Evaluating E-learning Transfer of Training in Industry

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Abstract

In this study, experimental research was conducted at a Midwestern manufacturing facility with the researcher designing, developing, and evaluating an OSHA safety training program to be delivered via the Internet and in the traditional classroom. The researcher examined the effectiveness of e-learning in the industrial setting at Level 3 based upon the Kirkpatrick model and compared e-learning to traditional classroom learning. The results indicated that both e-learners and traditional classroom learners were transferring training at Level 3 and there was no significant difference between the two groups.

*Keywords:* e-learning, evaluation, training
Evaluating E-learning Transfer of Training in Industry

E-learning is an application that will help organizations compete in the design and delivery of workplace learning in the 21st century, according to Driscoll (2002). Driscoll further noted that it is a powerful tool that can be used to reduce training costs, improve return-on-investment, and to deliver just-in-time training. Lewis and Whitlock (2003) indicated that e-learning is no longer new; it occupies a growing role in most education and training organizations. E-learning is playing an increasing role in the lives of learners and training organizations. According to Lewis and Whitlock (2003), educators and trainers are intrigued by the technology available and seem to have forgotten some simple rules of good teaching; one of those is to focus on the learners, and not on the technology.

Recent advances in computer and telecommunications technologies have led to an increased use of distance training methodologies for work-related training. This type of training is referred to as the ‘e-learning revolution,’ according to Sloman (2002). The training profession is involved in the e-learning revolution due to the new technologies available in the workplace. Computers and technology are being used in virtually every aspect of work. Sloman (2002) indicated that while the practice of using computer and communication technologies for organizational training has expanded rapidly, research examining the effectiveness of e-learning has lagged behind.

Henderson (2003) noted that thinking of learning as a business tool that can help improve the bottom line is a different perspective from thinking about learning in a university context or learning as self-improvement for an individual. It is not knowledge for the sake of knowledge, but knowledge and skills for the sake of business. When learning is thought of as a business
tool, it has to serve the needs of the business. Henderson (2003) indicated that it is important to shape learning in a specific business direction, to a specific level of proficiency, and within a specific timeframe.

According to Driscoll (2002), organizations using e-learning have the ability to deliver standardized training to large numbers of employees in different locations in a short amount of time. With accelerated product cycles, a business cannot wait to roll out training over a matter of months. Henderson (2003) indicated that e-learning can achieve a rapid rollout by delivering programs quickly across the organization so that all the people who need training can get it in the shortened timeframe. Organizations are becoming more cost conscious and are closely monitoring training budgets; they want the most return for their investment in employee training (Driscoll, 2002).

Organizations are increasingly looking to e-learning as a way to make training geographically dispersed employees more cost effective by reducing or eliminating the travel costs associated with training (Henderson, 2003). In the rapidly changing workplace of the 21st century, employees will need to be continuous learners, and e-learning may be the cost effective mode of delivery. Driscoll (2002) indicated that the quality of research conducted on distance training may affect the extent to which new learning technologies enhance training effectiveness.

According to Van Buren and Erskine (2002) in the 2002 ASTD State of the Industry Report, the typical firm spent about $2 million on training in 2000 with a 37 percent anticipated increase for 2001. One could question whether this money is being well spent. In order to evaluate the training, ASTD regularly asks participants in its benchmarking efforts to report on their evaluation methods of training using Kirkpatrick’s (1998) four levels of evaluation. The
2002 ASTD State of the Industry Report data revealed that “more than 78 percent were using reaction measures (Level 1) in 2000. In addition, 32 percent were using learning evaluations (Level 2), 9 percent were using behavior evaluations (Level 3), and 7 percent were evaluating results (Level 4)” (p. 23).

Redmon and Salopek (2000) noted that the delivery of traditional training to an increasing number of employees is fast becoming a financial and logistical dilemma. One answer to this increasing dilemma can be e-learning, delivered either through the Internet or the company’s intranet. The question for most organizations is no longer whether they will implement e-learning, but how to do so with quality and in a cost effective manner. Although existing research by the Forum Group and ASTD firmly establish the importance of workforce training, the issue being debated is what form of training and delivery are most effective (Simmons, 2002). Most prevalent in this debate is the argument over choosing between traditional face-to-face training and e-learning methods. Supporters of e-learning purport that it is an effective means of delivering training at substantially reduced costs, the delivery methods provide increased access to learning, and on-demand training is available anytime and anywhere, according to Simmons (2002).

Hall (1997) indicated that training should be continuously available to end-users as they need knowledge for using new functions or to resolve problems. Henderson (2003) noted that just-in-time training is becoming a basic survival need and that identification of cost-effective ways to enable knowledge capabilities of a diverse global workforce is critical. Recently there has been more pressure to improve performance than ever before due to increasing global competition, escalating technological change, organizations struggling to manage information,
continuing transformation of the workplace, and changing communities. In order to improve performance in the workplace, training must be transferred to the job (Broad, 1997, p. 7). Transfer, as described by Broad and Newstrom (1992), is “the effective and continuing application by trainees of the knowledge and skills gained in training to the workplace” (p. 6).

**Problem Statement and Purpose**

When employers have invested in training their employees, and those employees have not applied the training back on the job, employers have lost time, money, and confidence in training as a viable business investment (Broad & Newstrom, 1992). When employees are not able to transfer what they have learned, they will not perform at their highest level. In order to determine the effectiveness of e-learning, evaluation methods will need to be employed. The Kirkpatrick model was developed to assist instructors and supervisors in determining training outcomes. Kirkpatrick (1998) theorized that learning should be measured at four levels:

- Level 1 – Reaction
- Level 2 – Learning
- Level 3 – Behavior
- Level 4 – Results.


- 78 percent of training organizations were evaluating training at level 1; 46 percent were evaluating at level 2; 27 percent were evaluating at level 3; and 11 percent were evaluating at level 4. Spending for training per employee was up from $734 in 2001 to $826 in 2002 (p. 2).

Boverie, Mulcahy, and Zondlo (1994) noted that more qualitative and quasi-experimental approaches involving action research, critical incidents, and similar methods be used to evaluate
the results of training in the future. Boveri et al. further noted that more research in the field of training evaluation is necessary, and that evaluation is paramount to the success of any training program. Boveri et al. indicated that training must be cost effective and teach participants skills and concepts that they can transfer to their organizations after the training has been completed. The problem of this study is to determine the effectiveness of e-learning and traditional learning at Level 3 using the Kirkpatrick (1998) model.

The purpose of this study is to provide information about the effectiveness of e-learning to Human Resource Development professionals considering the use of e-learning as a training delivery method.

Research Questions

Specific research questions that were answered in this study include:

R Q 1: What is the effectiveness of transfer of training at Level 3 evaluation of e-learners (Group A) and traditional classroom learners (Group B)?

Hypothesis 1: Transfer of training at Level 3 will occur post-training for e-learners and traditional learners.

R Q 2: Is there a significant difference in transfer of training at Level 3 between e-learners and traditional classroom learners?

Hypothesis 2: E-learners (Group A) and traditional classroom learners (Group B) will transfer training at Level 3 equally.

Theoretical Framework

Brinkerhoff (1987) noted that the purpose of training is to yield value to an organization, and this means that acquired learning should be transferred to the workplace. The immediate
skill, knowledge, or attitude objectives of training are not an end in themselves. Trainers fail to apply the knowledge and skills available to them to improve the transfer of training to the workplace (Baldwin & Ford, 1998). Horton (2002) indicated that Level 1 evaluation can gauge whether learners feel comfortable and confident in their ability to take the course and can give the presenter feedback to improve the course and its presentation. Learning evaluations at Level 2 will measure whether the original learning objectives of the course were met and identify the facts, concepts, skills, attitudes, and beliefs learners acquired in training. Performance evaluations at Level 3 will measure job performance and is referred to as transfer of training. Level 3 evaluation will help organizations target job-critical skills and remove barriers to applying learning on the job, and unless training improves job performance it is of questionable value (Horton, 2002).

The ASTD 2002 State of the Industry Report (Van Buren & Erskine, 2002) indicated that learning and behavior evaluations tend to be more common in organizations that spend more on training as a percentage of their annual payroll; large organizations were more likely to use results (Level 4) evaluations than small and medium organizations. The ASTD 2002 State of the Industry Report further indicated that increasing pressure is being applied to organizations to demonstrate the benefits from training.

Despite the growing trend of web-based learning, is e-learning really better for delivering training programs? Driscoll (2002) indicated there is a need for research to determine the effectiveness of e-learning. Broad (1997) noted the need for more research of learning/training being transferred to the workplace. Kirkpatrick (1998) noted that no final results may be expected from a training program unless a positive change in behavior occurs. Kirkpatrick
further wrote that it is important to determine whether the knowledge, skills, and attitudes learned in the training program are transferred to the job. This study was conducted in response to the need for research in the effectiveness of e-learning and transfer to the workplace.

**Literature Review**

Henderson (2003) noted that e-learning is learning at a distance that uses computer technology, usually the Internet, and enables employees to learn at their work computers without traveling to a classroom. This can be a scheduled session with an instructor and other students, or it can be an on-demand course the employee can take for self-directed learning. Tanquist (2000) noted that e-learning refers to anything delivered, enabled, or mediated by electronic technology for the explicit purpose of learning.

Morrison (2003) defined e-learning as “the continuous assimilation of knowledge and skills by adults stimulated by synchronous and asynchronous learning events – and sometimes Knowledge Management outputs – which are authored, delivered, engaged with, supported, and administered using Internet technologies” (p. 4). Piskurich (2003) noted that the defining characteristic of e-learning is the use of a computer network or the web for delivery of learning (p. 2). Floyd (2003) noted that e-learning refers to multiple delivery methods through technology including the virtual synchronous classroom, virtual asynchronous classroom, electronic performance support systems, web-CBT, and on-line assessment (p. 39).

**Benefits of E-learning**

Kulik (2000) noted that for corporations to succeed, they will have to increasingly value their own intellectual and human capital, and realize that knowledge and talent are the real sources of competitive advantage and value creation. Kulik further reported that within this
environment, e-learning platforms will be critical enablers for strategic success. Technology and globalization have led to a global economy based on knowledge, and this knowledge requires higher quality learning (Marquardt & Kearsley, 1999).

Henderson (2003) indicated that e-learning can be more flexible and provide a higher quality of learning. Henderson further indicated that students learn better and retain the learning longer when permitted to learn at their own pace. Morrison (2003) noted that enterprises are making a commitment to e-learning, and each year it becomes a more common feature for providing education and training (p. 45).

Henderson (2003) noted that trainers should consider how e-learning can improve performance and thus improve the business or the organization. Hartley (2000) indicated that e-learning is the preferred medium of training for reduced cost to an organization, as it is usually less expensive than traditional training. Sloman (2002) reported that e-learning will cease to simply be about learning; the techniques and approaches of e-learning will extend into key business process and become a change management tool. Sloman further reported that e-learning will migrate beyond its traditional role as a form of training intervention. Morrison (2003) indicated that e-learning has taught us that learning should be driven by business requirements, not training requirements (p. 100).

Rosenburg (2001) noted that it is essential for organizations to develop a business case that supports e-learning strategies. Some businesses have accepted e-learning as a business strategy while others are very cautious (Tanquist, 2000). For some organizations it is difficult to envision how a computer could replace an instructor-led classroom. Henderson (2003) noted that companies are finding that existing education costs can be dramatically reduced with e-
learning, especially as travel costs to classrooms are eliminated. E-learning can help eliminate expenses by allowing the trainer to build the course once, then deliver it simultaneously to multiple locations. It is also less expensive to update e-learning than it is to develop classroom solutions, thus saving the expense of printing (Redmon & Salopek, 2000).

There are tactical benefits of e-learning such as reducing travel and related costs of airfare, hotels, meals, other travel expense, leveraging existing infrastructure, enabling delivery independent of a platform, providing tools for tracking and record keeping, and making updates easy (Driscoll, 2002). E-learning promises lower costs of distribution, any time and anywhere access, and just-in-time learning that is responsive to learners’ immediate needs (Simmons, 2002). Marquardt and Kearsley (1999) indicated that learning in organizational settings today represents a new type of learning that is performance-based and tied to business objectives.

E-learning comes in a variety of styles and sizes, but all share the goal of getting knowledge and skills training to employees more quickly, effectively, and often at a lower cost (Henderson, 2003). Rosenburg (2001) indicated that reinventing the training organization will need to occur when an organizational and business model that supports, rather than limits, the growth of e-learning is adopted. Morrison (2003) reported that e-learning will supply the workforce with an up-to-date and cost-effective program that will yield skilled knowledge workers (p. 16).

Knowles (1984) noted that adults in the 1980s were beginning to demand that their learning take place at a time, place, and pace convenient to them, and that by the end of the 20th century most educational services would be delivered electronically. Morrison (2003, p. 16) indicated that building e-learning around the learner is a critical success factor. With e-learning
people can complete tasks more efficiently, and when a task is completed there is immediate feedback. There is relevance for the learner with just-in-time learning and the frequent responses and interaction keep learners engaged (Hartley, 2000). Schank (2002) indicated that in order to create quality e-learning, it is important to complete research on the training audience’s everyday work in order to gather stories, language, common mistakes, and details that can be used to make the simulations realistic. Showing learners the downstream consequences of their mistakes helps drive home the lessons behind those mistakes and ensure that they don’t make the same mistakes at a later date.

Schank (2002) indicated that a good course must evoke emotional reactions in its students. Emotions are one of the fundamental bases of memory. Schank further indicated that a good e-learning course will promote exploration and enable inquiry, thus engaging and motivating the student to want to learn more. Henderson (2003) noted that areas where e-learning can be used effectively today include:

- **Technical training** – an instructor can teach trainees how to use products like Excel. This type of training can include parts that are self-study and instructor-led. Trainees can practice their technical skills on a simulator or a virtual connection to a real system.

- **Professional knowledge and skills training** – professional skills such as negotiating, running meetings, coaching, and team dynamics can be taught to trainees at many locations. This type of training may include parts that are self-study and parts that are instructor-led for skills transfer.
- New job role training – employees can be taught how to perform a new job role learning new knowledge and skills. This type of training can be partly self-study and partly interactive where the students work with an instructor or with other students.

- Update training – employees can be updated on the latest state-of-the-art developments. This can be self-study or instructor-led.

- Tip of the iceberg training – there are situations where an employee needs to know a little about a topic but does not need to become an expert. This type of learning lends itself to a self-study, on-demand style but can be successful as instructor-led also.

Anderson (1999) noted that the concept of distance education has changed. When combined with the new Internet-based tools, it offers HRD professionals effective and efficient training solutions for the workforce. Anderson further noted that due to the changes in technology, employee demographics and globalization, organizations are challenged to discover new solutions to assist employees in gaining the knowledge, skills, and attitudes required for top performance in organizations. Schank (2002) indicated that students can learn valuable and complex lessons from e-learning simulations in which there are no clear-cut right and wrong answers, but detailed and realistic long-term consequences that play out based on the decisions they make.

In order to keep a learner’s interest, and for the lessons learned to be useful, it is important to connect difficult content to the human, real-world context in which learners will use it (Schank, 2002). According to Gates (1995):

There is an often-expressed fear that technology will replace teachers. I can say emphatically and unequivocally, it won’t. The information highway won’t replace or
devalue any of the human educational talent needed for the challenges ahead. However, technology will be pivotal in the future role of teachers (p. 185).

Well designed virtual learning begins with having people experience something, then they must be called upon to do something as a result of that experience. Good e-learning entices learners to learn more by making the experience exciting (Schank, 2002). According to Sloman (2002), e-learning will be most effective as part of a systematic approach involving classroom and experiential learning with appropriate support; this is referred to as blended learning.

Northrup (2002) noted that interaction is valued as an important variable in Web-based learning environments. Good Web-based learning will provide levels of interaction appropriate to the learning outcomes of the course, while constantly ensuring that the communication loop is perceived by the online learner to be complete. Making learners’ projects or tasks realistic not only puts the content in the appropriate real-world context, it also motivates learners to achieve, since that context is probably why they are taking the course in the first place. Web mentors should focus their energies on providing detailed and constructive feedback instead of on grades or credit (Schank, 2002). Henderson (2003) noted that through e-learning the instructor can create new learning opportunities; the instructor can do training that is almost impossible to do when everyone has to gather face to face. It is possible to train a group of new managers in small sections over a year’s time even if the managers are widely distributed in locations around the world.

Northrup (2002) indicated that the quality of online interactions can promote successful learning outcomes. The learner, not the training department, is at the center of e-learning in the enterprise. E-learning in the enterprise is almost always for the benefit of learners who have
finished their formal education and have become lifelong learners; they want to be good at their jobs (Morrison, 2003, p. 100). Schank (2002) noted that we are still at the beginning of the e-learning era; build a great e-learning course and the world will know about it. The best e-learning systems of today will form the foundation of the education system of the future.

**Evaluation**

Kirkpatrick (1998) indicated there are three reasons for evaluating training programs: evaluation can illustrate how to improve future programs, to determine whether a program should be continued or dropped, and to justify the existence of the training department (p. 18). Russ-Eft and Preskill (2001) indicated that evaluation should be viewed as a systematic process and is a planned and purposeful activity. Evaluation involves collecting data regarding questions or issues about programs. This can be used as a process for enhancing knowledge and decision making, then using what was learned from the evaluation to make critical decisions (p. 5). Scriven (1991) wrote, “what distinguishes evaluation from other applied research is at most that it leads to evaluative conclusions, and to get to them requires identifying standards and performance data, and the integration of the two” (pp. 143-144). Russ-Eft and Preskill (2001) indicated that the bottom line in evaluation is the collection of quality information that will inform and guide learning, decision making, and practice (p. 9).

The literature surrounding training evaluation has examined the importance of conducting sound evaluations and provides reasons for evaluating training programs (Bober & Bartlett, 2004). Van Dam (2003) noted that the effects of e-learning can be measured at different levels; the best-known learning evaluation framework comes from the work of Donald Kirkpatrick and Jack J. Phillips. Van Dam illustrated that organizations will need to develop a tracking and
reporting strategy with processes in place to capture the data needed if e-learning is to be successful. According to Van Buren and Erskine (2002) in the 2002 ASTD *State of the Industry Report*, ASTD regularly asks participants in its benchmarking efforts to report on their evaluation methods of training using Kirkpatrick’s four levels of evaluation. Horton (2001) indicated that most evaluations take a layered approach using the basic model developed by Kirkpatrick in 1959 that provides a framework for evaluating e-learning. Horton noted that there are several reasons to evaluate e-learning programs to:

- Justify investments in training,
- Make better decisions about training,
- Hold participants accountable,
- Demonstrate financial responsibility,
- Improve training quality, and
- Encourage learning.

Rosenberg (2001) indicated that Kirkpatrick’s four levels of evaluation are appropriate in e-learning situations. Driscoll (2002) noted that organizations can easily lose sight of the business issues related to productivity when using Web-based training and both quantitative and qualitative measurements should be used. Some of the quantitative measures that could be used are:

- The number of calls to the helpdesk per X number of users;
- The cost of program design, development, and delivery;
- The number of hours required to develop a WBT program; and,
- The time it takes the average user to complete the course.
Qualitative measures that could be used consist of:

- Did learners enjoy the program?
- Does the program support the corporate mission?
- Does the program enhance the training department’s status?
- Is this program helping your company keep up with the competition?

Hall (2002) wrote that e-learning needs to be evaluated to measure the business benefit. This benefit can be measured by performance, competencies, and intellectual capital. These critical measures are naturally linked to business impact and help to maintain the case for e-learning initiatives. Morrison (2002) noted that e-learning needs to be a key part of the organization’s performance improvement strategy; it needs to be about outcomes not inputs (p. 45). Formal learning interventions in the workplace are designed and delivered with the expectation of improving organizational and employee performance. Ensuring that these trained skills are transferred to the job remains of critical importance for HRD researchers and practitioners (Burke & Hutchins, 2008).

Measuring the business results of training is no different than measuring business results from any other kind of effort. Developers must identify indicators of success and track how they are influenced by training (Horton, 2002). Morrison (2003) noted that 67 percent of American organizations that conduct training use the Kirkpatrick Model to measure the four levels of training, including performance (p. 58). Morrison further noted that in 1996 Jack Phillips updated Kirkpatrick’s model by adding a fifth level of evaluation, return on investment (ROI) (p. 64).
Return on Investment

In the past, organizations simply looked at cost-savings and benefits from an e-learning perspective. Today, organizations are looking at more tangible returns that relate to business. Harris (2003) noted that today organizations are interested in ROI and multilevel measurements. Henderson (2003) noted that ROI is what business people spend their time figuring so they can make good business decisions. There are two main ways of looking at an e-learning ROI calculation: cost-focused ROI where the concern is reducing existing expenses; value-focused ROI where the concern is getting more value. Horton (2002) indicated that the ROI basic formula is: ROI equals return divided by investment. ROI is a valuable roadmap to continually measure the success of a company’s e-learning solution (Harris, 2003).

Harris (2003) noted that organizations considering implementing a ROI strategy start the process by delivering a return-on-expectation (ROE) survey. When an organization looks at opportunities and there are no measures in place, then they can do an ROE. This should be highly visible and pave the way for future sponsorship and participation in ROI projects. Driscoll (2002) noted that as well as evaluating during the analysis through the pilot phases of the program, the curriculum designer will need to conduct ongoing evaluation based upon the Kirkpatrick Model.

Kirkpatrick (1998) noted that the reason for evaluating a training program is to determine the effectiveness of it. No final results can be expected from the training program unless a positive change in behavior occurs (p. 57). Therefore, it is important to see if the knowledge, skills, and/or attitudes learned in the program transfer to the job.
**Kirkpatrick evaluation model.**

- Level 1 – Reaction. Evaluation on this level measures how those who participate in the training react to it.

- Level 2 – Learning. Learning can be defined as the extent to which participants change attitudes, improve knowledge, and/or increase skill as a result of attending the program.

- Level 3 – Behavior. Behavior can be defined as the extent to which change in behavior has occurred because the participant attended the training program. This level is often referred to as ‘transfer of training’.

- Level 4 – Results. Results can be defined as the final results that occurred because the participants attended the program and could include increased production, improved quality, decreased costs, reduced frequency and/or severity of accidents, increased sales, reduced turnover, and higher profits (Kirkpatrick, 1998, pp. 19-23).

The four levels of evaluation represent a sequence of ways to evaluate training programs. Each level is important and has an impact on the next level. Kirkpatrick (1998) illustrated that none of the levels should be bypassed simply to get to the level that the trainer considers the most important.

**Phillips evaluation model.** Phillips (1997) expanded upon the Kirkpatrick Model of evaluation by adding a fifth level (i.e., Level 5, return on investment) (p. 42). Phillips reported that it is important to evaluate at each level, otherwise it will be difficult to conclude that the results achieved were actually caused by the training program. According to Phillips (1997), the
framework developed by Kirkpatrick has been the most widely used approach in organizations, however, the five-level ROI framework is rapidly gaining acceptance (p. 44). The practice of evaluating at all levels is consistent with the practices of ASTD’s benchmarking forum.

\textit{Phillips five-level ROI model.}

<table>
<thead>
<tr>
<th>Level</th>
<th>Brief Description</th>
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<tbody>
<tr>
<td>1. Reaction &amp; Planned Action</td>
<td>Measures participant’s reaction to the program and outlines specific plans for implementation.</td>
</tr>
<tr>
<td>2. Learning</td>
<td>Measures skills, knowledge, or attitude changes.</td>
</tr>
<tr>
<td>3. Job Applications</td>
<td>Measures change in behavior on the job and specific application of the training material.</td>
</tr>
<tr>
<td>4. Business Results</td>
<td>Measures business impact of the program.</td>
</tr>
<tr>
<td>5. Return on Investment</td>
<td>Measures the monetary value of the results and costs for the program (p. 43)</td>
</tr>
</tbody>
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\textbf{Methodology}

A Hazardous Communication safety training program was designed and developed by the researcher and reviewed by the safety manager of the manufacturing facility and two safety experts. The ADDIE Model (Driscoll, 2002) was used to design and develop the training program. It was uploaded to the Blackboard platform to access via the Internet at the manufacturing facility in order to conduct the training via e-learning (Group A). The safety
training program was also given in a traditional classroom (Group B) setting in order to ascertain if there was any significant difference between e-learning and traditional classroom learning when given the same instructional material by the same instructor.

**Population and Sample**

The population of the facility was 220 employees, but the sample used in this study was 200 production employees, including supervisors and team leaders at the Midwestern manufacturing plant. The researcher used an intact group with randomization using the 1-2, 1-2 numbering method. Demographical information was obtained from each trainee on the pre-test and post-test evaluation. This demographical information consisted of age, years of education, gender, position, computer experience, and length of employment at the Midwestern manufacturing plant.

**Variables**

The independent and dependent variables were as follows:

**Independent variables.**

- The two different training methods, e-learning and traditional classroom learning
- Demographics
  - Age
  - Education
  - Gender
  - Position
  - Computer Experience
  - Length of employment.
Dependent variables.

- The level of scores on the:
  - Level 3 evaluation
    - Safety records pre/post-training
    - Supervisor Focus Groups.

Three evaluation instruments were developed by the researcher and reviewed by the safety manager of the manufacturing facility and four faculty members of Indiana State University for clarity and validity pertaining to the safety program content. A pilot study of the training program was conducted with two Indiana State University Human Resource Development graduate students to test the sequencing of the training program.

The safety training was then given to Group A via the e-learning method; the safety training was provided to Group B via traditional classroom learning. Evaluations were conducted according to the Kirkpatrick (1998) model at Level 1 – reaction, Level 2 - learning, and Level 3 – behavior with the same instruments used for Group A and Group B. A pre-test was administered to both groups prior to the training and a post-test following the training.

After receiving the evaluations from Level 3, the data was analyzed using the Windows ® version 13 of SPSS. The analysis was used to determine if there was a significant difference between Group A and Group B at Level 3. The data was reported in graphical and tabular form illustrating the mean score for the entire respondent group. Statistical analysis of the data collected consisted of an analysis of variance (ANOVA) and an independent sample t-test.
Findings and Analysis of Data

The purpose of this study was to provide information about the effectiveness of e-learning to Human Resource Development professionals considering its use as a training delivery method. According to Phillips and Stone (2002), a significant problem that has plagued the training and development field for many years is a lack of transfer of what is learned by the participants from the training setting to the job setting. It is critical to make sure that learning occurs and that it is transferred to the job. The result of the transfer is measured on the job during level-3 evaluation (p. 89).

An ANOVA test was completed using the data from the pre-test and post-test for classroom learners (Group B) to ascertain if there were significant differences between the two evaluations. The ANOVA test demonstrated a p value of 0.380 using an alpha level of 0.05. This indicated there was no significant difference between the pre-test and post-test scores of classroom learners at the 0.05 alpha level.

Level 3 evaluation was conducted one month post-training. The first method of Level 3 evaluation was conducted using a focus group of six Supervisors from the Midwestern manufacturing plant. The focus group was conducted by the Human Resource/Safety Manager and consisted of discussion followed by a questionnaire consisting of 9 questions. The Supervisors responded on one sheet for e-learners and a separate sheet for classroom learners.

The mean score from the Supervisor focus group for e-learners was 79.63 indicating that 79.63 percent of the time employees were transferring training to the workplace. The mean score from the Supervisor focus group for classroom learners was 80.46 indicating that 80.46 percent of the time employees were transferring training to the workplace. The median score for
both groups was 90.00 and the range of scores for both groups was 100. The standard deviation for the e-learners was 22.379 while the standard deviation for the classroom learners was 23.717.

An independent sample t-test comparing 2 sets of independent means was conducted at the 0.05 alpha level. The results of the t-test are listed in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Levene’s Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
<th>Mean Difference</th>
<th>Std. Error Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equal variances assumed</td>
<td>0.000 0.984 -0.188 106</td>
<td>0.851 -0.833 4.437 -9.631 7.964</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal variances not assumed</td>
<td>0.188 105.6 44</td>
<td>0.851 -0.833 4.437 -9.631 7.965</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The independent sample t-test comparing the two sets of independent means of e-learners and classroom learners demonstrated that the p value (0.984) was greater than the 0.05 alpha level. This indicates that there was no significant difference in transfer of training at Level 3 evaluation between the two groups.

The second method of Level 3 evaluation used was to compare the safety incident reports at the Midwestern manufacturing plant pertaining to Hazard Communication one month pre-training to one month post-training. There was one incident reported when a liquid on concrete near the barrel storage building was leaking and the label on the barrel was incorrect; it appeared
that someone had put the liquid in an unapproved container. There were no incidents reported in the one month period post-training.

The research questions determined the following:

1. The effectiveness of transfer of training at Level 3 evaluation for e-learners (Group A) was 79.63 percent.

The effectiveness of transfer of training at Level 3 evaluation for classroom learners (Group B) was 80.46 percent.

Transfer of training did occur for both groups, e-learners (Group A) and classroom learners (Group B).

Hypothesis 1: Failed to reject the hypothesis.

2. There was no significant difference in transfer of training at Level 3 between e-learners (Group A) and classroom learners (Group B).

Hypothesis 2: Failed to reject the hypothesis.

Discussion, Conclusions, and Recommendations

“Training is an investment. If the learners apply back at work what they acquired during their learning, there will be a return on the investment. If they do not, then the training time was merely spent (and hence wasted) rather than invested” (Parry, 1997, p. 49).

Discussion

Following the training program, a post-test was administered to both groups of learners. The mean score on the post-test for Group A, e-learners, was 9.63 with the mean percent score being 80.25 while the mean score on the post-test for Group B, classroom learners, was 9.53 with a mean percent score of 79.45. These statistics indicate that the e-learners did slightly better on
the post-test with the mean 0.10 higher than the classroom learners, and the mean percent score of e-learners was 0.80 higher than the classroom learners. Human aspects could have affected the classroom learners during their training, such as interaction in the classroom, reaction to the instructor, or pacing of the training program.

To ascertain if there was a significant difference between the pre-test and post-test scores for e-learners (Group A), an analysis of variance (ANOVA) test was completed. The findings illustrated that there was a significant difference between the pre-test and post-test for e-learners at the 0.05 alpha level. An analysis of variance (ANOVA) test was also completed on the pre-test and post-test scores of the classroom learners (Group B) to ascertain if there were significant differences between the two scores. No significant difference was found between the pre-test and post-test scores of classroom learners at the 0.05 alpha level.

Level 3 evaluation was conducted one month post-training using a focus group of six Supervisors from the Midwestern manufacturing facility utilizing a questionnaire consisting of nine questions for the e-learning group (Group A) and the classroom learners (Group B). The mean percent for the e-learners (Group A) was 79.63 while the mean percent for the classroom learners (Group B) was 80.46. These statistics indicated that Group A, e-learners, were transferring the training 79.63% of the time while Group B (classroom learners) were transferring the training 80.46% of the time. The Supervisor focus group indicated that classroom learners were transferring training at a slightly higher rate (0.83) than e-learners. This may have been due to bias on the part of the Supervisors or observation may not have been given equally to all employees. An independent sample t-test comparing two sets of independent
means was utilized to ascertain if there was a significant difference between the two groups. There was no significant difference between the two groups using an alpha level of 0.05.

The second method of Level 3 evaluation used was to compare the safety incident reports at the Midwestern manufacturing facility pertaining to Hazard Communication one month pre-training to one month post-training. There was one incident report filed in the one month period pre-training and no incident reports filed in the one month period post-training. This may indicate that transfer of training did or did not occur; a more longitudinal study would need to be conducted to answer this question.

Conclusions

The findings of this study paralleled the major research questions. To the extent that the data and findings of this study were valid and reliable and within the framework of the limitations placed on this study, conclusions may be drawn.

**Research question 1.** What is the effectiveness of transfer of training at Level 3 evaluation of e-learners (Group A) and traditional classroom learners (Group B)? The data indicated that transfer of training was occurring at Level 3 for e-learners (Group A) 79.63% of the time. The data indicated that transfer of training was occurring at Level 3 for classroom learners (Group B) 80.46% of the time.

**Research question 2.** Is there a significant difference in transfer of training at Level 3 between e-learners (Group A) and traditional classroom learners (Group B)? The data indicated that there was no significant difference in transfer of training at Level 3 between e-learners (Group A) and traditional classroom learners (Group B) at the 0.05 alpha level.
This study provides findings with practical implications for companies that have not yet implemented e-learning. As the study indicated, trainees can learn well in an e-learning environment. This could be due to differing levels of experience with computers, but in general the trainees in the e-learning group performed better on the pre-test and the post-test. Would the classroom learners have performed better in the e-learning environment that is self-paced without an instructor and/or distractions in the classroom? It would be interesting to conduct another training event with the two groups at the same manufacturing facility and reverse their method of training to ascertain if differences would still occur. This may also help to illustrate the biases that exist in supervisors to the use of e-learning.

The findings in this study offer some important insights and implications into future research. The focus of this research was an evaluation of e-learning in industry at Level 3 based upon the Kirkpatrick Model. However, a comparison was also done between e-learners and classroom learners at Level 3 to ascertain if transfer of training was occurring equally with the two groups, or if there was a significant difference between the groups. Academics and practitioners have argued that too little attention is given to efforts to assess whether training participants actually transfer what they learn in the training to the actual work environment. Phillips and Stone (2002) noted that the comprehensive measurement of training will provide for a closer link to the organization’s goals and initiatives and allow line managers to see the results (p. 2). Evaluating transfer of training to the work environment for e-learning and classroom training could be very beneficial to manufacturing facilities in the future.
Recommendations

The Midwestern manufacturing facility where the researcher conducted the experimental research had not experienced e-learning previously; this could have been a limitation to the study. Future researchers may wish to consider conducting the research in facilities that are not new to e-learning. Also, studies should not be limited to the manufacturing realm alone, but also be conducted in healthcare, banking, education, social services, non-profit organizations, government organization, retail business, etc. Researchers who wish to replicate this study should consider using larger numbers of respondents to validate the results of this study.

In addition to evaluating e-learning and classroom learning at Level 3, a future researcher might consider evaluating the blended learning approach at Level 3 as well as e-learning, and classroom learning. Following the training, a comparison could be made for all three of the groups at Level 1, Level 2, and Level 3. Post-evaluations could also be done to evaluate the return on investment (ROI) from six to twelve months post-training.

The researcher would also recommend that the same population and sample at the Midwestern manufacturing facility be used to conduct Level 4 evaluation from six to twelve months post-training. Level 4 evaluation will document if there has been a return on investment (ROI). As with all research, the findings of this study should be utilized to solve problems and for future research in the HRD field.
References


