NDT TRAINING ASSESSMENT

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ABSTRACT:
Complete sufficient organized training is essential for initial certification to become thoroughly familiar with the principles and practices of the specified NDT method. Self assessment is essential and mandatory to discover the extent of effectiveness of learning and to meet the ISO 17024 criteria for certification. The assessment process for NDT training based on the training objectives and outcomes will be discussed in detail.

The mission of the NDT training will be translated into specific objectives and outcomes that are expected as a result of the training process. The outcomes are measurable and can be assessed regularly. The results of outcomes assessment can be used as a feedback in order to make improvements.

INTRODUCTION:
Non-destructive testing results solely depend on the capabilities of the personnel who are responsible for performing the test [1]. The training must contribute towards the acquirement of three essential elements [2]:

a. Knowledge,
b. Skill and
c. Personnel attributes

Assessment is essential to monitor candidate’s learning processes and outcomes in order to determine areas of strength and weakness in a particular training program. The techniques of assessment should be devised so as to test the entire knowledge, understanding, skills etc of the candidates according to the recommended practice of SNT-TC-1A and CP-189.

This article describes a systematic, ongoing, iterative, effective self-assessment approach of ascertaining the outcome of the efforts in the realization of set aims and objectives.

PROPOSED SELF-ASSESSMENT PROCESS:
The intent of the self assessment process is to have the training documented, measurable objectives, including expected outcomes at the end of the course [3]. The training program can be used regularly to assess the progress against its objectives. The results of these assessments are used to identify program loopholes so that objectives can
be modified accordingly. It involves a sequence of steps that can be grouped into four phases [3,4]:
1. Defining objectives and outcomes for the training program.
2. Mapping the objectives with outcomes.
3. Assessment tools and
4. Evaluation
The basic self assessment flow chart for NDT training is shown in the Figure 1.

**FIGURE 1:** Self Assessment Flow Chart

**EXPLANATION OF CRITERIA:**

1. **Defining Objective and Outcomes for the training program:**
   Objectives are broader statements that describe the career and professional accomplishments that the training prepares to achieve. Outcomes are narrower statements that describe what the candidates are expected to know and be able to do after they finish their training [5].

   The paper describes the following objectives and outcomes for the NDT level training based on the recommended practice of SNT-TC-1A [1] and CP-189 [6].
Objectives:
1. **Foundation:** To provide students with a strong knowledge of terms, concepts, principles etc. involved in non-destructive testing.
2. **Skills:** To provide practical training in handling and testing the non-destructive testing equipments.
3. **Data Analysis:** To develop knowledge and skills for interpretation and evaluation of the results.
4. **Awareness and professional Ethics:** To offer environment to enhance team essential skills for effective careers in the inspection profession.

Outcomes (a-k):
- a. Ability to understand the basic theory and principles of NDT methods.
- b. Understand the scope and limitations of the techniques and methods.
- c. Understand the specification or codes or acceptable criteria used in the procedure.
- d. Ability to set-up and calibrate the equipments.
- e. Ability to conduct the testing independently.
- f. Awareness of measurement of errors in instrumentation, human and environment.
- g. Use of appropriate measurement techniques to collect data.
- h. Interpret the results and investigate the possible artifacts
- i. Evaluate the results w.r.t. the applicable codes, standards and specifications.
- j. Show confidence to take responsibility for on the job training and guidance of trainees and NDT level I personnel.
- k. Demonstrate the ability to organize and report the results of the test.

2. **Mapping objectives with outcomes:**
   The outcomes are the byproduct of the program learning objectives and the two must be interrelated [2]. A typical matrix that relates the NDT training program objectives to the expected outcomes is given in Table 1.

**TABLE 1:** Mapping between Program Objectives and Outcomes.

<table>
<thead>
<tr>
<th>Matrix</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a</td>
</tr>
<tr>
<td>1</td>
<td>o</td>
</tr>
<tr>
<td>2</td>
<td>*</td>
</tr>
<tr>
<td>3</td>
<td>o</td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

o Substantial contribution to the objective
* Moderate contribution to the objective
3. **Assessment Tools:**

The following tools are recommended for ascertaining the outcome of the efforts in the realization of set aims and objectives.

**A) Examination:** The recommended practice is to conduct examinations in general, specific and practical work in order to satisfy the criteria of certifications [1]. In order to assess the examination the following should be put into practice:

i. The examinations must be correlated with course objectives. Effort must be made to develop a set of questions that completely cover all the course objectives and satisfy the recommendation.

ii. Prepare a design for the examination giving due weightage to objectives. Typical example is shown in table 2.

### TABLE 2: Weightage to Objectives

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Objective</th>
<th>Marks</th>
<th>Weightage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Foundation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Data Analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Ethics</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

iii. Timely tests and mock-up examinations must be conducted from time to time to assess the learning outcomes.

iv. The instructor must be held responsible to analyze the score results of these questions in order to determine how well the course objectives are satisfied.

**B) Surveys:** Monitoring of the student satisfaction via surveys: This is a survey at or near the completion of the training. The objective is to assess the degree to which the students think their training met its objectives and to solicit their input regarding potential improvements to the training. A rubric is an easy and powerful tool to assess the satisfaction [7]. A typical example is shown in the table below.

### TABLE 3: Student Survey Form

| EVALUATION: STUDENT |
|---------------------|-------------------|
| Outcomes | Scale |
| a | 1 2 3 4 5 |
| b | 1 2 3 4 5 |

- On a scale from (1) to (5), please rate how well this course has helped you to perform the following course outcomes (1 = Very dissatisfied, 5 = Very satisfied)
C) **Alumni and Employer surveys:** This is a survey or feedback from the previous students and employers. The main idea behind it is to gather information about what the employer is looking for and to modify the training according to it.

4. **Evaluation:**

After assessment the final stage is to evaluate the training program depending upon the outcomes. If there is any drawback then modify it consequently and review the sequence of steps. Evaluation is a continuous process and it is essential to develop in a refined manner so as to collect the necessary evidences.

CONCLUSIONS:

Self-assessment is a critical activity for the training and development function. In this paper a four phase assessment approach is presented. The recommended practices SNT-TC-1A, CP-189 and CP-105 are used as the foundation for determining instructional objectives, outcomes and the evaluation for the NDT training. The assessment approach described in this paper can easily be modified and adapted for all the NDT methods.

REFERENCES: