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Impacts of Health and Safety Education: Comparison of Worker Activities Before and After Training

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Abstract

Background—The International Chemical Workers Union Council (ICWUC) Center for Worker Health and Safety Education in Cincinnati, Ohio, trains workers to protect themselves from hazards due to chemical spills and other chemical exposures. We evaluated whether the ICWUC Hazardous Waste Worker Training Program affects the attitudes and post-training activities, of trained union workers.

Methods—Detailed survey questionnaires were administered to 55 workers prior to and 14–18 months following training. Surveys queried trainees' interest and involvement in safety and health, use of information resources, training activities at their worksite, and their attempts and successes at making worksite improvements.

Results—Post-training, the study population showed an increase in training of other workers, use of resources, attempts at improvements, success rates for those attempting change, and overall success at making improvements. Self-reported interest decreased, and self reported involvement in health and safety did not significantly change.

Conclusion—The study demonstrates that workers are more willing to attempt to change worksite conditions following training, and that their efficacy at making changes is substantially greater than before they were trained. The study confirms earlier work and strengthens these conclusions by using statistically tested comparisons of impact measures pre- and post-training.

Keywords

hazardous materials; safety and health training; training evaluation

INTRODUCTION

The International Chemical Workers Union Council (ICWUC), Center for Workers Health and Safety Education in Cincinnati, Ohio, trains workers to protect themselves from hazards due to chemical spills and other chemical exposures. The ICWUC training philosophy concentrates on providing interactive training that improves the ability of worker

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participants to solve health and safety problems at their worksites. The current study measures the impact of training by comparing attitudes, activities, and accomplishments prior to training with the same measures 24 months after workers have been trained. This study builds on an earlier evaluation of the ICWUC training program by McQuiston et al. [1994] with the significant addition of statistical comparisons of measures of impact post to pre-training.

The ICWUC training program operates as 1 of 18 centers funded by the National Institute for Environmental Health Sciences (NIEHS) to address the training needs of workers conducting hazardous materials response and remediation under OSHA's Hazwoper Standard (29 CFR 1910.120). While the standard itself contains relatively primitive suggestions for evaluation of training, (written tests, skills proficiency) [OSHA, 1988] occupational safety and health decision makers are increasingly looking to evaluations that examine impacts as measures of training effectiveness [Schulte et al., 1996]. As a group, these training programs have been supported by NIEHS to improve the reliability and validity of training evaluation. These efforts are part of a growing body of research and publications in the field.

McQuiston et al. [1994] reported that substantial numbers and percentages of workers followed through on training by using resources provided in the training, conducting training at their workplaces, identifying safety and health problems, obtaining changes in training or equipment, and improvement of handling of spills. This methodology reflected substantial improvement upon methodologies used in many earlier training evaluation studies that measure student satisfaction or student retention of information [Cohen and Colligan, 1998].

Since publication of the McQuiston study, other efforts have been made to evaluate the impacts of NIEHS funded Hazardous Waste Worker Training Programs. For example, an assessment of the impacts of training conducted by the New Jersey/New York Hazardous Materials Worker Training Center employed mail and phone surveys 6 months following training [Weidner et al., 1998]. They reported that workers believed that technical topics and hands on training were important in their training, that they had a high level of recall of information communicated in training, and that the training had significantly improved their ability to respond to actual hazardous material incidents.

While the NIEHS training programs continue to move away from defining impact as numbers trained, improved knowledge, and course evaluation by students, there remains a diversity of impacts measured by the training programs. Evaluations from 17 grantees in 1996 utilized a wide variety of measures including student evaluations of program, student self rating of proficiency, pre- and post tests of knowledge, changes in work site policies and practices, and activities such as use of resources and training of coworkers [McQuiston, 1996]. Similarly the methods of measuring impact are diverse, including interviews, survey, focus groups, and gathering of anecdotal stories [Cole and Brown, 1996]. While some of the training organizations asked participants if training had improved their effectiveness in reducing hazardous material hazards, none of the 17 evaluation studies compared information on impacts before and following training [Cole and Brown, 1996].

The National Institute for Occupational Safety and Health (NIOSH) TIER model of research on training effectiveness lists impact assessment as an important fourth research goal [Loos et al., 1999]. A NIOSH analysis of published evaluations of worker training efforts aimed at reducing chemical exposures indicates that 13 of 22 published studies measured self reported application of knowledge. Measurement of impacts of safety and health training remains the most difficult outcome for the training community to measure [Gotsch and Weidner, 1994; Robson et al., 2001].

The study of occupational safety and health training impact fits into a broader category of intervention research. Intervention research (or prevention effectiveness) is the study of planned and applied activities designed to produce designated outcomes by applying apply scientific methods to measure the impact of health interventions [Goldenhar and Schulte, 1994; Robson et al., 2001]. Such evaluation should carefully incorporate a theoretical basis for the intervention, an intervention powerful enough to be measured, a rigorous study design, valid measurement instruments, and appropriate use of statistical analysis [Goldenhar and Schulte, 1994].

The move from evaluating occupational safety and health training by student course evaluations and testing, to measuring of impacts has developed in tandem with important changes in workplace safety and health training philosophies. Three important developments have influenced training in recent years in ways that by definition must also influence the evaluation of these training programs.

The first of these is the growth within the worker training community of participatory or empowerment training. Increasingly, training by unions or labor education organizations seeks to empower workers to take an active part in making workplaces safe [Wallerstein and Baker, 1994]. This approach to training has a theoretical basis in a philosophy of participatory education described by Shor and Freire [1987]. This type of training sees trainers as facilitators in the development of knowledge that students possess through life experience, rather than communicators of a static body of knowledge. It is worker centered, emphasizes participatory and hands-on exercises, and seeks to motivate participants to remain active in improving their working conditions [McQuiston et al., 1994; Deutsch, 1996].

A second and related development is the increasing use of workers as trainers. The ICWUC and several other NIEHS sponsored training programs rely on worker trainers to both deliver training and to become the full time educational staff. This use of peer training in occupational safety and health has been reported to be more successful for increasing self-efficacy among trained workers than the use of professional trainers [Kurtz et al., 1997].

Thirdly, this philosophy of training becomes particularly important in light of increasing attention to the limits that worker training may face in the context of a variety of work place circumstances or systems. These systems may not be supportive of making changes that prevent injuries and illnesses to workers. This perspective takes a systems approach to workplace organizations and suggests that while worker training may be a prerequisite to improved safety at work, it can be significantly limited or enhanced by the organization to

which the training is applied [Ford and Fisher, 1994]. These limits to training appear to support the need for training workers beyond technical materials. Effective worker training should help workers become more effective in making work place changes. At the same time evaluation of training that is meant to create impacts on complex workplace systems must recognize the limited though critical role of training in overall work place safety and health programs [NIEHS National Clearinghouse, 1997].

The ICWUC program fits well into this scheme of intervention research, employing a participatory and empowering training approach and an evaluation methodology that seeks to measure impacts in the context of work place safety and health systems. In the context of the more typical reliance on professionals to solve health and safety problems, evaluation of this worker centered model of workplace change is particularly important.

METHODS

This study builds on the earlier evaluation of ICWUC training program [McQuiston et al., 1994] by comparing the measures of attitudes, activities, and accomplishments to measures of the same factors prior to training. Compared with the earlier study, this methodology provides a stronger test of the hypothesis that the training program impacts workplace health and safety but is not as powerful as a random- or quasi-experimental design, employing measures on a control population [Goldenhar and Schulte, 1994; Johnston et al., 1994; Robson et al., 2001]. There are few occupational safety and health training evaluations that compare impacts prior to and following training and employ a control population [Cohen and Colligan, 1998]. This reflects both the difficulties of choosing and obtaining responses from an appropriate control population and the relative newness of applying scientific methods to measure the outcomes of training.

The ICWUC Training Program

In 1987 the International Chemical Workers Union received a grant from the NIEHS to establish a training program for hazardous waste workers and chemical emergency responders. From its inception, this training Center was a consortium arrangement and was operated in cooperation with the United Steelworkers of America, the University of Cincinnati, and the Greater Cincinnati Occupational Health Center. Since that time the ICWUC Center for Worker Health and Safety Education has expanded to include the International Association of Machinists and Aerospace Workers, the Aluminum, Brick, and Glass Workers International Union, the American Flint Glass Workers Union, and the Coalition of Black Trade Unionists. The Center defines its long term goal as promoting workers' ability to solve workplace problems, develop union-based strategies for improving occupational health and safety conditions, and for its students to become and remain active participants in this process. The immediate educational goal of the classes is to provide students with the relevant tools, problem solving skills, and the confidence needed to use these tools in the workplace.

Training

Each class has approximately 22 students from 6 to 8 participating local unions who are first responders at their worksites to substantial releases of hazardous chemicals. Instruction includes a mix of classroom programs and hands-on activities with workers wearing encapsulating suits to simulate chemical emergency spills (using actual leaking pipes, drums, and valves). The curriculum is designed to be worker centered, non-threatening and structured to encourage the maximum student participation through adult education methods. The staff and worker/trainers act as facilitators with the participants' experiences and knowledge being the key resource. The Center has developed an extensive worker trainer program in which most of the educational staff has previously participated with most coming from the rank and file membership.

The ICWUC Center has developed effective hazardous waste and chemical emergency response curricula, two highly regarded "worker friendly" manuals, a train-the-trainer program and manual, an interactive three-segment video and flexible modular field training programs. The 4-day hazardous waste and chemical emergency response programs held at the Cincinnati Education Center are conducted by nine full-time staff and two part-time adjunct instructors. Center facilities include a large, well-equipped area where hands-on chemical emergency response simulation exercises are performed. A more detailed description of the Center's program can be found in the earlier study by McQuiston et al. [1994].

Survey Methodology

A survey questionnaire was administered at the ICWUC training center before individuals began training, and by mail and phone, 14–18 months following training. In order to avoid overlapping reporting of impacts by more than one respondent, this study included only one respondent per local union. Where more than one respondent was available from a local union, the respondent was randomly selected for inclusion in the study. Specifically, the attitudes, activities, and accomplishments questionnaire was distributed to participants the night preceding the 4 day training program and to commuting participants within the first hour of the first class (a small percentage of the total). These completed questionnaires were sent to Convergys Systems, a marketing research and database consulting service, for coding. Between 14 and 18 months after the initial training date, Convergys Systems mailed the same questionnaire to these same participants and followed up with four attempts to obtain a survey response by phone interview 2 weeks later. Random selection of respondents to be analyzed was conducted when responses were available for more than one respondent per local union. We are aware of no particular biases created by the sampling method used to obtain 55 paired responses for data analysis.

Survey Instrument

The survey instrument was developed to obtain self reported information on attitudes, activities, and accomplishments of ICWUC training participants 12 months prior to training and 12 month prior to administration of the post-training survey. The questions used in the current study were similar to those used in the earlier study [McQuiston et al., 1994].

Two questions requested scaled (1–10) information on levels of interest and involvement in making safety and health changes at their worksites. A second set of questions requested information on specific activities performed by worker participants. Information was obtained on whether participants used a number of health and safety resources. Resources measured were Material Safety Data Sheets (multiple sources), NIOSH Pocket Guide to Chemical Hazards [NIOSH, 1994], D.O.T. Emergency Response Guide [USDOT, 1996], National Fire Presentation Association Guide [NFPA, 1997], N.J. Hazardous Substance Fact Sheets [NJDOH, 1992], and a manual developed by the training center, ICWUC White Manual [ICWUC, 1998]. Additional questions asked for information on the quantity and content of training conducted by participants.

A third set of questions asked participants whether they had tried to make changes to work place practices and conditions such as respiratory protection, training in chemical hazards, availability of MSDS, labeling of chemical containers, storage of incompatible chemicals, supply of protective gloves, supply of protective suits, emergency response drills, decontamination procedures, and whether they had succeeded.

Analytic Methods

Questionnaire data was entered from written and phone surveys into SPSS statistical packages by Convergys Systems, and outputted in spreadsheet text format. The data was then imported into SAS JMP Discovery Software for analysis [SAS, 1998].

Mean scores for level of interest and involvement in making changes before and after training (scored 1–10) were calculated. Analysis of use of resources by ICWUC trainees compared the percentage and raw numbers of participants who reported using the various resources during the 12 months following training to the resources used in the 12 months prior to training (Table I). The ratio of numbers of participants using a resource post-training to number of resources used before training was calculated. Mean numbers of participants conducting training, mean numbers of workers trained per respondent, and mean number of hours of training by each respondent were calculated pre- and post-training (Table II). Ratios of these numbers post and pre-training were calculated.

Means for percentage and number of workers attempting and making worksite improvements were calculated for categories “any change” and for a variety of areas of safety and health changes imbedded as objectives in the ICWUC training program (Tables III and IV). For the purposes of this analysis responses were counted as “successful” if respondent stated improvement was “completed” or “in progress.” Ratios of numbers attempting and making improvements post to numbers attempting and making improvements pre were also calculated.

Success rates for changes in the identified categories were calculated for pre- and post-training surveys by dividing the number of workers reporting a success in making a change by the number of workers trying to make that change (Table V).

Statistical significance of differences pre- and post-training for mean interest and involvement in improving safety and health conditions, for numbers of workers trained per

respondent and for mean hours of training was determined by a matched pairs analysis using a t-test with a criteria of $P \leq 0.05$. Statistical significance for differences between pre- and post-training for resources used, number of workers conducting training, attempts to make improvements, success rates, successes at making improvements, reports of spills and spill related injuries, was determined by contingency analysis using likelihood ratios (chi-square) with a criteria of $P \leq 0.05$.

RESULTS

Analysis of survey results was based on 55 pre- and post-training surveys representing 55 separate local unions and worksites that were obtained between January and May, 1999. There was a 41% response rate for the survey.

Interest and Involvement

Mean levels of interest in making changes in safety conditions showed a significant decrease from pre- (9.2) to post (8.6) ($P = 0.03$) surveys on a 10 point scale measuring levels of interest. Mean involvement in making changes showed a non-significant decrease in score from 7.3 to 7.2 ($P = 0.81$).

Use of Resources by ICWUC Trainees

The mean percentage of ICWUC trainees using the various resources increased for each resource (Table I). Ratios of percentage for use post-training to pre-training ranged from lows of 1.2 for the MSDS sheets to 10.0 for the NJ Hazardous Materials Fact Sheet. The mean percentages for use of resources prior to training were generally less than 20%. One exception was Material Safety Data Sheets with a mean percentage of use prior to training of 69%.

Training Efforts of ICWUC Trainees

ICWUC trainees were significantly more active conducting training in their workplaces in the 12 months following training than in the 12 months before they were trained (Table II) and showed an increase from 8 to 27 (out of 55). The mean number of fellow workers trained per respondent increased more the fivefold from 1.7 to 8.7. Mean hours of training conducted by ICWU trainees increased more than tenfold from 0.3 to 3.5 hr per trainees. The differences for number who conducted training and mean number trained per respondent and mean hours trained per respondent were statistically significant at $P \leq 0.05$.

Health and Safety Improvements: Attempts, Successes, Success Rate

Significantly more ICWUC trainees attempted to make safety and health improvements post-training than in the 12 months preceding their trained (Table III). This change was significant for “any change” and all areas surveyed except for changes in emergency response drills. Overall, 56% of ICWUC trainees had attempted to make some change prior to their training while 89% attempted some change following training (ratio of 1.6).

The percentage of workers reporting attempts prior to ICWUC training, ranged from a low of 6% for decontamination procedures to a high of 29% for availability of MSDS. The

percentage of workers reporting attempts at change following training ranged from a low of 26% for supply of protective suits, to a high of 58% for attempting to obtain training in chemical hazards. The largest ratio of attempting change post to pre-training was for decontamination procedures (4.7). Lowest ratio of attempting change was for availability of MSDS sheets and emergency response drills (both 1.9).

The proportion of respondents succeeding at making improvements increased significantly following training for all the types of change with the exception of storage of incompatible chemicals and emergency response drills. The proportion of respondents succeeding for the all inclusive category “any change” doubled following training. The proportion succeeding prior to training in specific categories ranged from 4 to 22% while post-training the success rate ranged from 18 to 55% (Table IV).

The ratio of success rate post-training to pre-training for workers attempting any improvement (calculated as number of respondents successful/those who tried) for workers attempting any change was 1.2 (Table V). All subcategories except emergency storage of incompatible chemicals and response drills showed increases in success rate following training. For those subcategories where success rate increased, the ratio of increased ranged from 1.1 for decontamination procedures to 2.0 for supply of protective suits. The ratio of success rate post-training to pre-training for improvements in emergency response drill was 0.88.

DISCUSSION

Results of opinion questions concerning trainee interest and involvement demonstrate a high level of interest and involvement in improving health and safety conditions among the trainee groups prior to training. While the training cannot be shown to increase these variables, this result appears related to recruitment and selection processes for training that bring highly motivated workers to the ICWUC training. This decrease is slight and needs to be evaluated in light of the reports of actual activities discussed below.

The earlier study of ICWU trainees demonstrated high levels of usage of resources post-training [McQuiston et al., 1994]. The current study strengthens the association of this impact with participation in the training program by demonstrating statistically that workers who attend the training increase their use of these resources compared to their usage before training. As expected, the increases in use of resource for relatively uncommon resources (ICWUC White Manual and N.J. Hazardous Substance Fact Sheets) are greater than for resources that are more widely published and distributed. The relatively small improvement for use of MSDS sheets is most likely due to its high initial rate of use prior to training. With the exception of use of MSDS, participants are reporting considerable improvement in their use of resources.

This study also strengthens the earlier report that ICWUC trainees provide training to their co-workers following the ICWUC training course [McQuiston et al., 1994]. The measures of number conducting training, mean number trained per respondent, and mean hours trained per respondent are most likely interrelated measures that statistically demonstrate a change

in the collective effort of ICWUC participants to conduct health and safety training at their workplaces. This demonstrates the further dissemination of educational material beyond the immediate recipients of training. Future evaluations could be formulated more precisely to determine the nature of changes in training effort.

The evaluation of whether the ICWUC training changes the degree to which workers attempt and succeed at making safety and health changes in their workplaces most closely reflects the empowerment and participatory training philosophy of the ICWUC training program. It is important to note that while respondents self report a statistically significant decrease in self reported interest and non-statistically significant decrease in involvement in making improvements in their work, their actual involvement in making improvements as measured by reported attempts to make specific improvements (Table III), increased significantly following training. That is, trainees' subjective reports of degree of involvement as measured in a scaled question are not consistent with their reports of actual involvements. This finding raises questions about the usefulness of traditional scaled subjective questions concerning motivation. From an impact evaluation perspective, reports of actual involvement are more important than reports quantifying a general level of interest in making improvements. Alternatively participants may be already involved and interested but in areas other than the ones targeted by this program.

Apparently, participation in the ICWUC training increases workers' ability to translate pre-existing general interest and involvement into action. It may be argued that this increase in activity can be explained by an increase in confidence, knowledge, and skill gained by the ICWUC trainees during their training. The significant improvements reported for attempts to make change comes on top of a relatively high baseline of workers attempting to make any change prior training. Although the percentages of workers reporting attempts to change post-training is statistically higher than prior to training, the percentages of attempts post in this study are somewhat lower than those reported by McQuiston et al. [1994].

Equally important in understanding the impact of the ICWUC training is the result showing significant increases following training in the rate of success for workers who try to make safety and health changes (Table V). The training program appears to improve the efficacy of workers who attempt to make workplace change. It would be of interest to see if less participatory methods are equally effective however it is difficult to implement and recruit for such a program given the widespread belief among the membership and the Center's staff that these programs are worthwhile to attend while less participatory methods are less desirable. Another limitation of this analysis is that differences between labor and management were not addressed since all participants are union members.

While this study demonstrates substantial and significant increases in use of resources, training efforts, attempts at making worksite changes, success rate of trainees, and aggregate impact of training on accomplishments of trainees, the sub analyses of issue areas show variation of impact. These variations should be examined as formative information for further investigation. Other suggested questions for future research include:

a. what are the factors that motivated people who did not try to make change pre-training to now go out and attempt to make changes in specific areas?

b. how did the program improve the success rate for those workers who demonstrated high motivation and success pre-training?

Issue or topic areas showing relatively low improvement should be examined to determine if relatively low impact is due to serious barriers in the worksites, relatively low perceived need for specific areas, other factors we have not considered, or whether impacts in these areas can be improved by training. These analyses are beyond the scope of the current study.

CONCLUSIONS

This study of the ICWUC training program confirms suggestions by an earlier study [McQuiston et al., 1994] that the program increases the use of hazardous materials resources, and increases the quantity of training conducted by participants. More importantly the program appears to increase trainees' self confidence or willingness to make safety and health improvements and their effectiveness at making these improvements. In the aggregate more workers tried and succeeded at making changes following training, leading to a suggestion that the training has contributed to substantial improvements in workplace conditions. While the study lacks the rigor of an experimental model, its replication of earlier results and the addition of statistical comparisons of impact measures pre- and post-training, increase the strength of the hypothesis that the ICWUC training program impacts workplaces in important ways likely to be protective of workers' health and safety.

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TABLE I

Resources Used by Trainees Before and After Training; Chemical Workers (n = 55 Workers)

Resource used	Pre%/(n)	Post%/(n)	Ratio post/pre	*P*-value[a]
ICWUC white manual	4 (2)	33 (18)	9.0	<0.0001
Material substance data sheet	69 (38)	83 (46)	1.2	0.07
NIOSH pocket guide	11 (6)	87 (48)	8.0	<0.0001
D.O.T. emergency response guide	15 (8)	45 (26)	3.3	0.0003
NFPA guide	9 (5)	56 (31)	6.2	<0.0001
N.J. hazardous substance fact sheet	4 (2)	36 (20)	10.0	<0.0001

[a]Contingency analysis: Likelihood ratio probability > chi-square.

TABLE II

Training Conducted by Students Before and After Training; ICWUC Chemical Workers (*n* = 55)

Training measure	Pre	Post	Ratio post/pre	*P*-value
Number who conducted training	8 (15%)	27 (49%)	3.4	<0.0001[a]
Mean number trained per respondent	1.7	8.7	5.1	0.01[b]
Mean hours trained per training	0.3	3.5	11.7	0.0024[b]

[a] Contingency analysis: Likelihood ratio probability > chi-square.

[b] Matched pairs: Probability > t.

TABLE III

Percent of Chemical Workers Trainees Attempting to Make a Health and Safety Improvement Before and After Training (n = 55 Workers)

Area of attempted improvement	Pre%/(n)	Post%/(n)	Ratio post/pre	*P*-value[a]
Any improvement	56 (31)	89 (49)	1.6	<0.0001
Respirator Protection	15 (8)	49 (27)	3.4	<0.0001
Training in chemical hazards	18 (10)	58 (32)	3.2	<0.0001
Availability of MSDS	29 (16)	56 (31)	1.9	0.0036
Labeling of chemical containers	24 (13)	56 (31)	2.4	0.0004
Storage of incompatible chemicals	13 (7)	42 (23)	3.3	0.0005
Supply of protective gloves	13 (7)	46 (25)	3.6	0.0001
Supply of protective suits	9 (5)	27 (15)	3	0.0118
Emergency response drills	16 (9)	31 (17)	1.9	0.0708
Decontamination procedures	6 (3)	26 (14)	4.7	0.0027

[a]Contingency analysis: Likelihood ratio probability > chi-square.

TABLE IV

Percent of Trainees Making Worksite Improvements Before and After Training* (n = 55 Trainees/Locals)

Area of improvement	Pre%(n)	Post%(n)	Ratio post/pre	*P*-value[a]
Any improvement	42 (23)	82 (45)	2.0	<0.0001
Respirator protection	9 (5)	36 (20)	4.0	0.0005
Training in chemical hazards	7 (4)	44 (24)	6.0	<0.0001
Availability of MSDS	22 (12)	49 (27)	2.3	0.0025
Labeling of chemical containers	18 (10)	55 (30)	3.1	<0.0001
Storage of incompatible chemicals	12 (7)	35 (19)	2.7	0.0063
Supply of protective gloves	9 (5)	44 (24)	4.8	<0.0001
Supply of protective suits	4(2)	22 (12)	6.0	0.0027
Emergency response drills	11 (6)	18 (10)	1.7	0.2772
Decontamination procedures	4 (2)	18 (10)	5.0	0.0109

*Percentage successful includes changes completed and in progress.

[a]Contingency analysis: Likelihood ratio probability > chi-square.

TABLE V

Success Rate of Improvements Attempted Before and After Training (n = 55 Trainees/Locals)

Type of improvement attempted	Pre% (n success/n try)	Post% (n success/n try)	Ratio success rate post/ success rate pre
Any improvement	74 (23/31)	91 (45/49)	1.2
Respirator protection	62 (5/8)	74 (20/27)	1.2
Training in chemical hazards	40 (4/10)	75 (24/32)	1.9
Availability of MSDS	75 (12/16)	87 (27/31)	1.2
Labeling of chemical containers	76 (10/13)	97 (30/31)	1.3
Storage of incompatible chemicals	100 (7/7)	82 (19/23)	0.82
Supply of protective gloves	71 (5/7)	96 (24/25)	1.4
Supply of protective suits	40 (2/5)	80 (12/15)	2.0
Emergency response drills	66 (6/9)	58 (10/17)	0.88
Decontamination procedures	66 (2/3)	71 (10/14)	1.1