

**Development of a Systematic Process to Evaluate the Effectiveness of
Environmental Health and Safety Training at XYZ Medical Center**

by

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ABSTRACT

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An effective Environmental Health and Safety (EHS) training program can result in fewer employee injuries and illnesses, better morale, and lower insurance premiums among other benefits. The purpose of this study was to analyze the practices utilized by XYZ Medical Center to evaluate the effectiveness of EHS training with respect to preferred evaluation practices. This was accomplished through a survey, which was sent to staff in the Safety Department at XYZ Medical Center. The survey was created using preferred evaluation practices, which were identified as the Kirkpatrick four level model. This model was modified by subsequent researchers by adding a fifth level called return on investment and renamed the Phillips model.

The objectives of the study were to:

1. Identify preferred training evaluation practices through a thorough literature review.
2. Evaluate the extent that EHS trainers at XYZ Medical Center are using preferred evaluation practices.
3. Develop a formal EHS training evaluation process for XYZ Medical Center.

It was identified that current EHS training evaluation practices appeared to be inadequate with respect to preferred evaluation practices and a process to evaluate the effectiveness of EHS training programs was presented.

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CHAPTER I: INTRODUCTION

The setting of this study was XYZ Medical Center, a large medical facility in Midwestern America. The medical center includes two hospitals with approximately 2,000 hospital beds, 250 research and clinical laboratories, and a large outpatient clinic. To maintain the organization, several support facilities and processes are required. Some of these support facilities include power plants, warehouses, recycling facilities, and a waste incinerator. Nearly 30,000 people are employed at this medical center in a variety of occupations.

Employees at the organization encounter various processes and activities, some of which are potentially hazardous. Environmental Health and Safety (EHS) policies and programs have been implemented to minimize hazards and to assist in compliance with the requirements of accreditation and regulatory bodies. Included in many of these EHS programs are requirements for employee training. The primary methods of delivering EHS training within the organization are through lecture, intranet, CD-Rom, and videos.

The benefits of a high-quality EHS training program are recognized within and outside the organization. The 2003 strategic plan for the organization's safety department lists, "Develop and implement methods to evaluate effectiveness of safety training" as an improvement opportunity (Internal, 2003). A training program evaluation process helps insure that training is being performed correctly and is meeting organizational goals. (Crucefix, 2001) A detailed evaluation will also help justify training costs and enable the organization to calculate return on investment. Evaluating the effectiveness of training can identify areas where training needs improvement and may also provide insight on ways to improve it (Machles, 2003).

Training is a frequently utilized tool in the prevention of injuries because it can be used to develop knowledge, skills, and safe behaviors (Nickols, 2000). Several EHS regulations and accreditation standards require training (Keller, 2003). Some of these standards also require a system to evaluate the effectiveness of the training. Every employee at XYZ Medical Center is required to have EHS training. Many of these individuals have multiple exposures to potential hazards and therefore require training on several EHS topics.

At the time of this study, nineteen mandatory EHS training programs existed for multidisciplinary groups of employees. This number does not include department specific or small scope training topics. Consistent and uniform training evaluation procedures did not exist for these programs.

Even though EHS training is conducted, many accidents and injuries continue to occur, possibly indicative of ineffective training or some other factor not yet determined. This study will attempt to develop a process to evaluate the effectiveness of EHS training, regardless of delivery format, in an effort to meet training objectives designed to increase employee safety.

Statement of the Problem

The current EHS training system at XYZ Medical Center may not be effective at identifying successful training program components, opportunities for improvement, and techniques to construct successful EHS training programs.

Purpose of the Study

The purpose of this study was to investigate the practices utilized by XYZ Medical Center to evaluate the effectiveness of EHS training with respect to preferred

evaluation practices. This evaluation will lay the groundwork to begin the process of developing an effective EHS training evaluation system.

Objectives of the Study

The objectives of the study are to:

1. Identify preferred training evaluation practices through a literature review.
2. Evaluate the extent that EHS trainers at XYZ Medical Center are utilizing preferred evaluation practices.
3. Develop a formal EHS training evaluation process for XYZ Medical Center.

Significance of the Study

Program costs and impact on workplace injuries and illnesses are very important factors in EHS training programs. According to OSHA (1998), resources spent on training are a good investment and that evaluation can give employers the necessary information to determine if the training was effective and should be offered again in the future. Without a system to evaluate the effectiveness of training, the results of ineffective employee safety training programs may not be identified for years (Crucefix, 2002). Spending money on ineffective training programs reduces available capital to invest in effective programs. The United States businesses spent an estimated 54.2 billion dollars on formal training programs in 2002; this was a 2.6 billion dollar decrease from 2001 (Galvin, 2002). Training programs that have evidence of effectiveness will be more insulated from budget cuts and the costs related to training can be more easily justified (Crucefix, 2002).

One of the work teams within the Safety Department at XYZ Medical Center (Occupational Safety Team) tracked the time spent preparing and/or conducting training

during the first quarter of 2004 (Internal, 2004). The results of this exercise averaged over 26 hours or 5.1% of total work-time spent training during the first quarter. It is likely that this team is representative of the training practices for the entire Safety Department throughout the year. If this information is extrapolated onto the entire Safety Department for the year, it is likely that more than \$101,000 will be spent on staff salaries and benefits to conduct EHS training.

Limitations of the Study

Limitations of the study include:

1. Simply evaluating training will not increase safety. The organization will need to use the data as a method to continuously improve the training process, which should lead to a safer work environment.
2. Higher-level evaluations gather more beneficial information but require greater effort (Kirkpatrick 1998, Phillips 2002).
3. This organization is very large and has limited staff to implement the training evaluation process.
4. The subset of the XYZ Medical Center Safety Department that tracked training activities during first quarter 2004 is representative of the group as a whole.

Chapter II: REVIEW OF LITERATURE

Introduction

Training in America boasts a long and remarkable history. The industrial revolution began in the 1700s, and with it, a new focus on worker training emerged. The 1800s brought about a social transformation in the form of moving individuals into the corporate organization and training people to work at specific tasks became a necessity. Beginning in the late 1800s several industrial developments, such as the invention of the electric motor, the internal combustion automobile engine and eventually the assembly line, increased the need for worker training. The National Society for the Promotion of Industrial Education was formed in 1906 and in 1911 Fredrick Taylor published *The Principles of Scientific Management*. The first cars rolled off the assembly line at Ford Motor Company in 1913 followed by the start of World War One in 1914. In 1942, the American Society of Training Directors (ASTD) was formed. The ASTD focused on leading government and business in understanding that learning is the key to competitive improvements for organizations and individuals. In 1959, ASTD published one of the first articles that focused on business outcomes resulting from training written by Donald Kirkpatrick.

Training throughout history has been used for large variety purposes. Bloom (1956) indicates that trainers are able to teach in three domains; knowledge (cognitive), skills (psychomotor), and attitudes (affective). Blooms taxonomy notes that people learn through some interaction with a media. Thomson (2002) indicates that people learn differently based on the media they are subject to and combining the types of training media can increase the comprehension of the training. According to Nickols (2000) some additional purposes of training may include:

1. Focusing energy on issues.
2. Making work and issues visible.
3. Supporting other interventions.
4. Legitimizing issues.
5. Promoting change.
6. Reducing risk.
7. Creating a community based on some shared experience.
8. Building teams.
9. Indoctrinating new staff.
10. Communicating and disseminating knowledge and information.
11. Certifying and licensing.
12. Rewarding past performance.
13. Flagging “fast trackers.”
14. Developing skills

Training Elements

Several training systems are cited in the literature and all have slightly different views on the elements of an effective training system (Cohen & Colligan, 1998). Three EHS specific training systems were found during a literature search. The three EHS training systems identified were the ANSI, NIOSH, and OSHA systems. The key elements of these systems are outlined below.

The NIOSH system (Cohen et al.)

1. Needs Assessment
2. Establishing Training Objectives

3. Specifying Training Content and Media
4. Accounting for Individual Differences
5. Specifying Learning Conditions
6. Evaluating Training
7. Revising the Training

The OSHA System (OSHA 1998)

1. Determining if Training is Needed
2. Identifying Training Needs
3. Identifying Goals and Objectives
4. Developing Learning Activities
5. Conducting the Training
6. Evaluating Program Effectiveness
7. Improving the Program

The ANSI Z490.1-2001 standard: Criteria for Accepted Practices in Safety, Health, and Environmental Training

1. Training Program Administration and Management
2. Training Development
3. Training Delivery
4. Training Evaluation
5. Documentation and Record Keeping

All three of these systems have similar fundamental or key elements. The key elements identified include a series of five components: needs assessment, learning objectives, presentation of training, evaluation of effectiveness, and process

improvement. These five components are reviewed in the following paragraphs. The evaluation of effectiveness component is given its own section titled “The Evaluation Process.”

A needs assessment is the first step for any program design (Phillips, 1997). If a program is going to be effective, it must meet the needs of the participants (Kirkpatrick, 1998). Various techniques can be used to assess needs (Leatherman, 1990). The process consists of using interviews or surveys of essential people in the training process and reviewing pertinent regulations to identify needs. According to Newton (2002), these requirements can be identified by answering four questions; Is the training a one time event or is refresher training required, How long should the training sessions last, and what topics are required to be covered. The result of the needs assessment should be a description of the performance and/or regulatory compliance deficiencies of the intended audience. The data collected from the needs assessment should be tabulated and presented in a practical format.

Once the training requirements have been determined through a needs assessment, the second element is finalizing the goals and objectives of the training (Newton, 2002). According to Kirkpatrick (1998), objectives should be set for three different aspects of the program. The three aspects include: what you are trying to accomplish, behaviors you want supervisors and managers to exhibit in order to accomplish the results, and the knowledge, skills, and attitudes you want participants to learn in the training program.

The third element in the training program is the actual presentation of the training. To be effective, the training presentation should address how people learn. According to Brauer (1994), the training should address the principles of learning addressed in this

paragraph. The training should stimulate multiple senses such as visual and auditory depending on the required input rate of the material and should fit the individual needs of the participants. The objectives should be stated clearly and the content presented logically in the proper sequence. Principles should be taught with procedures to help employees retain knowledge longer. The entire process should initially be taught followed by specific details. The trainees should have time to practice any skills that are being taught but the practice sessions should be kept short. If performance is the goal, participation should involve all trainees. The trainees should know how they are doing throughout this process and the correct performance should be rewarded. Trainees will perform better if they are interested and challenged. Any simulations should duplicate the actual conditions as realistic as possible. The unique or unusual material will be retained longest but opportunities for relearning will help sustain knowledge (Brauer, 1994).

The fourth key element in the training program is the evaluation process, which will be discussed in detail in the next section titled, "The Evaluation Process." The fifth key element in the training program is process improvement. If it is clear that the employee's level of knowledge or skill did not reach expectations it may be necessary to revise the training program. According to OSHA (1998) answering four questions will assist in improving the training program; were parts of the content already known, what material was confusing or distracting, was anything missing from the program, and what did the employees learn or fail to learn from the program.

EHS Training

According to the US Bureau of Labor Statistics (BLS, 2004) in 2001, 5,915 work-related fatalities occurred, excluding the 2,886 work-related fatalities that resulted from the September eleventh terrorist attacks. In 2002, 5,524 work-related fatalities and 4.7 million nonfatal injuries and illnesses were reported by businesses in the United States (BLS, 2004). These workplace injuries not only affect the health of employees but these injuries affect income. The National Safety Council reports that work injuries cost Americans \$131.2 billion in 2000; this collectively exceeds the combined profits of the top thirteen Fortune 500 companies (2000).

Training is frequently used as an injury prevention technique (Nickols, 2000). According to OSHA (1998), training is time and money well spent and the employer should regard it as an investment rather than an expense. Effective EHS training can result in fewer injuries and illnesses, better morale, and lower insurance premiums, among other benefits. OSHA (1998) indicates that if ignorance of hazards is a contributor to accidents and injuries, then training will help provide a solution. In a NIOSH sponsored literature review, overwhelming evidence of increased knowledge of job hazards, safer work practices, and many other positive outcomes were identified (Cohen & Colligan, 1998).

Robotham (2001) indicates that workers without EHS training are at high risk for workplace injuries and illnesses and that ineffective training may lead to death, injury, and lost profits. For these reasons, several EHS regulations and accreditation standards require training (Keller, 2003). NIOSH indicates that more than 100 OSHA standards for hazard control in the workplace contain requirements for training aimed at reducing risk

factors for injury or disease (Cohen & Colligan, 1998). Some of these and other EHS standards also require a system to evaluate the effectiveness of the training.

The Evaluation Process

Several training evaluation systems were identified during the literature search phase of research. The most frequently occurring training evaluation systems were the CIPP Model, Kaufman's five levels, the Kirkpatrick model, and Phillips five levels. (Phillips, 1997). The CIPP model is an acronym for the four basic types of evaluations in the model. Context, Input, Process, and Product are the four evaluations in the model. The context evaluation in the CIPP model refers to evaluating the appropriateness, social acceptability, and adequacy of the program objectives. The input evaluation refers to evidence and support of the program. In the input evaluation, support could be theoretical or empirical in nature. The CIPP process evaluation step is designed to evaluate the success of the implementation process and how well implementation procedures were followed. The final step in the process, product evaluation, is designed to evaluate the knowledge, skills, abilities, behavior change, and the satisfaction of the participants (Matthews, 2001).

Kaufman's five levels is a revision of Kirkpatrick's four levels, which moves beyond the organization and attempts to measure advancement of the society and surrounding environment (Phillips, 1997). The evaluation system used in this study is the Kirkpatrick/Phillips model. According to an ASTD benchmarking forum, 67 percent of multinational companies that conduct evaluations use the Kirkpatrick model (Santos & Stuart, 2003).

An evaluation is a systematic process to determine the worth, value, or meaning of an activity or process (Phillips, 1997). According to Kirkpatrick (1998) the evaluation process consists of a series of four levels. The levels, in order, are reaction, learning, behaviors, and results respectively.

Evaluating reaction usually consists of having a trainee fill out a reaction or perception survey or interviewing the trainee to identify their reaction to the training program (Kirkpatrick, 1998). Evaluating reaction and evaluating customer satisfaction are synonymous. Evaluating reaction is important for a variety of reasons. Comments and suggestions are collected as feedback to improve the program future sessions. Kirkpatrick (1998) recommends several guidelines for effective reaction evaluations. Reaction evaluations should ask what you want to find out in a format that will easily quantify the resulting data. Written comments should be encouraged and all participants should contribute. An acceptable standard should be developed for comparison and the reactions should be measured against that standard.

According to Kirkpatrick (1998), instructors can teach three things: knowledge, skills and attitudes. Therefore, evaluating learning means to determine if knowledge was gained, skills developed or improved, or were attitudes changed. Learning should be measured before and after the training to determine the effect of the training. A standard pre and posttest can be used for evaluating knowledge; however, if a particular skill or skills are to be evaluated then a performance test should be administered. Evaluating learning is extremely important because without learning a behavior change will not occur (Kirkpatrick, 1998).

When participants in a training program return to their jobs, changes may or may not have occurred. The behavior evaluation level attempts to quantify changes in behavior as a result of a training program. Evaluating behavior is very important because it measures how well the training actually transfers to the workplace (Machles, 2003). Behavior change requires a desire to change, necessary knowledge and skills, the right job climate, encouragement, and rewards for change. Many factors play a role in the climate of the job and supervisors are critical in the process. Supervisors can create a climate that is preventing, discouraging, neutral, encouraging, or requiring of a behavior change. For a behavior change to occur in the workplace, the supervisor must create a climate that is at least neutral or better (Kirkpatrick, 1998). It is important to allow enough time for a behavior change to take place before measuring.

Arguably the most important step is the fourth level of evaluating results. Some examples of results are increases in quality and productivity, decreased employee turnover, increased quality of work life, decreased accidents and injuries, and decreased workers compensation claims. The outcomes gained in this evaluation usually provide evidence supporting a positive or negative result. It is difficult to obtain absolute proof that a training program accomplished a desired result so it is important to be satisfied with evidence if proof is not possible (Kirkpatrick, 1998). A control group is used if possible and it is critical to conduct measurements at appropriate times.

According to Phillips (2002) an additional fifth level to the Kirkpatrick model actually exists called return on investment (ROI). Many expectations for training have changed dramatically, the most pronounced change is new and vigorous justification of the cost of training based on ROI and organizational impact (Brown, 1997). Phillips five

levels include reaction, learning, behaviors, results, and ROI respectively. ROI focuses on isolating the effects of the program and converting the data into monetary values. All possible program costs are captured and the intangibles such as improved public image, increased job satisfaction, and improved teamwork, are identified typically through the use of a cost summary tool (Phillips, 2002). The net program benefits are divided by program costs and multiplied by one hundred. The calculation results in a percentage of net benefits after costs are covered. The ROI process is similar to that of cost-benefit ratio. The cost-benefit ratio is simply the result of program benefits divided by program costs. The final step of the ROI process is communicating the results to appropriate parties. Measurement of costs and benefits does not mean anything without communicating the results appropriately (Phillips, 2002). Communication is necessary to make improvements and to show accountability in the programs.

As the evaluation level increases so does the level of difficulty and expense. It is not feasible to evaluate all programs at all the levels. Phillips (2002) suggests evaluation targets for each of these levels.

- 100 percent of EHS programs should be measured for **Level 1** -Reaction
- 70 percent of EHS programs should be measured for **Level 2** -Learning
- 30 percent of EHS programs should be measured for **Level 3** -Behavior
- 20 percent of EHS programs should be measured for **Level 4** –Results
- 5-10 percent EHS programs should be measured for **Level 5** –ROI

Why Evaluate?

According to Crucefix (2001), a detailed evaluation will help to justify any costs associated with training. An evaluation system can make it possible to improve future

training. Phillips (1997) indicates that the evaluation process will enable an organization to identify strengths and weaknesses and to compare costs to benefits of the program. An evaluation system can also be used to gather data to make management decisions about future training programs and can determine if training was the appropriate solution for a specific need.

Many large organizations have adopted evaluation practices with great success including Commonwealth Edison, Eastman Chemical Company, First Union National Bank, Intel, IBM, Kemper Insurance, Lenscrafters, Motorola, Nortel, and Texas Instruments (Kirkpatrick 1998, Phillips 1997). First Union National Bank utilized the Kirkpatrick model to evaluate a new employee development program. The evaluation process identified that participants learned the information presented and were using their newly acquired skills. The evaluation process also identified that more participants than non-participants were staying at First Union after the training. These outcomes resulted in a one million dollar savings to the company.

Since Intel Corporation implemented the Kirkpatrick model they were able to improve their needs assessment, design, and evaluation processes. Intel was also able to demonstrate the impact of their training on their primary business indicators (Kirkpatrick 1998).

Evaluation is so important to Motorola that the organization created a separate department called Motorola University. Motorola adopted the Kirkpatrick model and has implemented the evaluation system worldwide.

Smaller organizations have also achieved very good results using best practices to evaluate their training programs. Healthcare Inc., a regional provider of healthcare

services was able to measure a dramatic ROI (Phillips, 1997). The process began with evaluating the previous year's data regarding sexual harassments issues. A training program for all first and second line managers was conducted with the goal of requiring these managers to provide the same training for their employees. A standard pre and posttest level-2 learning evaluation was conducted. The information collected in the level-2 evaluation supported the information gathered in the needs assessment. The results showed that before the training sessions, much of the management staff did not know or understand the sexual harassment policy. After the training was completed, the learning evaluation illustrated a 65 percent increase in knowledge. The level-3 evaluation consisted of a sending a standardized questionnaire to 25 percent of the non-supervisory employees. The rating from the level-3 evaluation was exceptionally high achieving an average score of 4.1 out of 5 with 5 being the most positive reaction. The level-4 business impact demonstrated decreased employee turnover due to reasons of sexual harassment or hostile work environment. The level-5 ROI was calculated at 1,052 percent primarily due to decreases in internal complaints, external charges, and litigation (Phillips, 1997).

Otto Engineering, a small manufacturing company in Illinois, was able to measure improvements and resulting benefits from a workforce education program. The first step in measuring these benefits was to perform a standard pre and posttest level-2 evaluation system for all workers. As the education levels of the workers increase so did quality and productivity. A correlation was then identified between production, quality, and education. The company then began to increase pay with increases in education. Some of the benefits Otto Engineering captured were lower injury claims, improved

productivity, and less scrap. These benefits were compared to training costs and the entire training program was calculated to have a 4.5-month payback timeframe.

Summary

Evaluating the effectiveness of training can help identify the value of training programs, techniques to improve training programs, and the value of training resources to the organization. Training evaluation programs have successfully benefited both massive corporations and tiny businesses in accomplishing goals. These benefits are understood and have been adopted by organizations such as ANSI, OSHA, and NIOSH. The ANSI, OSHA, and NIOSH training evaluation systems all incorporate the Kirkpatrick model to varying degrees in their evaluation systems.

Chapter III: METHODS AND PROCEDURES

Introduction

The methods and procedures used in the study are explained in this chapter under the headings of (1) method of study, (2) sample selection, (3) instrumentation, (4) procedures followed, and (5) method of analysis.

Method of Study

It was identified that a formal EHS training evaluation system did not exist at XYZ Medical Center. It was hypothesized that the current EHS training evaluation system at XYZ Medical Center may be ineffective at identifying successful training program components, opportunities for improvement, and techniques to construct successful EHS training programs. A literature review was conducted to ascertain the benefits of an EHS training evaluation system and to determine preferred evaluation practices. As indicated in Chapter II, preferred evaluation practices were identified and benefits of an evaluation system were discovered.

A survey, which is included in Appendix A, was sent to all thirty-nine staff in the Safety Department at XYZ Medical Center to evaluate the extent that EHS trainers are using preferred evaluation practices. EHS staff at XYZ Medical Center were chosen because the majority of EHS training is either conducted, developed, facilitated, or purchased by EHS staff. The survey was created using the Kirkpatrick four level model as a template. Phillips' additional fifth level to the Kirkpatrick model was also incorporated into the survey. XYZ Medical Center EHS personnel were asked if they provide training and if so, do they evaluate the effectiveness of the training. If yes, they were asked if they evaluate the effectiveness of EHS training based on reaction, learning,

behavior/application, results, or ROI. An analysis and comparison of XYZ Medical Center's EHS training evaluation practices with preferred practices is included in Chapter IV. Through information gained from the literature review, survey, and analysis, a process was developed to evaluate the effectiveness of EHS training at XYZ Medical Center.

Sample Selection/Instrumentation

The subjects in this study were the staff of the Safety Department at XYZ Medical Center. A survey was developed based on the preferred evaluation practices identified during a literature review. The survey was designed to illicit information on the current EHS training evaluation system, which could be quantified and directly compared to preferred evaluation practices. All thirty-nine employees in the XYZ Medical Center Safety Department were sent the survey questionnaire in Appendix A.

Procedures Followed

All thirty-nine Safety Department employees were sent a survey through the internal mail system. The survey consisted of a cover sheet briefly explaining the study and two pages containing the survey questions. Seventy four percent (Twenty-nine of the thirty-nine) questionnaires were completed and returned. Each questionnaire was numbered one through twenty-nine to indicate the order in which it was received.

Method of Analysis

The data collected from the survey was compared with suggested targets of preferred evaluation practices. Targets of the preferred evaluation practices were to evaluate the following percentages of the total number of training topics.

- 100 percent of EHS programs should be measured for Level 1 -Reaction

- 70 percent of EHS programs should be measured for Level 2 -Learning
- 30 percent of EHS programs should be measured for Level 3 -Behavior
- 20 percent of EHS programs should be measured for Level 4 –Results
- 5-10 percent of EHS programs should be measured for Level 5 –ROI

The rationale behind setting targets for evaluation is that as the level of evaluation increases, so does difficulty and expense (Phillips, 2002). It would not be feasible for most organizations to be evaluated at all levels.

CHAPTER IV: RESULTS

The purpose of this study was to analyze current training evaluation practices and to develop a system to enable XYZ Medical Center to evaluate the effectiveness of EHS training programs. The objectives outlined in Chapter I include the following:

1. Identify preferred training evaluation practices.
2. Evaluate the extent that EHS trainers at XYZ Medical Center are using preferred evaluation practices.
3. Develop a formal EHS training evaluation process for XYZ Medical Center.

Identify Preferred Training Evaluation Practices

Preferred evaluation practices were identified as the Kirkpatrick model, which include reaction, learning, behavior, and results. This system was slightly modified by author Jack Phillips. The modified version of the Kirkpatrick model, called the Phillips model, added a fifth level called return on investment. The ROI level attempts to compare benefits with costs and to recognize the intangible benefits of the training program.

Table I

The Levels of Preferred Evaluation Practices by Author.

Evaluation	Kirkpatrick Model	Phillips Model
Level 1	Reaction	Reaction
Level 2	Learning	Learning
Level 3	Behavior	Application
Level 4	Results	Impact
Level 5	Not Applicable	ROI

As discussed in Chapter II, evaluating reaction and evaluating customer satisfaction are synonymous. Evaluating reaction is important for a variety of reasons but the most important is that comments and suggestions are collected as feedback to improve the program future training sessions. Evaluation level one is the same for the Kirkpatrick and Phillips models. Evaluation level two, learning, is also the same in the Kirkpatrick and Phillips models. Evaluating learning means to determine if knowledge was gained, skills developed or improved, or were attitudes changed. Learning is typically measured before and after the training through a standard pre and posttest.

Level three of the Kirkpatrick model is labeled as Behavior and level three of the Phillips model is labeled application. The name of the level is different but the description is the same; level three is where the rubber meets the road (Machles, 2003). The behavior/application evaluation level attempts to quantify to what extent training programs are applied to the workplace as a result of a training program. Evaluating behavior is very important because it measures how well the training actually transfers to the workplace

Level four of the Kirkpatrick model is labeled results and level four of the Phillips model is labeled impact. This level evaluates the impact training had on desired results and therefore the evaluation method must be designed to measure desired parameters. Some examples of results are increases in quality and productivity, decreased employee turnover, increased quality of work life, decreased accidents and injuries, and decreased workers compensation claims. The outcomes gained in this evaluation usually provide evidence supporting a positive or negative result.

As indicated previously, the Phillips model added a fifth level on the Kirkpatrick model called return on investment. ROI focuses on isolating the effects of the program and converting the data into monetary values. All possible program costs are captured and the intangibles such as improve public image, increased job satisfaction, and improved teamwork, are identified typically through the use of a cost summary tool. The net program benefits are divided by program costs and multiplied by one hundred. The calculation results in a percentage of net benefits after costs are covered.

Current EHS Training Evaluation Practices at XYZ Medical Center

An evaluation of the current EHS training system was conducted by a survey which, was sent to all of the staff in the Safety Department at XYZ Medical Center to evaluate the extent that EHS trainers were utilizing preferred evaluation practices. All thirty-nine Safety department employees were sent a survey through the internal mail system. Seventy four percent (twenty-nine) questionnaires were completed and returned. Sixty nine percent (20 employees) indicated that they provide EHS training to employees. The twenty Safety Department employees who provide EHS training indicated that they provide training for 33 training programs.

Of the total programs evaluated, 18% were evaluated at level one, 19% were evaluated at level two, 17% were evaluated at level three, 8% were evaluated at level four, and ROI was not calculated for any EHS training programs. As can be seen by the evaluation targets presented in Table II, XYZ Medical Center evaluation practices were significantly less stringent than preferred evaluation targets. Deficiencies in training evaluation were calculated at 82% for level one, 51% for level two, 13% for level three, 12% for level four, and 5-10% for level five.

Table II

Measures of EHS Training Evaluation Based on Preferred Evaluation Practices.

Evaluation Levels	Measures	Evaluation Target %	Percent (%) of Programs Evaluated by EHS Personnel
Level 1	Reaction	100	18
Level 2	Learning	70	19
Level 3	Behavior/ Application	30	17
Level 4	Results/Impact	20	8
Level 5	ROI	5-10	0

Proposed EHS Training Evaluation System at XYZ Medical Center

The consensus of the literature reviewed indicated that several tasks must be accomplished to develop a training evaluation. The first step in the training evaluation process is the needs assessment. The needs assessment analyzes the needs of the training participants and should be done for each program. Needs of a training participant may include information required to comply with regulations, policies, and standards or to accomplish a job successfully.

The process steps necessary to develop an EHS training evaluation system were identified as the following:

1. Conduct and document a needs assessment.
2. Develop learning objectives for each training topic.
3. Validate the learning objectives based on regulations, accreditation standards, and internal policy.
4. Develop evaluation criteria.

5. Evaluate existing training media based on the key objectives and revise if needed.
6. Develop or acquire additional training materials as needed.
7. Evaluate all programs utilizing preferred evaluation practices at evaluation targets when feasible.
8. Track the data.
9. Communicate the process and incorporate into the management system.

The process of developing learning objectives is necessary to determine the results, which the training should accomplish. The learning objectives can be validated through applicable regulatory requirements and organizational policy. Evaluation criteria should be developed for each of the five levels as determined by the learning objectives and desired results. Existing training programs should be evaluated to determine if they satisfy the learning objectives, if not training programs should be modified, replaced or acquired.

With all of these steps in place, programs should be evaluated utilizing preferred evaluation practices at evaluation targets when feasible. The information should be tracked adequately and efficiently. Learning management systems are commonly used to register, track, and achieve record keeping for levels one and two of the evaluation process. Specific tools, such as surveys, audit tools, and cost summary tools will need to be developed or acquired for record keeping of levels three, four, and five.

The final step in the evaluation process is communication. Communication is necessary for management to understand implications of expected results/goals. Goals should be communicated such that management can understand how to improve future programs. Information should be communicated promptly and should be tailored to the

audience. Various audiences will interpret information differently; therefore, the content and delivery should be suitable for the specific party.

Summary

Current EHS training evaluation practices at XYZ Medical Center appeared to be inadequate with respect to preferred evaluation practices. The steps proposed will allow XYZ Medical Center to identify the value of EHS training programs and training resources to the organization. An EHS training evaluation system will provide techniques to improve future training programs and will assist in determining the fate of these programs. Information in this chapter will be used to determine the recommendations in Chapter V.

CHAPTER V: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

It was hypothesized that the EHS training system at XYZ Medical Center may not be effective at identifying successful training program components, opportunities for improvement, and techniques to construct successful EHS training programs. The purpose was to analyze the practices utilized by XYZ Medical Center to evaluate the effectiveness of EHS training with respect to preferred evaluation practices. This was accomplished through a survey, which was sent to staff in the Safety Department at XYZ Medical Center. Safety Department staff at XYZ Medical Center were chosen because the majority of EHS training is either conducted, developed, facilitated, or purchased by this staff. The survey was created using preferred evaluation practices which were identified by the Kirkpatrick four level model. Phillips' additional fifth level to this model was also incorporated into the survey. Safety Department staff at XYZ Medical Center were asked if they provide training and if so, do they evaluate the effectiveness of the training. If yes, they were asked if they evaluate the effectiveness of EHS training based on reaction, learning, behavior/application, results, or ROI.

The objectives were then to:

1. Identify preferred training evaluation practices through a literature review.
2. Evaluate the extent that EHS trainers at XYZ Medical Center are using preferred evaluation practices.
3. Develop a formal EHS training evaluation process for XYZ Medical Center.

It was identified that current EHS training evaluation practices at XYZ Medical Center were substandard with respect to preferred evaluation practices. The steps

proposed in Chapter IV will allow XYZ Medical Center to identify the value of EHS training programs and training resources to the organization.

Conclusions

1. Several training evaluation systems designed to measure societal, organizational, and personal impact and effectiveness were identified in the literature search. The Kirkpatrick/Phillips model was recognized as the most successfully utilized model to evaluate the effectiveness of an organizations training programs.
2. Data collected from the Safety Department staff survey was calculated to indicate deficiencies in training evaluation at 82% for level one, 51% for level two, 13% for level three, 12% for level four, and 5-10% for level five. Therefore the data comparison identified that EHS training evaluation practices at XYZ Medical Center appeared to be inadequate with respect to preferred evaluation practices. Data collected from the survey also indicated that various types of evaluations were conducted for EHS training programs and that a standardized evaluation program did not exist. It can be concluded that the lack of a formal training evaluation system at XYZ Medical Center may be placing the organization at risk of being ineffective at promoting the retention of EHS related information.
3. It was concluded that training evaluation programs have successfully benefited both massive corporations and tiny businesses in accomplishing goals by evaluating training with a five level process. The five levels in the training evaluation process include reaction, learning, behavior, results, and ROI. Before an evaluation process may begin, several steps must be accomplished. Once these steps have been completed, all training programs should be evaluated utilizing

preferred evaluation practices at the evaluation targets, given in table II on page 24, when feasible. The data should be tracked for the purposes of identifying techniques to improve training programs, identifying the value of training resources to the organization, improving future training programs and to assist in determining the fate of these programs. Some examples of techniques to improve training programs could be to change the presentation style to incorporate more visual and hands on learning activities. The evaluation results should be communicated and incorporated into the management system.

Recommendations

1. The Kirkpatrick/Phillips model was the most successfully utilized training evaluation model identified in the literature search. The methodology in this model should be considered the preferred evaluation system and implemented at XYZ Medical Center. Benefits of implementing this system would include achieving the ability to identify strengths and weaknesses of training and being able to justify training costs. A formal system will also assist in reacting more efficiently to accreditation and regulatory changes by updating the training requirements contained in the needs assessment.
2. XYZ Medical Center should implement a process to evaluate the effectiveness of EHS training programs at preferred evaluation targets. This would require an increase in evaluation rates of 82% for level one, 51% for level two, 13% for level three, and 12% for level four to reach recommended evaluation targets. Level five return on investment was not calculated for any EHS training programs at XYZ Medical Center. A return on investment process should be implemented in

- which 5-10% of programs are measured as recommended in the literature. For an evaluation system to be effective, an adequate quantity of programs must be measured however, as noted in Chapter II costs increase as the level of evaluation increases. Therefore it may not be feasible to evaluate all programs at all levels.
3. The data collected from the training evaluation process should be used to identify techniques to improve existing training programs, to identify and calculate the value of training resources to the organization, to improve future training programs and to assist in determining the fate of EHS training programs. Improvements in existing training programs might include incorporating additional visual and hands on learning activities and exercises. Accomplishing these items by using evaluation data will add credence to the decision making process and help justify program costs.
 4. Consider determining the actual costs of all EHS training throughout the organization to establish a more accurate accounting of the economic impact of training programs.
 5. Decrease the variation of the messages delivered for EHS training programs by developing, purchasing, acquiring, and delivering only training materials that meet the learning objectives developed during the evaluation process.
 6. Consider providing information on evaluating training effectiveness to all EHS trainers and provide tools to assist them in the evaluation process.
 7. Expand on the level 2 learning evaluation by measuring information retention at predetermined intervals. These measurements could be accomplished through interviews, surveys, or posttest.

8. Consider collaborating with Human Resources and other applicable groups to modify the current training system and to acquire equipment and resources necessary to implement a training evaluation system. Through this collaboration the concept of a centralized training department to provide assistance and consultation to departments and groups could be developed.

Areas of Further Research

1. Examination of EHS training evaluation systems, which specifically affect the Healthcare industry.
2. Development of improved evaluation systems.
3. Examination of intangible items with respect to return on investment.
4. Further examination of training evaluation targets.
5. Continued study of data interpretation and application of evaluation data for continuous improvement of training systems.

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Appendix A: Survey Instrument

I am conducting a survey as part of my thesis requirement for the University of Wisconsin-Stout. The attached survey is completely voluntary and anonymous. Please take a few minutes to fill out and return to me through the internal mail system by 10-30-2003

Thank you for your time and assistance.

Jeff Nesbitt

Please answer the following questions by placing a check mark in the correct column. If you answer "yes" to any questions from 2-7 please enter the approximate percentage of total trainees that you typically evaluate.

Definition of training: Any activity provided to trainees to gain, improve, or retain specified knowledge, skills, or abilities. Some examples of training include lectures, demonstrations, or developing online presentations.

	YES		NO
1. Do you provide any Environmental Health and/or Safety training to employees? <i>If the answer is no, please stop and mail the survey. If yes, please proceed to question number two.</i>			
	YES	NO	%
2. Do you evaluate the effectiveness of this training? <i>If the answer is no, please stop and mail form. If yes, please complete attached form for each topic that you evaluate. Note if you train on multiple topics please make a copy of the attached form for each topic.</i>			

I understand that by returning this questionnaire, I am giving my informed consent as a participating volunteer in this study. I understand the basic nature of the study and agree that any potential risks are exceedingly small. I also understand the potential benefits that might be realized from the successful completion of this study. I am aware that the information is being sought in a specific manner so that only minimal identifiers are necessary and so that confidentiality is guaranteed. I realize that I have the right to refuse to participate and that my right to withdraw from participation at any time during the study will be respected with no coercion or prejudice.

NOTE: Questions or concerns about the research study should be addressed to Jeff Nesbitt at (507) 255-6043, the researcher, or Dr. Elbert Sorrell at (715) 232-2630, the research advisor. Questions about the rights of research subjects can be addressed to Sue Foxwell, Human Protections Administrator, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 Harvey Hall, Menomonie, WI, 54751, phone (715) 232-1126.

	YES	NO	%
3. Do you evaluate the effectiveness of this training by measuring the participant's perception/reaction? <i>(e.g. perception surveys)</i>			
4. Do you evaluate the effectiveness of this training by measuring the participant's learning? <i>(e.g. quizzes, tests)</i>			
5. Do you evaluate the effectiveness of this training by measuring the application/implementation of the training? <i>(e.g. drills and/or audits to see if the training has transferred to the workplace)</i>			
6. Do you evaluate the effectiveness of this training by measuring the business impact of the training? <i>(e.g. impact the training had on changing behaviors, reducing injuries, illnesses ,and/or workers compensation costs)</i>			
7. Do you evaluate the effectiveness of this training by measuring its return on investment?			
8. Please list any additional methods that you use to evaluate the effectiveness of training that are not listed above:			

When you have completed the survey, please return through the internal mail to:

Jeff Nesbitt
Do 1-252
Safety