seek to identify and illustrate the relationship between the inputs, activities, outputs, and impacts (short-, medium-, and long-term) related to a particular program. Pettibone then described the process of how the WETP engaged to develop its initial logic model, including identifying impacts, and then identifying the activities that help to reach the desired impacts.

Jim Remington, NIEHS, walked participants through the components of the WETP logic model. He emphasized that the logic model shows not only how each input leads to specific outputs, impacts and outcomes, but also how each activity is firmly linked to the WETP Strategic Plan. Remington added that the logic model will serve as a useful reference for WETP to ensure that its resources continue to be directed towards activities aligned with the priorities in the WETP Strategic Plan and that maximize the positive outcomes of the program.

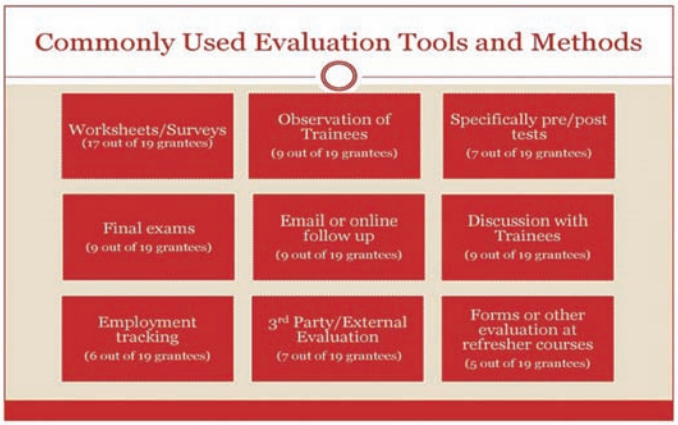


*(*See Appendix B for larger version of the WETP Logic Model)*

Later, participants were invited to provide suggestions to improve the WETP logic model. Participants generally expressed support for the logic model. However, they noted that some amendments were still needed; including additional inputs (e.g., apprenticeship coordinators, Federally-funded contractors, Foundations, etc.), and increased clarification of the relationship between inputs and activities. Participants also identified a series of additional suggested outputs they would like to see represented in the logic model, including the systematic collection of training-related success stories. Lastly, participants suggested additions to the impacts identified; including "increased environmental awareness", "employment enhancement", and "standardized evaluation process for e-training", among others. (*See Appendix C for complete list of participant suggestions*)

Newly Created Awardee Evaluation Profiles

In preparation for the workshop, WETP Senior Intern, Hannah Leker, reviewed awardee evaluation data from the 2012 preliminary grantee progress reports. The information helped the WETP to develop concise summaries of evaluation tools and methods used by each awardee. This comprehensive review of awardee evaluation data was the first review WETP has done since the 1995 review, conducted by Tom McQuiston, United Steelworkers Tony Mazzocchi Center, in preparation for the 1996 workshop on evaluation. This recent review process illuminated the need to build on the newly created profiles and update them annually.



The evaluation profiles reveal that grantees employ a variety of approaches to evaluating their training programs, including e-learning evaluation and looking at the employers' perspective of the impact of HAZWOPER training. Among the most commonly used evaluation tools and methods were worksheets or surveys, observing trainees, pre- and post-tests, final exams, discussion with trainees and email or phone follow-ups. Some of the more innovative evaluation tools and methods consisted of review game exercises (such as toxic jeopardy), focus groups, audience response systems, and incorporation of the social ecological model. Commonly mentioned best practices included maintaining an emphasis on hands-on training, addressing literacy challenges, using Spanish materials and instructions when there are Spanish-speaking participants, and integration of academic, and life skills and technical training (e.g. the MWTP).

Study: Employer Perspectives on Training

Kevin Riley, UCLA-LOSH, presented another unique approach to evaluation that is being applied by 4 WETP grantees (e.g., Midwest Consortium for Hazardous Waste Workers Training, New York/New Jersey Hazardous Materials Worker Training Center, The New England Consortium, and Western Region Universities Consortium) who are in the midst of a multi-year research study to focus on employers' perspectives of the impact of HAZWOPER training. The study is focused on 3 primary questions:

- What motivates employers to send employees to HAZWOPER training?
- Does the training provided by our programs meet employers' perceived needs?
- How willing are employers to involve workers in safety and health programs when they return to work?

Information was collected through interviews with management allies and a survey distributed to public and private sector employers who sent employees to trainings conducted by the 4 WETP grantees. The preliminary findings of the study have unveiled some important information about the perspectives of employers with respect to worker training, including the following:

- 91% of employers surveyed identified "background or experience of trainers" as the most important characteristic of training providers. The popularity of this response offers insight into how training providers can make their programs more attractive to employers.
- The most important factors in an employer's decision to provide workers with HAZWOPER training was that it "protects employees from hazards" and that it is "required by OSHA".
- 44% of employers noted that they would still provide the same level of training even if there was no OSHA HAZWOPER standard in place. Meanwhile, 32% reported that they would utilize more online training if such flexibility was available. The result suggests that the standard may be encouraging more interactive and personal training to a wider range of workers.

E. If there were no OSHA HAZWOPER standard in place, how might the training you provide to employees be different than what you currently provide?

	Percent
I would provide employees with the same level of training	44%
I would provide employees with less than 40 hours for initial training	22%
I would provider refreshers less than annually	18%
I would provide refreshers only for those who do this work regularly	26%
I would provide refreshers only for those who have shown they don't understand the health and safety rules well	8%
I would provide more online training	32%
I would customize the 40-hour or refresher course	9%

N = 108

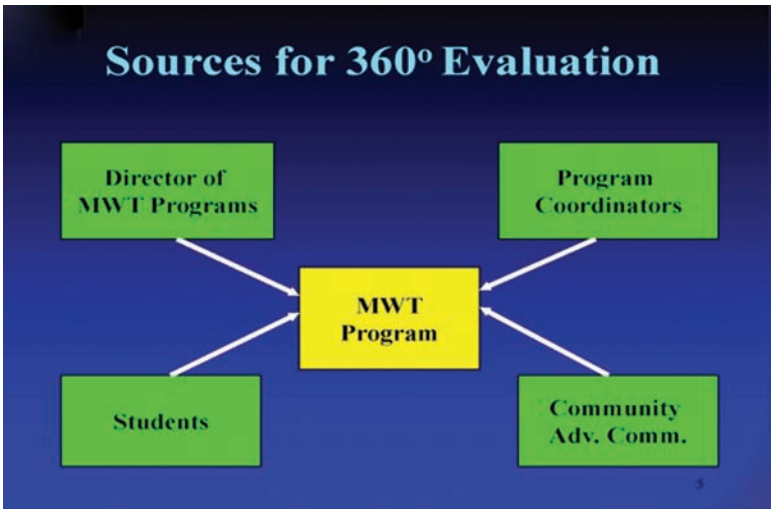
- Active involvement of trained workers in various aspects of company/agency safety and health programs does not appear to be a high priority of most employers.

Highlighted Workshop Panel Sessions

Panel sessions focused on a range of evaluation tools methods, and approaches; e-learning and evaluation; and how training effectiveness can be measured.

Evaluation Tools and Methods

Dr. Ruth Ruttenberg[3], Ruth Ruttenberg and Associates, emphasized the vitality of communicating the importance of evaluations. She highlighted refresher meetings and trainers' exchanges as valuable modes for communicating this message. Ruttenberg also identified strategies to address challenges in gathering sufficient data for evaluations, including learning to ask the same questions differently on questionnaires, and gathering responses through a variety of sources. Futhermore, Ruttenberg emphasized the importance of feedback loops as a vital tool for training evaluation. She commented that case studies are equally as important as survey data to the evaluation process.



Sue-Ann Sarpy, Sarpy and Associates discussed the 360-degree evaluation and feedback approach. The 360-degree evaluation is a thorough approach to evaluation that gathers qualitative and quantitative feedback from a wide range of multiple stakeholders. In the context of training programs, the 360-degree approach would likely consider the perceptions of the program director, program coordinators, students, and a community advisory committee through instruments such as questionnaires, interviews, and focus groups. Sarpy also highlighted the value of logic models as an effective tool for communicating to stakeholders a program's activities and short-, mid-, and long-term goals to help stakeholders gain a greater understanding of how to look at evaluation questions. Sarpy echoed Ruttenberg's comments regarding the importance of case studies to the evaluation process, and added that case studies also serve as a useful tool for communicating success stories among program stakeholders.

Tobi Lippin, New Perspectives Consulting Group, Inc., spoke about the participatory evaluation method utilized by the United Steel Workers. This approach to evaluation emphasizes a central role for workers in developing and conducting evaluations. Lippin noted that evaluators work together to determine what they want to know, identify appropriate evaluation questions, and to test pilot surveys. Ultimately, the data collected are utilized to develop a report presenting the findings through tables and bar graphs to reveal trends. Lippin acknowledged that the biggest challenges to utilizing the participatory approach include adequate resources and engaging workers at the data collection site in a participatory manner.

3 Ruth Ruttenburg is an independent consultant (Ruth Ruttenberg and Associates) who has performed a wide variety of training evaluation

Approaches to Evaluation

The panel session entitled *Approaches to Evaluation* highlighted evaluation programs that are currently utilized by the HAMMER facility, Occupational Safety and Health Administration (OSHA), and National Institute for Occupational Safety and Health (NIOSH).

Michelle Edwards, Mission Support Alliance LLC, shared that the HAMMER facility, located at the Department of Energy's Hanford Nuclear Site, uses a two-pronged approach to training evaluation. The approach includes trainee and trainer evaluation.

HAMMER uses the Kirkpatrick Model to gauge how training is impacting trainees. This model consists of 4 levels of evaluation focused on the areas of response, learning, performance, and results.

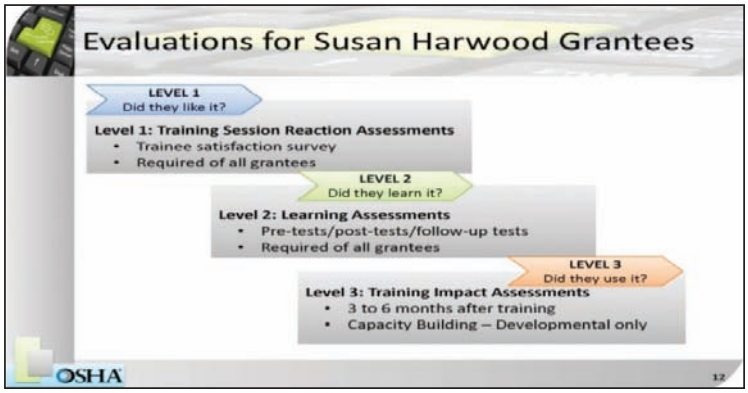
Kirkpatrick's 4 Levels of Training Evaluation

Levels	Measures	Tools
Response	Trainee reactions to training	feedback questionnaire, informal comments from participants, focus group sessions with participants
Learning	Skills and Knowledge acquired	pre- and post-testing
Performance	Job performance improvement	follow-up questionnaire, on-the-job observation
Results	Organizational goals met	surveys; interviews with trainees, trainers and employers

HAMMER also evaluates instructor contributions to trainee learning. This component of the evaluation includes conducting pre- and post-interviews with instructors. HAMMER also organizes peer-to-peer trainer observations, allowing trainers to have other trainers sit in on training sessions to observe their tactics and provide feedback.

Cathy Cronin, OSHA, noted that OSHA continues to build its evaluation capacity. Cronin noted that OSHA is currently using feedback from trainees, a local and national survey developed by the Occupational Health Training Unit, reports from Executive Steering Committee members who sat in on courses, and field advisory data to review training effectiveness.

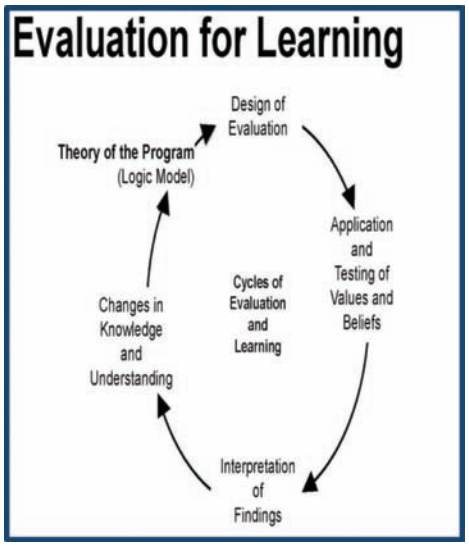
Dr. Paul Schulte, Director of Education and Information Division at the National Institute for Occupational Safety and Health (NIOSH), shared NIOSH's long history of researching worker training effectiveness. Schulte asserted that the purpose of training is to increase knowledge and awareness, empower workers, augment skills, and equip workers with the ability to engage in safe work practices. He reiterated that



an effective training program requires consideration of training as a systematic process that requires the attention to issues before, during, and after training.

Schulte shared that recent research (e.g., *Systematic Review of the Effectiveness of Training [2010]* and Robson et al. [2012][4]) shows a need for increased high quality randomized studies and more rigorous studies on training effectiveness. The research also shows a need for OSH training at every level (e.g., worker, foreman, employer, contractor, and owner). Schulte concluded by noting that it is important that workers are empowered and enabled to perform according to training content.

Tom McQuiston noted that more needs to be done to share information and lessons learned between NIOSH and WETP, as well as among WETP grantees, with respect to evaluation. McQuiston advised that collectively the agencies and WETP grantees should be examining prevention, preparedness, response, and the relationships between these components. He added that there is a need to also look more closely at occupational safety and health, environmental health, community health and environmental justice, and the relationships between these areas of concern.



McQuiston noted that evaluation design, including asking good and critical questions, should be a primary focus in developing evaluations.

McQuiston provided some recommendations for strengthening WETP's future evaluations. First, evaluations should be wary of assumptions, including: participant's work environments; how training programs affect change; how programs lead to increased knowledge and skills; and how training strengthens capacity to improve safety and health. Second, evaluations should be aligned with the values of worker participation and empowerment. Third, evaluations should help participants to become more critically aware of hazards and what needs to change. Fourth, evaluations should serve as a vehicle for applying learning to program development. And finally, evaluations should promote sharing and building solidarity within and across programs.

4 Robson, L.S., Stephenson, C.M, Shulte, P.A. et al. (2012, May).A Systematic Review of the Effectiveness of Occupational Health and Safety Training. Scandinavian Journal of Work, Environment and Health. 2012; 38(3). 193-208.

Evaluating E-learning Tools

Level 4—Techniques

- **E-learning no different than any other type of training**
- **A simple way is to determine its worth**
  - **Describe the change that resulted due to training**
  - **Estimate the value of that change (50K/year)**
  - **Estimate that % of the change due to training (50%)**
  - **Estimate your confidence in the training estimate (75%)**
  - **Training benefit = 50K/year x .5 x .75 = 18.5K/yr**
- **ROI = (benefits - costs)/costsx100**

The WETP had its first workshop on Advanced Training Technologies in April 1999. This was followed by competitive supplemental grants for the purpose of applications of ATT and a subsequent Lessons Learned Workshop on Advanced Training Technology in Health and Safety held in May 2000. Obviously, since then there have been extensive developments in communication and computer technologies with an ever-increasing emphasis on the application of these advancements to training.

ATT is now more commonly referred to as e-learning, which can be defined as the transfer of skills and knowledge via computer, tablet, or smartphone. It is called e-learning because technology distributes the knowledge or skill. E-learning has allowed evaluation to become shared among users and more interactive. With e-learning, information can be transferred in three ways: real-time, asynchronous, or blended synchronization. Blended synchronization is high level learning that combines decision-making and hands-on activity.

Tom Ouimet, Yale University, explained that the Kirkpatrick evaluation model is relevant to e-learning because it concerns itself with results, rather than the mechanisms used to accomplish the results. After this presentation a panel including Ted Outwater, NIEHS; Jamie Kirkley, WisdomTools Enterprises, Inc.; and Henry Ryng, INXSOL, LLC led a discussion focused on emerging e-learning evaluation tools and issues.

Donald Elisburg, National Clearinghouse, reminded participants that computer related information has moved in on us at warp speed, and that children learn in vastly different ways as they grow up in a technological world. We as training and evaluation professionals must recognize and understand these new ways of learning as we find new ways to measure training effectiveness.

Breakout Session Highlights

Subsequent breakout sessions discussed evaluation approaches for training underserved populations, learning theories and how they connect to evaluation approaches, and evaluating site specific training.

Evaluation Approaches for Training for Underserved Populations

This session focused on value of the Socio-Ecological Model (SEM) of evaluation to training programs serving underserved populations. SEM includes a 5-level approach (e.g., Intrapersonal, Interpersonal, Institutional, Community, and Policy) to training effectiveness evaluation. Utilizing this model can help to account for the challenges and barriers trainees from underserved populations must overcome to acquire the necessary knowledge and complete the training course, and give insight to training providers as to how to support trainee success. In other words, SEM helps to address the whole person.

SOCIO-ECOLOGICAL MODEL (SEM) TO EVALUATION

1. **Intrapersonal**
2. **Interpersonal**
3. **Institutional**
4. **Community**
5. **Policy**

Presenters in this session strongly emphasized the importance of story-telling as an evaluation tool. Linda Delp, UCLA-LOSH, asserted that stories tend to be more compelling than numbers in many cases. Ebony Turner highlighted the need to consider quantitative and qualitative data in evaluation. Turner commented that it is essential to "capture the human side" of trainees in collecting data for evaluation. The presenters also acknowledged a continuing challenge in attempting to quantify stories of trainees overcoming adversity, completing the training, and gaining employment. It was also noted that there are many resource limitations to such holistic approaches. Nevertheless, consideration of this qualitative information during the evaluation process helps to provide valuable insight into the true impact of the training program.

Learning Theories and How They Connect to Evaluation Approaches

The goal of the breakout session was to define theories and identify how and if theory-based approaches can assist evaluation programs. Learning theories in the WETP are commonly known as adult learning theories. This involves adults working best by doing and sharing experiences, solving immediate problems, working with other workers to improve content knowledge and skills, understanding value and purpose, and knowing that workplace training affects attitudes. Adult learning theory holds that the best training is done by peers and anything learned has to be applied. The amount of training performed is identified by need.

Lousie Weidner, UMDNJ, shared a blended learning approach, consisting of the development of curriculum structure, followed by implementation methods for the curriculum. Weidner noted that agile instructors are needed to implement the curriculum so that trainees know how success is defined. Also, core learning concepts of the training must be conveyed to determine trainee competency. In addition, instructors should be connected to the material and not isolated from it; this will allow the information to be conveyed to the trainees in the same connected format.

Kevin Riley, UCLA-LOSH, discussed cognitive learning theory. Riley identified cognitive learning theory as focused on changing a trainee's knowledge on a subject while also drawing on a trainee's experiences. Riley commented that training courses should be tailored to a particular group, and participatory exercises such as case studies, scenarios, and timelines should be used to have the trainees engaged in the subject matter. Post training, workers should be contacted via phone for follow up, added Riley. Training must be effective to become active and replicated in the workplace, Riley concluded.

Bob Feldman, OAI, Inc., presented the value of effective training through an ecological theory-based framework containing 5 levels. Each level represents factors to be considered in training development and implementation. The 5 levels include the following:

- **Level 1** – Knowledge, skills, and self-concepts
- **Level 2** – Interpersonal relationships, formal or informal (friends and family)
- **Level 3** – Formal regulation and operational directions
- **Level 4** – Community
- **Level 5** – Public policy issues

Feldman noted that the model involves asking 2 questions during the evaluation process: (1) are trainings affecting a trainee's performance and behavior? And (2) is the training learned also being brought into a trainee's home? In one of Feldman's case studies, survey results showed that many trainees brought the information into their homes, and taught their children how to be safe at home. Some trainees also share emergency response training with their neighbors.

Session attendees broke out into five workgroups to identify best practices and challenges with training and evaluations. The findings included:

- Instructor development, as opposed to only focusing on curriculum development, is very important so that instructors can adapt to new audiences and curriculum.
- E-learning is best when it is blended with hands on exercises. Classroom learning does have an advantage of being more cost effective.
- When determining how and when to use e-learning, learning objectives and the type of audience should be considered. For example, in the 40 hours HAZWOPER, e-learning can be used to convey basic facts and concepts.
- Information in a curriculum must be current, it must acknowledge different learning styles, and it must be tailored to the trainee audience.
- Audio and visual displays of information are more effective when they are repeated in the training.
- The training must have a real-world concept, and the topics must be applicable to real life occurrences.
- Follow up surveys on changed behaviors, and feedback from refreshers should occur.
- Expectations of management and trained workers should be clearly identified.
- The more different ways the information is conveyed can lead to a higher retention rate.
- Different audiences prefer different methods; some prefer lecture only, some prefer hands on only, and some prefer a blended approach.
- Positive, rather than negative, messaging should be used.
- Part-time instructors should be asked to comply with the same training methods as full-time instructors.
- Upon completion of training, trainees should be able to act out the lessons without thinking, and it should be second nature.

Evaluating Site-Specific Training

What are the keys to a good toolbox talk?

- **Pre-job briefings should be rotated so everyone trains and takes ownership**
- **Use a handout or a card as a reference**
- **Toolbox talks shouldn't be used to spread out an 8-hour refresher**
- **Training site should show respect to workers (not in a locker room**
- **NIOSH recommends case studies and involving specifics about the jobsite**

The discussion in this session focused on challenges and approaches related to evaluating site-specific training. Some of the challenges identified by participants included workers rushing through forms at the end of the day, difficulty evaluating hands-on activities, poor training facilities, equipment problems (e.g., e-learning tools), and commitment from management. The session also identified barriers to completing follow-up surveys. The barriers noted included, accessibility, communicating the importance of the survey, time, resources, and trust, among others.

Participants of the session worked to identify strategies to address the challenges related to site-specific training. Some of the strategies highlighted by participants included the following:

- Use focus group of stakeholders annually to review evaluations and develop new refresher training
- Allow more advanced students to present information during refresher courses
- Require participation in survey to get certificate upon completing course

- Limit access to web from tablets
- Consider age as a barrier to performing "dress-out" and use of newer technology in courses
- Conduct monthly debrief with trainers and provide trainers with results of evaluations

Participants were also asked to identify keys to good tool-box talk. Some of the suggestions included, rotating pre-job briefings to keep everyone engaged, handouts or cards as a reference, and case studies.

Next Steps for Advancing Evaluation

Workshop participants identified a number of important next steps for WETP and its grantees as they attempt to further advance worker training effectiveness evaluations, including the following:

1. WETP should create a "database" of evaluation instruments (public or private)
2. WETP should resurrect the WETP Compendium which included articles by and about our grantee training programs
3. WETP and its grantees need to focus specific attention to specific evaluation issues, including:
    - Improving response rates
    - Improving feedback loops between evaluators and those developing and delivering training, so that evaluation results are used to improve training
    - Developing more case studies/success stories from grantees

Future evaluation could also be strengthened by checking assumptions about participants' work environments, how training programs affect change, how programs lead to increased knowledge and skills, strengthened capacities and improved safety and health.

In addition, evaluation should be aligned with the values of participation and empowerment, and it should help participants become more critically aware of problems and what needs to be changed. Evaluation should be a vehicle for applying learning to program development.

CONCLUSION

The Evaluation Workshop brought together WETP awardees and other stakeholders to engage in dialogue about evaluation of worker safety and health training. Presentations and interactive breakout groups helped to increase awareness about the contributions of WETP awardees to the advancements in approaches to training evaluation. Participants also explored challenges to evaluation and strategies being employed by trainers. Participants gained useful insight into evidenced-based strategies and approaches that can be used to evaluate and improve the quality of their training programs.

Recommended Actions

- The next 5-year Funding Opportunity Announcement for the Worker Education and Training Program should require that Kirkpatrick Level 3 evaluation be done on at least one course per year.
- WETP should do an annual analysis of the evaluation information it obtains from grantees in the program evaluation reports in order to understand what, if any, new evaluation techniques or models are being applied by grantees. This analysis should be shared among the grantees so each can receive new ideas from others. At a minimum the analysis should build on the work begun in 2012 to develop grantee evaluation profiles.
- Grantees should demonstrate the value of the peer training model in the peer-reviewed literature.

APPENDIX A: WORKSHOP AGENDA

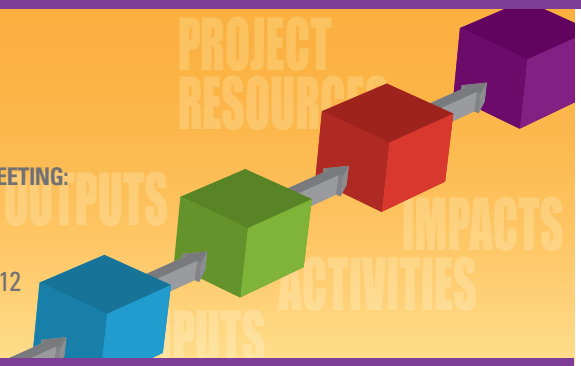
NIEHS
National Institute of Environmental Health Sciences

Prove It Makes a Difference:

Evaluation Best Practices for Health and Safety Training

AWARDEE MEETING: October 10

WORKSHOP: October 11–12



Worker Education and Training Program (WETP) Workshop Agenda • October 10–12, 2012

WEDNESDAY, October 10, 2012 ..... *Sheraton Chapel Hill*

6:00–7:30 p.m. **Reception and Poster Session: Grantee Evaluation Portraits**

THURSDAY, October 11, 2012 ..... *(101), Rodbell Auditorium*

8:00 a.m. **Shuttles depart Sheraton Chapel Hill Hotel for NIEHS Rall Building (101)**

8:00–9:00 a.m. **Registration**

9:00–9:15 a.m. **Welcome and Introductions** ..... *Rodbell Auditorium ABC*
Joseph "Chip" Hughes, Jr., NIEHS

9:15–9:30 a.m. **The Importance of Evaluating Safety and Health Training**
Joseph "Chip" Hughes, Jr., NIEHS

9:30–10:00 a.m. **Keynote Address: Current and Future Safety and Health Training Expectations Under 21st Century Workplace and Socioeconomic Conditions**
Craig Slatin, University of Massachusetts, Lowell/New England Consortium
Rappateur, Eula Bingham, University of Cincinnati

10:00–10:15 a.m. **Logic Models**
Kristi Pettibone, NIEHS

10:15–10:30 a.m. **WETP Logic Model**
Jim Remington, NIEHS

10:30–10:45 a.m. **Break**

10:45–11:05 a.m. **Findings from the Review of Awardee Evaluations**
Hannah Leker, former NIEHS Senior Intern

11:05 a.m.–12:30 p.m. **Evaluation Tools/Methods**
MODERATOR: Sharon D. Beard, NIEHS
Ruth Ruttenberg, Ruth Ruttenberg & Associates
Sue Ann Sarpy, Sarpy and Associates
Tobi Lippin, New Perspectives Consulting Group
Kevin Riley, UCLA-LOSH/Western Region Universities Consortium

NIH...Turning Discovery Into Health®

Worker Education and Training Program (WETP) Workshop Agenda *continued*

12:30–1:30 p.m. **Lunch** ..... *NIEHS Cafeteria*

1:30–2:00 p.m. **E-Learning Evaluation: Did they like it, did they learn it, did they change?**
Tom Ouimet, Office of Environmental Health and Safety, Yale University

2:00–2:40 p.m. **Response Panel and Discussion**
MODERATOR: Ted Outwater, NIEHS
Jamie Kirkley, WisdomTools Enterprises, Inc.
Henry Ryng, INXSOL, LLC

2:40–2:45 p.m. **Charge To Breakout**

2:45–3:00 p.m. **Break and Move to Breakout Sessions**

3:00–5:00 p.m. **Breakout Sessions**

- **Evaluation approaches for training with underserved populations** ..... *Rodbell Auditorium A*
  Linda Delp, UCLA-LOSH/Western Region Universities Consortium, Tipawan Reed, OAI, and Ebony Turner, Dillard University
- **Learning theories and how they connect to evaluation approaches** .... *Rodbell Auditorium B*
  Bob Feldman, UMD/OAI, Kevin Riley, UCLA-LOSH/Western Region Universities Consortium, and Louise Weidner, UMDNJ
- **Evaluating site specific training (toolbox talks, etc.)** ..... *Rodbell Auditorium C*
  Steve Fenton, Fenton & Associates, Bruce Lippy, CPWR and Sue Ann Sarpy, Sarpy & Associates

5:10 p.m. **Shuttles depart for Sheraton Chapel Hill Hotel**

FRIDAY, October 12, 2012 ..... *NIEHS Campus*

9:00–10:00 a.m. **Approaches to Training Evaluation—How Training Effectiveness Can Be Measured** ..... *Rodbell Auditorium ABC*
MODERATOR: Donald Elisburg, National Clearinghouse
Michelle A. Edwards, HAMMER/Mission Support Alliance
Paul Schulte, NIOSH
Tom McQuiston, on NIEHS
Cathy Cronin, OSHA

10:00–10:30 a.m. **Open Discussion with Panel**

10:30–10:45 a.m. **Break**

10:45–11:15 a.m. **Report Back from Previous Day's Breakout Sessions**

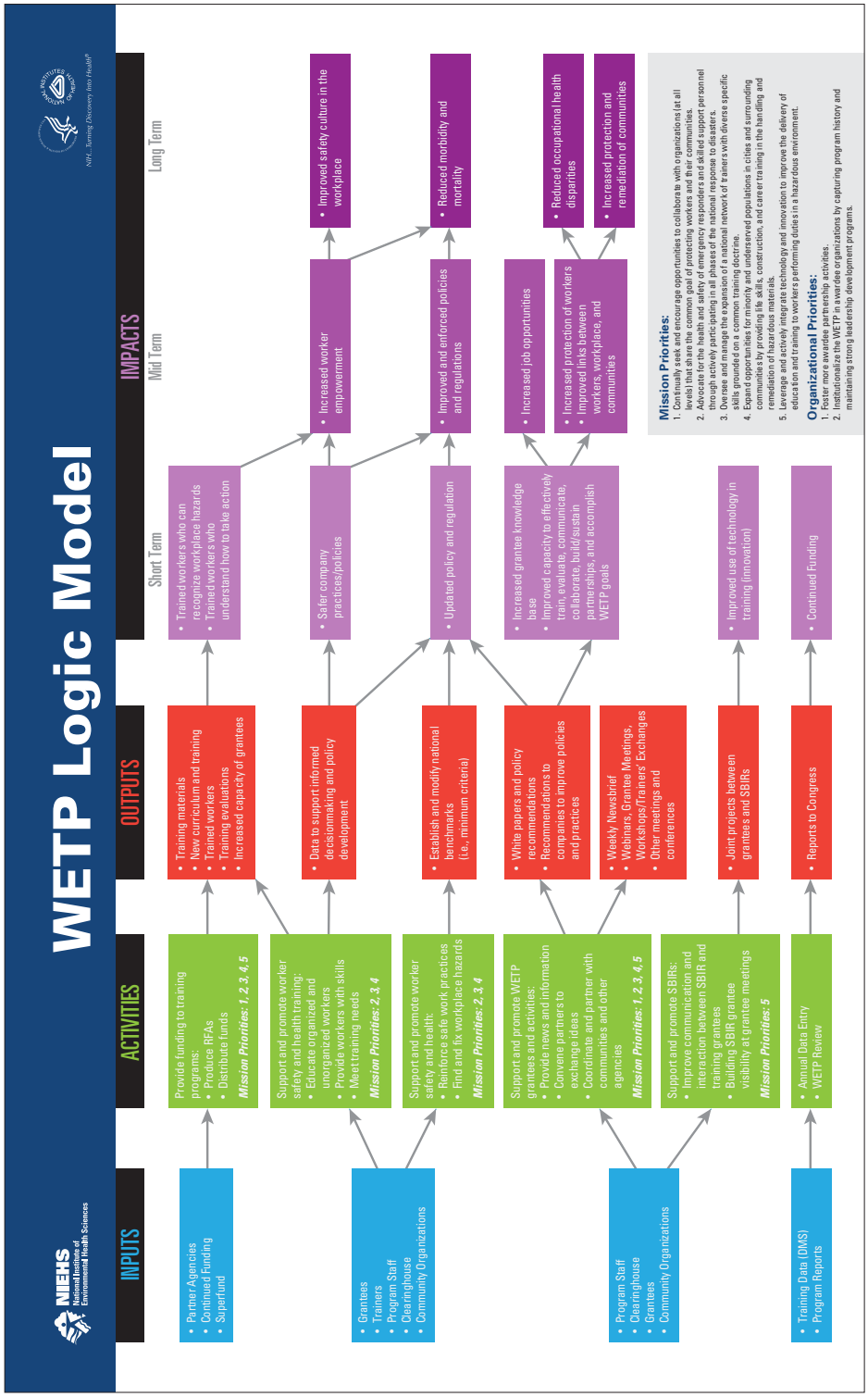
11:15–11:45 a.m. **Group Logic Model Feedback**

11:45 a.m.–12:15 p.m. **Next Steps, Wrap Up And Adjourn**

12:15–1:15 p.m. **Lunch** ..... *NIEHS Cafeteria*

1:15 p.m. **Shuttles depart for RDU airport & Sheraton Chapel Hill Hotel**

APPENDIX B: WETP LOGIC MODEL



The WETP Logic Model is also available online: http://tools.niehs.nih.gov/wetp/1/12FallMeeting/wetp_logic_model.pdf.

APPENDIX C: LOGIC MODEL FEEDBACK FROM WORKSHOP PARTICIPANTS

Inputs

- Can SBIRs provide training metrics to supplement DMS?
- Design Criteria on Evaluation Data Collection?
- Community Organizations (Identify and cultivate allies)
- Construction research funding (small grants program)
- Apprenticeship coordinators (reaching out to get their opinions)
- Federally-funded contractors (Tetra Tech, Veolia, CH2M Hill and others)
- Success Stories from MWTPs (photos, videos, etc.)
- Evaluation tools and results
- Foundations
- Americorps
- Affiliated Business Interest (risk management for municipalities)

Activities

- Compare to NIOSH Logic Model
- Educate Employers
- Communicate with Employers (find out what is important to their safety, not what you think is important)
- Anecdotal experiences
- Training to improve/increase reporting of hazards/ and tracking of near misses
- "Form the shape of content" – Ben Shahn
- Advice to Material for RFA (1st box)
- Evaluations should be structures (20% of RFA) (1st box)
- Use ARS systems to reduce non-responsiveness and barriers of literacy, and to perform quick audience analysis
- Use of ARS systems for instantaneous feedback (activity and output)
- SBIR – specific breakout session at grantee meetings (5th box down)
- Collect data and comment all activities (2nd , 3rd , 4th boxes)
- Create "smart" classrooms

Outputs

- Trainers more enthused about evaluation (more empowered to use evaluation)
- Ergonomics curriculum in SGAM
- Crane training, hands-on module and method
- Electrical safety trainers (skilled trades)
- Safety culture skilled trades focus on project evaluation by Univ. of Michigan
- Joint Projects with ICWU
- Fatality reports
- Systematic collection of examples of successes (homeless student becomes foreman)
- Providing training to workers who would not have the training if not for our program (specifically meth lab

awareness) (Alabama Fire College)

- Data should be expanded to emphasize stories (qualitative)
- Guidelines for NIEHS on what's needed in reports to Congress to support program (e.g., kinds of stories, other evaluations measures)
- Perform evaluation plans and generate reports
- Measure of number of folks who actually read/digest newsletters
- Determine what skills trained were actually used in workplace
- Survey supervisors of trained workers
- Collection of Anecdotal success stories
- Collective action for prevention
- Deconstruct "safety culture" and critically analyze it
- Resources for grantees to work with federal agency collaborators to develop rigorous, systematic ways to document stories and other qualitative data
- Increase worker involvement in incident investigation
- More mechanisms for communicating program activities, ideas, etc. to community orgs. (i.e. scholarships for community involvement in conferences)
- Facilitate "tin can" API records to program
  - Stickiness for students – records that follow them
  - Student collection of experiences

Impact

- Increased environmental awareness
- Reduced reportable accidents
- Evaluation of target audience needs by first talking to them before developing any training
- Funding – better understanding to exercise our constitutional rights
- Reduce injury death in short/mid-term (it's more than morbidity)
- Standardize evaluation process for e-training
- Employment enhancement
- Understand their engagement leads to employment (leads to several extended benefits)
- Increased reliance on evaluation data within workplace
- Governing bodies held to regulations in place
- Long-term: workers being safe at home as well as at work

Next Steps

- Bring together the qualitative and quantitative data.
- Research is a core part of what we've always done—this is an area where we try to figure out what the fine lines are.

National Institute of
Environmental Health Sciences