



PROACTIVELY EVALUATING TRAINING EFFECTIVENESS

Harry E. Fetterman
PP&L, Inc. – Susquehanna Steam Electric Station,
Berwick, Pennsylvania,
United States of America

Abstract

A common model of the five phase Systematic Approach to Training (SAT) displays the fifth phase, evaluation, feeding back into the previous four phases: analysis, design, development, and implementation. Evaluating training effectiveness in PP&L's Nuclear Department is not simply the fifth phase of the SAT. PP&L has demonstrated a more effective methodology is realized when evaluation is built into each of the other four phases. At PP&L, evaluation is conducted formatively throughout the first four phases of the SAT process and summatively after implementation.

1. INTRODUCTION

Of the many models available for instructional systems design, the Systematic Approach to Training (SAT) has been widely adopted throughout the United States nuclear power industry. A common representation of this model shows a linear flow of the first four phases: Analysis, Design, Development, and Implementation leading up to Evaluation. Then Evaluation feeds back into the first four phases as shown in Figure 1 below. When viewed in this linear model, evaluation is summative.

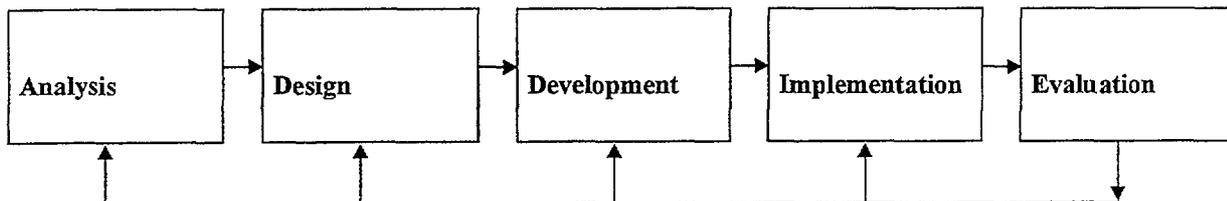


Figure 1. Linear Model of the Systematic Approach to Training

However, the benefits of the evaluation phase are increased if evaluation is also performed during each phase of training formation and delivery. This is generally termed formative evaluation. Figure 2 better illustrates the model used by PP&L, Inc.

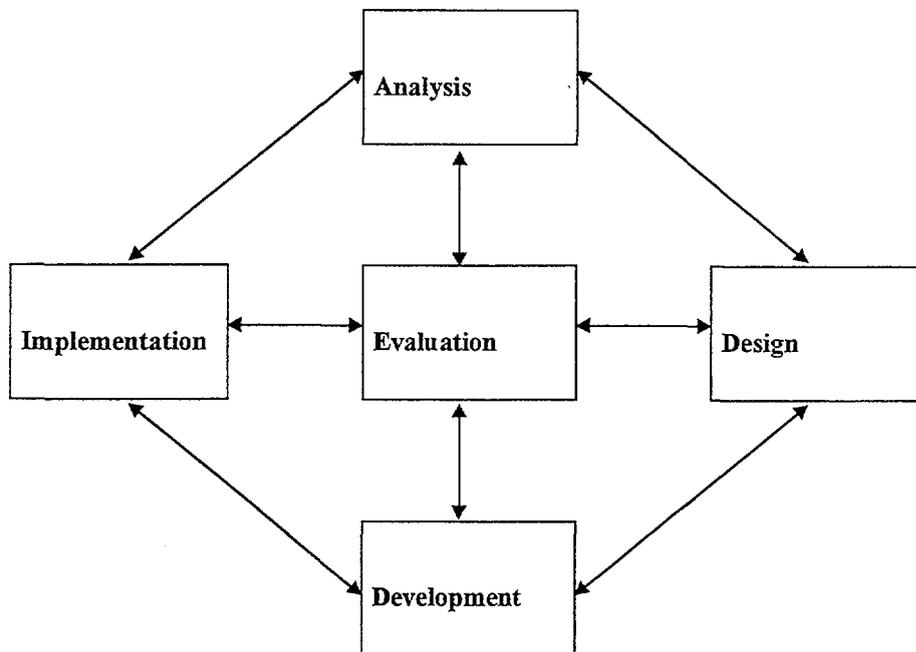


Figure 2. Proactive Model of the Systematic Approach to Training

2. ANALYSIS

Due to the maturity of PP&L's nuclear training programs, initial job analyses are not often performed. The analysis phase in PP&L's nuclear training programs includes a requirement to periodically review and verify existing job analyses to ensure each job analysis is current and accurate. This verification is conducted within four years of the last review. The job analysis verification is performed by work group incumbents, supervisors, and training personnel responsible for each training program.

In the job analysis verification, several key questions are asked, including:

- Is the task still performed?
- Is training required for the task?
- Is retraining needed on this task? And if yes, at what frequency?

This last question is part of the on-going evaluation of the training program. To answer this question, the incumbent participants assess tasks that they have been trained on, and provide feedback on their continuing training needs for those tasks selected for retraining. The output of the job analysis verification is one of the inputs used by the work group curriculum committee to determine the continuing training program for the upcoming year(s).

3. DESIGN

Work group subject matter experts (SMEs) and full-time training personnel work together providing mutual benefits during the design, development, and implementation phases. When training personnel design training material, work group SMEs are consulted to verify that the tasks to be trained accurately reflect the scope of the job and to verify the training needs. The work group may help determine the setting in which the training should be given, whether it should be in the classroom, laboratory, or nuclear power plant. Work group SMEs act as preliminary evaluators and consultants for the technical content of the learning objectives.

Work groups frequently assign a SME to the training group to design, develop, and teach specialized technical courses. In these cases roles are often reversed. The SME acts as the writer and developer, and full-time training personnel act as mentors for the design phase. The mentors provide educational soundness evaluations of the learning objectives.

4. DEVELOPMENT

The same mutual benefits between the SMEs and training personnel continue throughout the development phase. The development of technical training information and supporting materials, audio-visual media, and activities relies heavily on the two-way formative evaluation between the SME and full-time training personnel.

Before training material development is complete, the total training material package is sent out to work group SME(s), supervision, and training personnel for review. The proper selection of reviewers promotes a critical, thorough, and objective evaluation of technical content and educational soundness. When this evaluation is complete, the training material writer is responsible for incorporating appropriate comments. This process often requires input from the SME to ensure quality and accuracy of the training material.

Frequently, new or revised courses are given a pilot teach to a selected audience of SMEs and work group supervision. This technique is used to obtain valuable feedback the first time through the course to ensure the content and delivery meet the expectations of the work group and the training group. As a final step in formative evaluation, plant supervisory personnel and subject matter experts approve training material prior to its being taught.

5. IMPLEMENTATION

As instructors prepare to teach a course, they are not only refreshing the material in their own minds, but also ensuring that it is current and accurate. They check the referenced nuclear power plant procedures and other references to verify the material is up-to-date. Instructors also critique the training material format, continuously trying to enhance the presentation to make it more effective for the students. Before the material is taught, the instructors make appropriate changes to ensure the material is technically accurate, effective, and efficient. These "just-in-time" changes are approved before the material is taught.

During the implementation phase evaluative information is gained through students' immediate verbal feedback. The student population at PP&L for continuing training topics includes many incumbent workers with several years of experience in the work place. The experienced incumbents are a valuable resource during course delivery if the instructor draws

upon the wisdom they have acquired while performing work in this environment. Supervisors who sit in the class and managers who observe portions of the training provide immediate evaluative feedback to the instructors to ensure the nuclear power plant philosophy and expectations are being met by the instruction.

At any time during the course, generally near the end, students complete course critiques on the training material content and delivery. During the delivery, instructional supervisors periodically evaluate instructor performance and provide constructive criticism on instructional methods. Using the results of the end of course written exams, instructors are able to quickly deduce any points they may have missed in the instruction, points that were taught wrong, or any exam items that were not effective at evaluating the desired outcomes of the course. Instructors are responsible for prompt response on examination discrepancies and resolution of substantive items identified on student course critiques.

6. EVALUATION

Ideally, if the formative evaluation processes are completely successful, summative training effectiveness evaluations should find no human performance deficiencies after training has been given. Effective formative evaluation activities result in a reduced reliance on reactive, summative evaluations to correct conditions or situations after training has been delivered. In real application, PP&L practices both formative and summative evaluations to ensure, in a comprehensive manner, that training has been effective and to make corrections or enhancements as appropriate.

Each work group sponsors a curriculum committee with representatives from the training group and all levels of the work group. The work group manager is the chair of the committee. The curriculum committees routinely evaluate the effectiveness of training. They provide examples of how training leads to improved worker performance and make recommendations to enhance the content and delivery of future training. The curriculum committees use worker performance data and trends to help select continuing training topics for their work group.

The Evaluation Program Coordinator conducts post-training evaluation through interviews with previous students and their supervisors. The focus of the interviews is to determine to what extent the training program prepares or enhances the workers' ability to perform in the nuclear power plant.

During the first quarter of each year the Evaluation Program Coordinator also writes an annual report summarizing all training evaluation activities from the previous year. The data inputs for the annual report include all sources of training effectiveness evaluation, both internally and externally provided. The report comprehensively assesses the status of the nuclear power plant's training programs, and focuses on training successes and areas for improvement. The summary report is addressed to senior nuclear department management since they are ultimately responsible for evaluating the training programs' effectiveness at preparing nuclear power plant workers to perform their jobs.

7. SUMMARY

PP&L's training effectiveness evaluation program is continuous, comprehensive, critical, and candid. The on-going efforts of instructors, instructional supervisors, training management, and work group members promote open communication channels to maintain and improve training programs. The evaluation phase at PP&L is integrated into all phases of the Systematic Approach to Training, helping to ensure the desired outcomes of training.