TRAINING FIELD PERSONNEL - Training Field Measurement Technicians

Tom Pendleton
Southern Gas Association
3030 LBJ Freeway, Suite 1500
Dallas, Texas 75234

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Introduction

Can the effectiveness of skills training be measured? A Region Director friend of mine who works for a large natural gas pipeline company complained that his new measurement employees (new hires and experienced personnel that have transferred into gas measurement) are not performing required tasks and activities to his expectations. "My over-pressure protection & measurement equipment supplier, two month ago, presented a free, 1-day training session on "How to Test a Relief Valve Set Point". I paid for donuts and lunch! We told them exactly how to do it. "My employees just don't get it".

This response, a reaction created from frustration, plays out time and time again. Although this Director recognizes a performance deficiency, his statement is directed at a result (actual outcome) rather than the cause(s) that creates his concern. Many companies today are implementing proactive workforce readiness strategies. They are no longer simply paying lip service to the need for effective training programs, devising reactive measures, or creating explanations regarding why employees don't understand and cannot perform the skills expected of them.

To *begin* the process of determining cause(s) of learning deficiency, we need to understand something about the instructors learning model, the learning objectives, how the training content was presented, and how learner's knowledge is tested (assessed).

As a Technical Training Manager working in the industry, I was often told, "Just tell them how to do it" and they will be fine. They don't need to know why. Operation management was often disappointed when they determined their "Tell Them How" theory of training didn't work. Little, if any, knowledge was transferred: none may have been measured. The actual cost of effective training (including gains in productivity) pales when compared to the increased cost of inaccurate measurement, delayed product deliveries, unscheduled down time, damaged equipment replacements, impaired and strained customer relations, and re-training.

Basic Principles

Although, not a total answer, there are several basic principles and concepts worth reviewing that can help create effective training:

1. Understanding Training versus Education
2. Training Content & Learning Objectives
3. Changing Behavior
4. Performance Deficiency
5. Continuous Learning
6. Accountability & Documenting Results

Following our discussions of these principles, we will take a deeper look at Training Effectiveness by reviewing simple tools to help achieve a creditable and sustainable curriculum and documentation of effectiveness metrics.

1. Training versus Education

First, there is a difference between training and education. Education is often measured by time spent: you spent a day in a seminar or four years in college[1]. Alternatively, training is measured by what you can do when you've

[1] http://onlinelibrary.wiley.com/doi/10.1111/j.1744-6570.1988.tb00650.x/abstract - A survey to assess issues related to training and education. Based on a 61% response rate, findings were obtained regarding issues such as needs assessment, training and development approaches, reasons for selecting particular programs, characteristics of participants, how decisions are made regarding who will participate, preparation and follow-up of participants, evaluation of management training programs, future management training trends, and needed training content.

completed it. Training requires coaching, mentoring, performance counseling and learn-by-doing (hands-on) activities.

If my son told me he was taking an illegal drug education class at school, I would think this will be helpful for him. If he told me he was receiving training in manufacture illegal drugs, I would get the police involved. So,

- Training is about practice, about skill, about learning how to do things.

- Education is the act or process of imparting or acquiring general knowledge, developing the powers of reasoning and judgment. Education is about fostering the mind by encouraging independent thinking and introducing knowledge of the physical and cultural world. It is about theory, understanding, and core values.

There is overlap and concepts that are common to each. Education may require some knowledge, skills and abilities such as mathematics, reading and writing. In our Gas Measurement example, it takes training (practice) for technicians to learn how to correctly inspect and install an orifice plate.

It took education (critical thinking) to move this skill and its related technology from simply training a technician to change the plate between two flanges - to installing an orifice plate in a Senior Fitting equipped with the technologies (flow computer, temperature recorder, transmitters, communications devices and software) to gather, record, and calculate volume and flow, and communicate the information to stakeholders.

Learning theorists have a fancy term for the component of learning (education) that spurs learning to a higher level. It's called **"cognitive learning."** Cognitive learning supplies the role of vision in the development process. In effect, it incorporates insights into behavioral practice, thereby distinguishing the master professional from the apprentice performer.

Therefore, the combination of training and education develops a well-rounded individual who knows both how to perform a skill and the rational or science behind why it works. This builds troubleshooting and reasoning skills. The separation of training and education "may" create learning deficiencies.

However, in challenging economic environments, some leaders agree with the need for training, but see education as a type of unnecessary luxury. Under financial pressure, some cut both training and educational programs. This is true in the current environment of our industry where long term, highly experienced personnel are retiring and leaving the industry. These experienced contributors are being replaced with young, inexperienced employees who think and learn differently. Not only do they learn differently, they have little or no appreciable skill sets and, in many cases, have no one to teach them.

2. Training Content & Learning Objectives

Second, wouldn't it be great if training not only indicated understanding of a skill on the part of the Learner, but effectiveness of the course content and instructor?

For training to be effective, course developers must be clear about they want Learners to accomplish or learn. Clear, unambiguous learning objectives are the road map to learning a skill[2]. The learning objectives must reflect what the Learner is to do with this information. Not only must the learning objective be written, it must be tested, i.e., did the Learner understand the application of the objective.

Knowledge Transfer & Testing

to achieve this, the information or "Training Content" must outline and explain the identified learning objectives. Exam questions must be carefully written to test the objectives to ensure knowledge transfer occurs. This is a critical element of an effective training. For example, if a learning objective states:

[2] https://en.wikipedia.org/wiki/Test_(assessment) - A learning objective is an explicit statement that clearly expresses what the student will be able to do after taking a course. It is an observable and measurable student outcome statement. A learning objective identifies what behavior(s) a student must demonstrate in order for the instructor to know that the planned learning took place.

On the completions of this course, *the learner, using an insulation testing instrument, will be able to correctly setup the instrument and test the electrical potential across an insulated flange, recording the results in the Maintenance Management System.*

With this stated objective or outcome, the Training Content (course material) should explain how these processes are performed. Learners would then be tested to ensure they understand the content. i.e., the skill.

Simply stated, if it's important for Learners to understand a given skill, it's worth the time to determine the Learner's level of understanding by testing the objective(s). This can be accomplished by creating exam questions based on the learning objectives. *The learning objectives must be used to determine the effectiveness of training.*

What's an exam or test?

When discussing testing as a part of a class presentation, after the all reasons why it cannot be done have all been stated, someone will pull out a 10 questions true/false quiz and offers it as the "test".

Some questions:

a) Is 10 the correct number of questions for the training content?
b) Are the questions based on the stated learning objectives?
c) What is the passing score and how was it determined?
d) Are true/false the correct question type?
e) Are the questions biased?

Exam development issues are complex and focus on several concerns beyond the scope of today's presentation. I mention, but will not fully address, test development issues. Testing is critical to training effectiveness and determining whether or not knowledge transfer has occurred.

Training Assessment Examples
so, must we always have a written exam?

It's my opinion only, and phrase a little differently, I would say that a "measurable assessment" should be conducted, to determine if Learners understand the learning objectives. A measurable assessment will allow instructors to identify indications knowledge transfer and effectiveness.

The test may be a written exam! It can also be a performance evaluations or somewhere in between. Be creative in the way you think about assessments.

Example - Pipeline Design: Route Selection Assessment
In my experience with the Southern Gas Association (SGA), we conduct a four (4) day "Pipeline Design" Workshop. The focus of the Workshop is to present, in a classroom environment, a set of objective driven training lessons (content) on pipeline design topics.

The Learners knowledge is tested (again, let's call it assessed) to ensure they understand the learning objectives, but not with a traditional written test.

As an example of this model, one lesson in the course addresses pipeline route selection. Learners first participate in classroom discussion regarding terrain, elevations, width of right-of-ways, difficult crossings (rivers, lake, interstate and state highways, protected & historic areas), pipe size, and other construction concerns. A typical class size of 20 to 25 participants work in collaborative groups or "Pods" of 3 or 5 individuals. Learners are given topographical maps showing three (3) alternative pipeline routes.

Each "Pod" of Learners, with their newly acquired knowledge, calculators, regulations, and their group discussion, determine which of the three routes should be selected based on the relevant construction factors. During the

assessment for this lesson, each Pod reports out to the class explaining the relevant construction factors considered in making their route determination.

Learners are graded as a collaborative group. The instructor assesses each Pod by considering their reasoning and arguments for a specific route, use of relevant construction factors, and the clarity of their presentation. Comparing the final score received by each Pod member to a Pre-test score (typically written), a determination can be made regarding whether or not knowledge from the objective driven training content was transferred.

So, learners are tested and a score given, but not using a 10 question, off-shelf, true/false quiz. Other courses (Introduction to the Natural Gas Industry, Tapping & Stopping, Hydraulic Direction Drilling [HDD], etc.) use the same model of Learner collaboration and assessment.

3. Changing Behavior

Third, training changes behavior[3]. With a willing Learner, the goal of training is to change behavior. In the case of our Region Director, to correctly test the set point of a relief valve. Presentation, seminars, lectures do not train - unless they are designed to do so. Otherwise, they may inform the Learner. Simply informing the Learner of some relevant information is generally NOT the best way to change behavior.

Without a well thought out training plan, training may be ineffective because we may be training Learners on:

- Something they already know
- Something irrelevant they didn't know (good story)
- Providing training at the wrong time

Researchers suggest that training occurs from (figure 1):

Learning through Training:
➢ 70% On-the-Job Experience/Practice
➢ 20% Mentoring (one-on-one training)
➢ 10% Classroom (courses & reading)

Figure 1 - Learning through Training

This research rests on an old Chinese proverb:

- I hear and I forget;
- I see and I remember;
- I do and I understand.

Training requires doing. Consider the case where a Learner goes to training class, but on returning to the job, and is not allowed to use his newly learned skill. What are the likely results?

Yet there is a concern associated with training without understanding why, often referred to as **Rote learning** - a memorization technique based on repetition. If practicing a skill for many years essentially involves doing the same thing over and over, without education (higher orders learning and understanding why), it "may" mean the person has never gone beyond the behavioral (rote) dimension of learning. There is a difference between 20 *years of experience, and one year's experience 20 times*.

4. Performance Deficiency

Fourth, company leadership needs to have a real, "come to Jesus moment" and determine if training will improve a performance deficiency. Consider the motivation of the Learner.

[3] https://en.wikibooks.org/wiki/Learning Theories/Adult Learning Theories - Typical adult learning theories encompass the basic concepts of behavioral change and experience. From there, complexities begin to diverge specific theories and concepts in an eclectic barrage of inferences.

The classical instructional designer's test is to ask, "If the employee had a gun to his head, could he do it? If the answer is yes, Leadership may be facing a problem of motivation. Phrases such as, "there not paying me to do this" or "it's not my job" are attitudes. *Poor or destructive motivation is not a training problem.*

Further, the Workforce today is multi-generational (figure 2). Each generation brings it strengths and challenges. Employers will need to deal with each generation, so finding out the condition of the playing field is important. For example, in the United States 10,000 Baby Boomers retire each day.[4] Who are companies hiring (or hoping to hire) and what are their prospective employee preferences? [5]

Each generation has a learning preference. For a company to present content in a fashion that serves ONLY their economic needs and not the need of the Learner is a recipe for a learning train wreck.

Multiple Generations: Characteristics in the Workplace

Characteristic	Baby Boomers (1944 - 1965) 82 Million	Generation X (1966 - 1975) 41 Million	Generation Y (1976 - 1994) Millennial 71 Million	Generation Z (1995-2020) 23 Million
Also Known As	Post War Kids	Lost Generation Latchkey kids	Digital Native Boomer II	Digital Native
Work Ethic & Values	- Workaholic - Personal fulfillment - Desire quality - Question authority	- Eliminate the task - Self-reliance - Want structure - Skeptical	- What's next - Multi-skilling - Tenacity - Entrepreneur - Tolerant - Goal oriented	- Change jobs often - Relationships not company - Finance Responsible
Work is	- Exciting adventure	- A difficult challenge - A contract	- A means to an end - Fulfillment - Open Space-no cubical	- Fun & Cutting edge - Do I like my co-workers - I pick company
Leadership Style	- Consensual - Team - Collegial - Status	- Everyone the same - Challenge others - Ask "Why"	- Open forum - Community Service - Go-Go Team - Collaborative	- TBD
Learning Style	- Classroom-Interaction - Team Learning	- Classroom-Interaction - Self-learning – Digital	- Limited schedule - Digital Self-learning - Life Long Learning	- Open classroom - Self-learning - Digital
Communication	- In person - Written	- Direct - Immediate	- Voice & E-mail - Social Media	- Digital Linked up
Feedback & Rewards	- Don't appreciate it - Money - Title & recognition	- Asks "how am I doing" - Freedom-best reward	- Whenever I want it, " push of a button" - Meaningful work	- Freedom from restrictions - Conservative
Messages that Motivate	- You are valued - You are needed	- Do it your way - Limited Rule - What's in it for me	- You will work with other bright, creative people	- Cultural diversity - No boundaries

Figure 2 - Multiple Generations: Characteristics in the Workplace

[4] https://www.washingtonpost.com/news/fact-checker/wp/2014/07/24/do-10000-baby-boomers-retire-every-day/

[5] http://www.academia.edu/1267765/ - Understanding the Adult Learners Motivation and Barriers to Learning: With the changing demographic situation of the developed world there has been a focus on the concept of lifelong learning where people learning throughout their lives. The emergence of the knowledge society, rapid introduction of new technology and the changing work places increases the importance of adult learning. Understanding motivation and barriers to adult learning is therefore a highly relevant issue to the current situation of the world and not only in the field of education.

5. Continuous Learning

Fifth, training is not a one-shot deal - it must be continuous. Continuous formal and informal learning[6], collaborative learning and knowledge sharing are an integral part of the training process. The need for continuous learning and knowledge sharing, designed for operational specialists and/or individuals trained to do a given job, is rapidly becoming understood by training groups. Continuous informal and collaborative learning does not replace formal training. It has different aims and satisfies different learning styles and needs.

For example, our over-pressure protection & measurement equipment supplier are likely considered subject matter experts. While they share, "what is in the operating manual", many times they don't share key features learned during day-to-day operations. Employees/technicians do. They share collaboratively with each other specific questions and performance steps related to improving their own performance. They share “best practices” with others about solving specific operational problems. Continuous exposure to the experiences, problems and solutions of others may produce remarkable gains in the performance capacity.

As a learning method, internal technical training organizations endeavor to create formal and informal face-to-face and online learning groups, engage technicians as instructors, and seek their input in the development of training materials.

Skill Slippage

Skill slippage of learned skills almost always occurs when first learning a new subject. If the subject is important — whether in measurement, pipeline operations, or safety — the learning program must constantly diagnose “Fast Forgotten Information” and reinforce what was previously taught. Real skill acquisition, after all is said and done, requires showing, doing, correcting, practicing and customizing.

6. Accountability & Documenting Results

Sixth, finally, documenting results and creating accountability. This is tough because this party maybe **you** or your selection of the instructor. Free is not always bad, but free training can mean "sales call". Training professionals must take a longer view of their function, set challenging standards for their objectives and accept the notion that there is a difference among training programs, education courses, and continuous learning. Whatever deterioration there has been in the quality of employee training has resulted from the acts of company leadership and internal training groups. If management puts an emphasis on minimizing training cost per employee and refuses to recognize valid training as a contributor to productivity, in the final analysis, their actions ultimately will bring about a unconscious downgrading of employee performance expectations.

Exercise: Using your cell phone, goggle, "Web Harvesting". ***Remember:*** it is more than a phone!

[6] http://marciaconner.com/resources/informal-learning/ Informal learning accounts for over 75% of the learning taking place in organizations today. Often, valuable learning takes place serendipitously, by random chance. It happens through processes not structured or sponsored by an employer or a school. Informal learning is the term used to describe this concept. In order to differentiate between formal and informal, it is valuable to examine what is learned intentionally or accidentally.

Conditions for Learning
Lets shift gears and look at training process and tools. To enhance the chances for a successful training event, there are elements that help create "conditions" conducive to learning. Conditions include measuring the Effectiveness of Training and acquiring or developing training materials (workbooks, web-based courses and tests). Conditions conducive to learning include:

- Structured Training Materials (consistent message regardless of instructor)
- Content based on identified Learning Objectives (Objectives tested)
- Effectiveness of Learning (Metrics for evaluations & testing)
- A Climate for Learning – Group Size
- Controlled Observation/Performance Evaluations
- Opportunity for Experimentation (Analysis of their own Performance, self-learning)
- Training Curriculum (OQ, Safety, Compliance, Technical, etc.)
- Consistent Testing (pre and post exams)

As a summary, here are several factors driving skill gaps.

- Highly skilled (mature) employees retiring or leaving companies with younger, less skilled employees are being hires.
- There is a declining skill levels of many high school and colleges coupled with a growing number of non-English speaking workers (employees and contractors).
- Change in technology and increased sophistication of jobs and equipment.
- Pipeline owners seek technically competent employees who display professionalism with problem solving and decision making abilities.
- An element that is often overlooked are interpersonal skills. It's a worthy goal to have the most technically competent workforce on the planet. However, if this technically competent workforce cannot get the work completed because of infighting and strife fostered by a lack of interpersonal skills, what difference does it make?

Training Tools
So let's consider the available tools Training Professionals use to help close this skill gap and create effective training. The tools include:

1. The ADDIE model
2. Four Level of effectiveness
3. Summarizing and tracking training conducted

The ADDIE Model
The ADDIE model was initially developed for the military. ADDIE is a training content development model used by instructional course designers & training developers to build consistent and repeatable training materials – uniform training with a consistent message[7]. There are five phases:

1. **Analysis** of the instructional problem is clarified, the instructional goals & learning objectives. Is it a training problem?

2. **Design** deals with identifying base references (procedures, OEM materials, etc.), learning objectives, performance assessment, written tests, performance tests, structure content, graphics, subject matter review, lesson planning and media.

3. **Development** - create and assemble the content & graphics into a course. Submit for SME content review.

4. **Implementation** Train Instructors to use the workbook & learning exercises as functional elements. Conduct a class using the materials.

5. **Evaluation** based on in-class presentation; evaluate the course content, tests, and student reaction. Are Course Objectives met, edits required?

Deliverable of ADDIE
The deliverable is an objective driven workbook and test (evaluation), on-line course, job aid, or similar form or document that conveys desired information. Based on the creation of the training content, curriculum can be arranged and scheduled for presentation (figure 3).

Basic Natural Gas Measurement – Technical Curriculum

Monday: 8:00 AM – 1:00 PM	No Lunch	**Monday: 1:00 PM – 4:00 PM**
		"Working as a Member of the Team"
		Competency: Personal Effectiveness
		➢ Team Communications-Active Listening

[7] https://en.wikipedia.org/wiki/ADDIE_Model - ADDIE is an Instructional Systems Design (ISD) framework that lists generic processes that instructional designers and training developers use. This model strives to save time and money by catching problems while they are still easy to fix. A more recent expression of rapid prototyping is SAM (successive approximation model).

Travel Time		➢ Giving Clear Instructions ➢ Reducing Barriers ➢ Build Relationships ➢ Diversity

Tuesday: 8:00 AM – Noon	Lunch	**Tuesday: 1:00 PM – 4:00 pm**
Pipeline Hydraulics & Measurement Principles		Regulators & Relief Valves
Competency: Basic Measurement		Competency: Pressure Control
➢ ELN-9200 Measurement System (ILT) ➢ 701 Basic Gas Measurement & Gas Math (ILT) ➢ ELN-9201 Flow Mechanics (ILT) ➢ ELN-9101 Intro to Gas Measurement (On-Line) ➢ ELN-9181 Basic Electricity (On-Line) ➢ ELN-9191 Ohm's Law (On-Line)		➢ ELN-9202Pressure Regulator (ILT) ➢ 1502A Regulators (ILT) ➢ 1502B Pressure Relief Devices (ILT) ➢ 4020 Inspect, Test Relief Valves (On-Line) ➢ 4021 Inspect & Test Regulators (On-Line)

.

Wednesday: 8:00 AM - Noon	Lunch	**Wednesday: 1:00 PM – 4:00 PM**
Control Valves		Coriolis, Orifice and Positive Meters
Competency: Pressure Control		Competency: Meters
➢ ELN-9130 Basic of Control Valves (ILT) ➢ 1502C Controllers (ILT) ➢ ELN-9131 Basic Control Valves (On-Line) ➢ 4022 Inspect & Test Control Valves (On-Line) ➢ 0401 Inspect, Test Control Valves (On-Line)		➢ ELN-9145 Positive Displacement (ILT) ➢ ELN-9141 Orifice Meters (ILT) ➢ ELN-9146 Coriolis Flow Meters (ILT) ➢ ELN-9142 Turbine Meters (On-Line) ➢ ELN-9143 PD Meter Overview (On-Line) ➢ ELN-9144 Ultrasonic Meters (On-Line)

.

Thursday: 8:00 AM - Noon	Lunch	**Thursday: 1:00 PM – 4:00 PM**
Rotary, Turbine & Ultrasonic Meters		Collecting Samples
Competency: Meters		Competency: Sampling
➢ 1500 Turbine, Diaphragm/Rotary Meters (ILT) ➢ ELN-9147 Turbine Meters (ILT) ➢ ELN-9148 Ultrasonic Meters (ILT)		➢ ELN-9500 Gas Sampling (ILT) ➢ ELN-9501 Instrumentation Systems (ILT) ➢ ELN-9594 Instruments/Control Loop (ILT) ➢ ELN-9502 Gas Quality Instrument(On-Line)

.

Friday: 8:00 AM – Noon	No Lunch	**Friday: 1:00 PM – 4:00 PM**
Determine Gas Quality		
Competency: Gas Quality		
➢ ELN-9600 Gas Quality Measurement (ILT) ➢ ELN-9601 Gas Chromatography (ILT) ➢ ELN-9602 Gas Chromatography (On-Line) ➢ ELN-9091 Atmospheric Corrosion (On-Line)		Travel Time

**For full Industry Curriculum - see www.PenEduLearning.com*

Figure 3 - Basic Natural Gas Measurement – Technical Curriculum

Kirkpatrick Four Level - Effectiveness Measures

The Kirkpatrick 4-Levels summative evaluation model was developed by Dr. Donald Kirkpatrick in 1959. The 4-Levels Model is arguably the most widely used approach because of its simple, flexible, and complete evaluation[8].

[8] https://en.wikipedia.org/wiki/Donald_Kirkpatrick - Kirkpatrick's four levels are designed as a sequence of ways to evaluate training programs. Some practitioners suggests "it is best to look at the levels as a categorization scheme (i.e., their original purpose) in order to guide training developers in what levels to apply to the evaluation task".

If you deliver training for your organization, then you probably know how important it is to measure training effectiveness. After all, you don't want to spend time and money on training that doesn't provide a good return. This is where Kirkpatrick's Four-Level Training Evaluation Model can help objectively analyze the effectiveness and impact of training.

The Four Levels
The four levels are:
Level 1 - Reaction (Course Evaluation)
Level 2 - Learning (Knowledge Gained)
Level 3 - Behavior (Change in Performance)
Level 4 - Results (Company Goals)

Let's look at each of the four (4) levels in greater detail and how the model can be applied:

Level 1: Reaction - Start by identifying how you'll measure the Learners reaction - course evaluation. Consider addressing these questions:

- Did the learner feel that the training was worth their time?
- Did they think that it was successful?
- What were the biggest strengths of the training, and the biggest weaknesses?
- Did they like the venue and presentation style?
- Did the training session accommodate their personal **learning styles** ?

Next, identify how you want to measure these reactions. Using a tool such as Survey Monkey, in addition to the ideas listed above, create course evaluation questions to test the learning objectives regarding how well the instructor met the objectives during his presentation, etc. (figure 4)

The Level 1 survey can be assigned a numerical value. The numerical values are used to determine a score for the overall course evaluation, its value to the Learner and the quality of the instruction. For example, 1 (Strongly Disagree) through 4 (Strongly Agree) scale - the numeric value (or rating) can be derived from the average of all responses.

Level 2: Learning - Pre-Test and Post-Testing.
To measure learning, start by identifying what you want to evaluate. (These things could be changes in knowledge, skills, or abilities). It's often helpful to measure these areas both before **and** after training. So, before training commences, test the Learners to determine their knowledge.

Once training is completed, test the Learners a second time (at the end of the course) to measure what they have learned, or measure learning with interviews, performance or verbal assessments.

The Pre-test and Post-test scores and the change between the pre and post scores can be documented on a Training Summary document and used to evaluate the effectiveness of the course and the instructor (figure 5).

Level 3: Behavior - It can be challenging to measure behavior effectively. This is a longer-term activity that should take place weeks or months after the initial training.

Consider these questions:

- Did the Learners put any of their learning to use?
- Are Learners able to teach their new knowledge and skills to other people?

- Are Learners aware that they've changed?
- Are Supervisors aware of changes?

One method to measure a change in behavior is to conduct observations and interviews over a longer time horizon.

Course Evaluation - Regulator, Relief Valves & Control Valves [January-8, 2016] - Little Rock
(*Completed Class Summary*)

Comments regarding your experience participating and completing this course are extremely important to us. The information you provide is confidential and will ONLY be used to evaluate the effectiveness of this training course. Please indicate your response to each statement below by selecting (checking) the on-line rating on this evaluation.

Answer Options - Level 1 Evaluaton:	Strongly Disagree- Rate 1	Disagree - Rate 2	Agree - Rate 3	Strongly Agree - Rate 4	Rating Average	Total Response Count
1) The learning objectives were stated clearly at the beginning of the course.	0	0	0	8	4.00	8
2) The training aids, visuals and course materials were current, accurate and easily understood for my skill level.	0	0	0	8	4.00	8
3) By taking this course, I understand the principals of operation for the regulator, relief valve & control valve, including troubleshooting techniques.	0	0	3	5	3.63	8
4) During the course, I had sufficient time to understand the DOT requirements & frequencies, flow calculations, record keeping, LUFG, over-pressure protection devices and atmospheric corrosion.	0	0	2	6	3.75	8
5) Participation was encouraged throughout the course.	0	0	0	8	4.00	8
6) All my questions were answered clearly and to my satisfaction.	0	0	0	8	4.00	8
7) The Instructor was respectful, courteous, and conducted himself in a professional manner.	0	0	0	8	4.00	8
8) The Instructor is knowledgeable about the topics presented in this course.	0	0	0	8	4.00	8
9) The Instructor adjusted the pace of the course to my level of understanding.	0	0	1	7	3.88	8
10) Overall, the course was beneficial and will help me better perform my job.	0	0	0	8	4.00	8
		Class Average Total			3.93	
Additional Comments:						5
				answered question		8
				skipped question		0

Number	Response Date	Additional Comments:
1	Jan 8, 2016 6:25 PM	I was very impressed with the way this class was taught, focusing on lots of hands on participation and keeping safety a number one priority.
2	Jan 8, 2016 2:10 PM	Excellent class, would like to attend it again as a refresher
3	Jan 8, 2016 3:33 PM	This course was very helpfull. I hope to be able to take it again.
4	Jan 8, 2016 12:40 PM	It was a very good class
5	Jan 8, 2016 12:31 PM	This class had excellent hands on and the instructors were very helpful. Great class and I learned a lot

Figure 4 - Level 1 Course Evaluation

Also, keep in mind that behavior will only change if conditions are favorable. For instance, effective learning could have taken place in the training session. But, if the overall organizational culture isn't set up for any behavior changes, the trainees might not be able to apply what they've learned.

Alternatively, trainees might not receive support, recognition, or reward for their behavior change from their supervisor. So, over time, they disregard the skills or knowledge that they have learned, and go back to their old behaviors.

Level 4: Results - Of all the levels, measuring the final results of the training is likely to be the most costly and time consuming. The biggest challenges are identifying which outcomes, benefits, or final results are most closely linked to the training and coming up with an effective way to measure these outcomes over the long term.

Here are some outcomes to consider, depending on the objectives of your training:

- Increased employee retention
- Increased production
- Higher morale
- Reduced waste
- Increased sales
- Higher quality ratings
- Increased customer satisfaction
- Fewer staff complaints

Considerations
Although Kirkpatrick's Four-Level Training Evaluation Model is popular and widely used there are a number of considerations that need to be taken into account when using the model. One issue is that it can be time-consuming and expensive to use levels 3 or 4 of the model, so it's not practical for all organizations and situations. This is especially the case for organizations that don't have a dedicated training or human resource department, or for one-off training sessions or programs.

Some add a fifth level to Kirkpatrick for Rate on Investment (ROI). ROI Measure the benefits of training against the cost of training. To do this you must first calculate the financial value of the training provided. Next, you need to calculate the total direct and indirect cost of training. With those two variables in hand, you can calculate the ROI of your training as follows:

ROI = (Financial benefit from training – total cost of training) / (Total cost of training) X 100%

Summarizing Completed Training - Assessing Effectiveness
Compiling completed training information and data is a key requirement in documenting metrics for evaluating the effectiveness of training. On the Training Effectiveness Summary example below, you see the normal types of data about instructor led training (ILT) and on-line training are listed (training date, course title, attendee data, etc). The extension of cost data can be important for industry benchmarking and simple cost tracking to document how the company spends training dollars (figure 5)[9].

Effectiveness Measures
Training Effectiveness metric for the Level 1 course evaluation rating and the change in learning (Level 2) based on a comparison of average pre-post tests scores (figure 5).

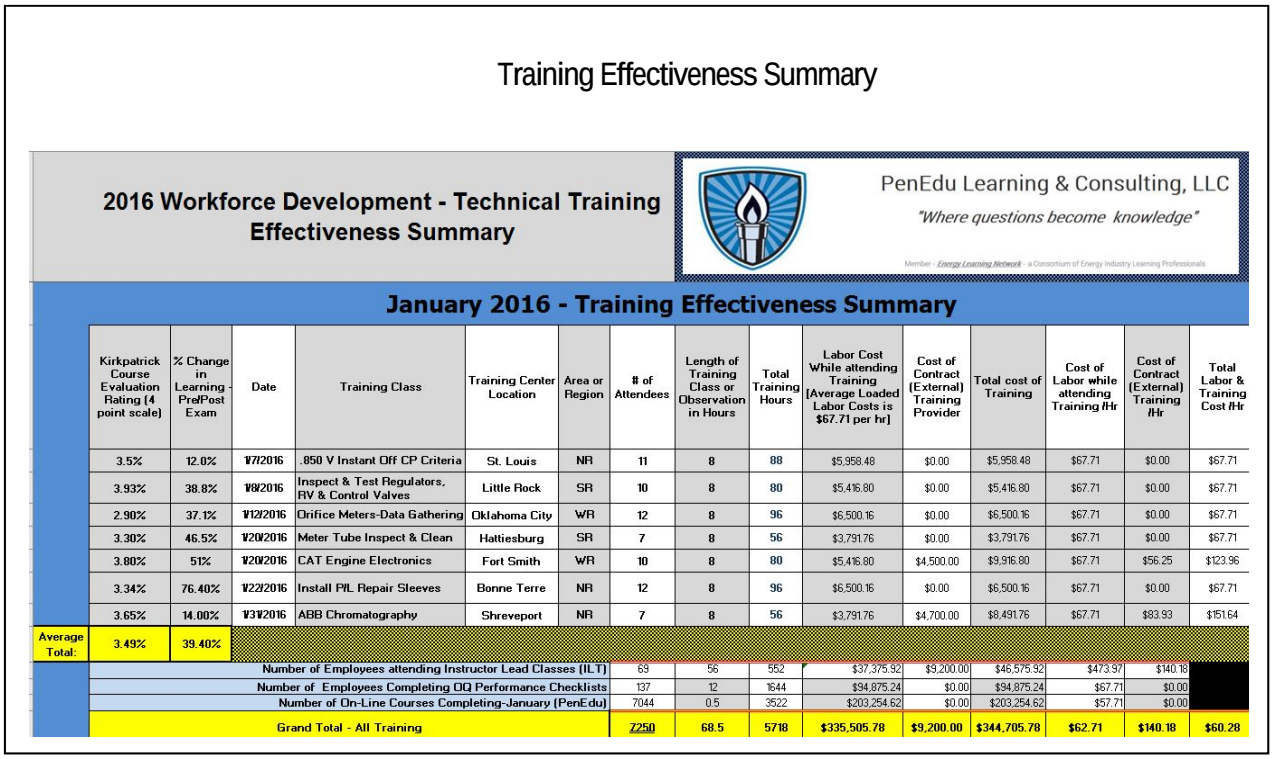
Kirkpatrick Course Evaluation: On a 1 (Strongly Disagree) compared to a 4 (Strongly Agree) scale, a numeric value (or rating) can be derived from the average of all responses. This rating is based on the questions on the course evaluation developed under the Kirkpatrick Model.
If course evaluation survey questions are written to capture this data, the following can be rated:

a) The Learner's experience
b) The Learners view of the usefulness of the course
c) The instructors' ability

[9]http://scholar.google.com/scholar?q=documenting+training+effectiveness&hl=en&as_sdt=0&as_vis=1&oi=scholart&sa=X&ved=0ahUKEwiQ5IKK9LvMAhVCTCYKHfbOALoQgQMIGzAA

For example, on a 4 point scale, any score under a 2.0 should be a clear indicator of poor instructor performance and possible intervention.

Percent (%) Change in Pre-Post Tests - The change in learning is a second key Training Effectiveness measure to consider. The Average Pre-Test score and the Average Post-Test score must be calculated. The comparison these two numbers (hopefully in a positive direction) is an indication the Learners increased their knowledge during the course (figure 5).



Training Effectiveness Summary

2016 Workforce Development - Technical Training Effectiveness Summary

PenEdu Learning & Consulting, LLC

"Where questions become knowledge"

Member - Energy Learning Network - a Consortium of Energy Industry Learning Professionals

January 2016 - Training Effectiveness Summary

	Kirkpatrick Course Evaluation Rating (4 point scale)	% Change in Learning - Pre/Post Exam	Date	Training Class	Training Center Location	Area or Region	# of Attendees	Length of Training Class or Observation in Hours	Total Training Hours	Labor Cost While attending Training [Average Loaded Labor Costs is $67.71 per hr]	Cost of Contract (External) Training Provider	Total cost of Training	Cost of Labor while attending Training /Hr	Cost of Contract (External) Training /Hr	Total Labor & Training Cost /Hr
	3.5%	12.0%	1/7/2016	.850 V Instant Off CP Criteria	St. Louis	NR	11	8	88	$5,958.48	$0.00	$5,958.48	$67.71	$0.00	$67.71
	3.93%	38.8%	1/8/2016	Inspect & Test Regulators, RV & Control Valves	Little Rock	SR	10	8	80	$5,416.80	$0.00	$5,416.80	$67.71	$0.00	$67.71
	2.90%	37.1%	1/12/2016	Orifice Meters-Data Gathering	Oklahoma City	WR	12	8	96	$6,500.16	$0.00	$6,500.16	$67.71	$0.00	$67.71
	3.30%	46.5%	1/20/2016	Meter Tube Inspect & Clean	Hattiesburg	SR	7	8	56	$3,791.76	$0.00	$3,791.76	$67.71	$0.00	$67.71
	3.80%	51%	1/20/2016	CAT Engine Electronics	Fort Smith	WR	10	8	80	$5,416.80	$4,500.00	$9,916.80	$67.71	$56.25	$123.96
	3.34%	76.40%	1/22/2016	Install P/L Repair Sleeves	Bonne Terre	NR	12	8	96	$6,500.16	$0.00	$6,500.16	$67.71	$0.00	$67.71
	3.65%	14.00%	1/31/2016	ABB Chromatography	Shreveport	NR	7	8	56	$3,791.76	$4,700.00	$8,491.76	$67.71	$83.93	$151.64
Average Total:	3.49%	39.40%													
				Number of Employees attending Instructor Lead Classes (ILT)			69	56	552	$37,375.92	$9,200.00	$46,575.92	$473.97	$140.18	
				Number of Employees Completing OQ Performance Checklists			137	12	1644	$94,875.24	$0.00	$94,875.24	$67.71	$0.00	
				Number of On-Line Courses Completing-January (PenEdu)			7044	0.5	3522	$203,254.62	$0.00	$203,254.62	$57.71	$0.00	
				Grand Total - All Training			7250	68.5	5718	$335,505.78	$9,200.00	$344,705.78	$62.71	$140.18	$60.28

Figure 5 - Summarizing Completed Training

NOTE: *7,044 web-based course views during January 2016 indicate a high level of self learning (this company has 450 employees - approximately 100,000 web-based course views annually).*