# 360° view of assessment and quality management

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Content

# 1  Abstract

In the past, the term assessment was used to refer particularly to the process of determining the extent to which learners have mastered a subject. It has recently been extended in the academic context to cover all uses of evaluation. [1]

Assessment and quality management approaches rapidly grow up as the heterogeneity of training institutions and associations results in a variety of interests, goals, and contents of teaching and learning. The DVWO Quality Model [2] was created to ensure the evaluation of the impact of educational services.

Implemented in instructional systems for traditional as well as web-based education and training this DVWO Quality Model can serve as a framework for a 360° view of assessment and quality management for LEARNING, EDUCATION AND TRAINING SYSTEMS.

# 2  Problem definition

Over the past years the German Federal Employment Agency based in Nuremberg has been forcing up its selection criteria for educational services and vocational training programs for receiving governmental support. In June 2004 (amended January 2006) a new law was launched by the German Federal Ministry of Labor and Social Affairs setting standards in vocational training programs. With the new legislation (Third Code of Social Law SGB III) issues of quality criteria for educational services received a new emphasis in Germany.

# 3  Use cases

The DVWO-Quality Model represents a quality standard for educational services. It was designed by a working group established by the German Training Association (DVWO, (Dachverband der Weiterbildungsorganisationen e.V.) in 2005 (published 2007[3]). The terms of reference of the DVWO-Quality Model are  conform with the international standard ISO 9001 and the German Approval and Accreditation By-law – Vocational training (AZWV) specifications.

The internal standards related to the DVWO-Quality Model were revised on the basis of field tests carried out as pilot projects by H. Scholz. The management systems of training institutions involved in the field tests have been independently audited and certified (ISO 9001/DVWO). The results were analyzed in a book published by the Beuth Verlag [4] (Eds. German Institute for Standardization DIN).

# 4  Stakeholders

The DVWO Quality Model is a generic quality management system, which supports the implementation and maintenance of quality criteria for educational services. It was designed for various parties having greatest interest to be independently audited and certified that their educational services meet the standards set by ISO 9001 (and the approval criteria of AZWV). The DVWO Quality Model represents a substantial guide for trainers, training institutions and associations willing to undergo their own self-evaluation and assessment of the quality and consistency of their training schemes.

The elements of the DVWO Quality Model, the **Competencies Pyramid (see figure 1)** and the **Assessment Wheel (see figure 2)**  can also support system administrators and programmers creating accessibility solutions towards the evaluation of e-Learning systems and monitoring didactic effectiveness of e-learning measures.

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[1] http://wiki.eval.wmich.edu/wiki/Assessment

[2] German Training Association DVWO (Dachverband der Weiterbildungsorganisationen e.V.)

[3] Scholz, Helga: Realisierung des Bildungsprozesses, in: Richter, R. (eds.): DVWO Qualitätsmodell, S. 47-80, 2. Auflage, Offenbach, 2007 – GABAL

[4] Scholz, Helga: Qualität für Bildungsdienstleistungen, Berlin, Wien, Zürich 2008 – Beuth Verlag

# 5 Proposed solution

The purpose of this White Paper is to identify the assessment demands of the pedagogical dimension that represents the basis for teaching and learning activities towards effective e-Learning. Using DVWO norms sets a focus on the learner's demands and puts the pedagogical dimension in the centre of the assessment of e-Learning measures. Additionally it allows for the performance of e-Learning programs in conformity with the AZVW specifications.

## 5.1 Proposed didactic solution

Training institutions have to determine and manage numerous processes to work effectively. Educational services, and the teaching/learning evaluation and assessment need a clear distinction from monitoring organizational processes.

The institutional and administrative processes can transparently be documented on the basis of ISO 9001. In the field of teaching and learning modalities, the DVWO working group extended the established ISO 9001 basis of the process-based model (ISO 9001) by specifying quality policy and quality objectives, and adding the **DVWO Process-Model**. This new model represents the interrelated and interacting teaching and learning processes.

The aim of this DVWO Quality Model is to determine the quality of educational services by using an interpretation of ISO 9001:2000 standards. In addition to the eight ISO 9001 quality management principles the DVWO Quality Model has four further guidelines:

1. The educational services must be structured on the basis of the DVWO Quality Model.
2. Quality criteria must be named using the Competencies Pyramid in conjunction with the Content Objective Matrix.
3. Curricula can be arranged in an open or closed manner. The open curricula requires the operational objectives according to Mager [5].
4. Educational services must be assessed and evaluated.

## 5.2 Quality criteria and competencies

In 2005, the DVWO Quality Commission decided to use the Bloom's taxonomies [6] as quality criteria for learning objectives, teaching and training methods, and measurement of learning outcomes.

Bloom's Taxonomy of Learning Domains remains the most widely used system of its kind in education, industry and corporate training. [7] Thus, it was quite natural selected to be in the core of the DVWO Competencies Pyramid of learning domains.

As shown in **figure 1** the Competencies Pyramid constitutes of four parts (a fourth was added to Bloom's, Krathwohl, Dave taxonomy domains):

1. Cognitive domain (intellectual capability)
2. Affective domain (feelings, emotions and behavior)
3. Psychomotor domain (manual and physical skills)
4. Self-adjusting domain (according to individual requirements of the training association)

The dispute to place synthesis and evaluation on the same level was solved by adding a new subcategory "creation". The Competencies Pyramid system has seven increasing assembly levels, contrary to the six levels of Bloom (five levels Krathwohl, Dave).

Based on the European Qualifications Framework ( EQF ) considerations the seventh level "creation" is not to be understood as a rearranging one (synthesis) but conceived as design projects that lead to new knowledge and new procedural solutions.[8]

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5 Robert F. Mager, Preparing Instructional Objectives (Palo Alto, California: Fearon Publishers, 1962).

6 Möller, C.: Technik der Lehrplanung, Beltz Verlag, Weinheim und Basel, 1976

7 Anderson, L.W., & Krathwohl (Eds.). (2001). A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. New York: Longman.

[8] Brussels, 8.7.2005 SEC(2005) 957 COMMISSION STAFF WORKING DOCUMENT TOWARDS A EUROPEAN QUALIFICATIONS FRAMEWORK FOR LIFELONG LEARNING

Each level of the Competencies Pyramid defines a state of training experience. Like Bloom's taxonomies, it is a hierarchical construct to subsume that participants have to master each level before progressing to the next level.

In order to advance at the next level of the pyramid, the participant has to visit each learning domain:

- From development of knowledge and intellect (cognitive domain)

- Attitude and beliefs (affective domain)

- Ability to put physical and bodily skills into effect (psychomotor domain)[9]

- Individual requirements of the training association

The Competencies Pyramid represents a tool to construct objectives for learning programs, training courses and further educational services. It can facilitate the transfer, transparency and recognition of learning outcomes assessed by self-evaluation or certified by expert centers as well as ISO 9001 certification institutions. It can also encompass detailed descriptions of particular qualifications, learning pathways or access conditions.
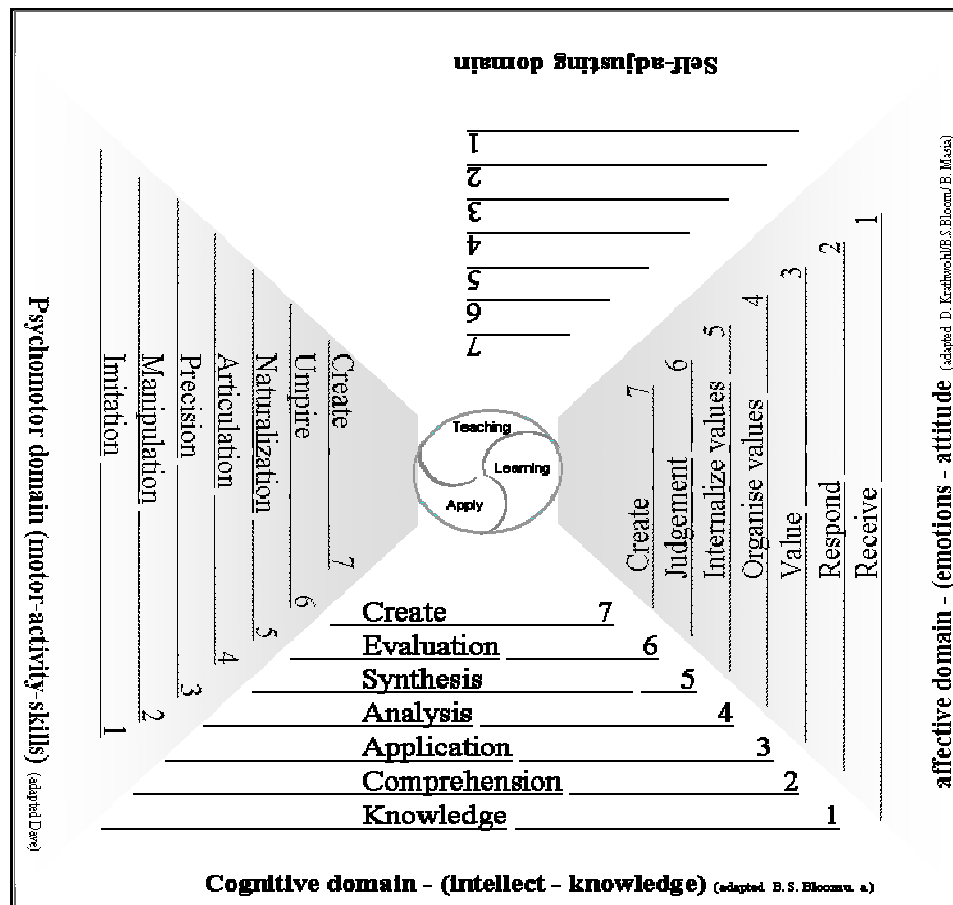


**Figure 1 Competencies Pyramid**

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[9] Based on the 'Taxonomy Of Educational Objectives: Handbook 1, The Cognitive Domain' (Bloom, Engelhart, Furst, Hill, Krathwohl) 1956. Bloom's Taxonomy second domain, the Affective Domain, was detailed by Bloom, Krathwhol and Masia in 1964 (Taxonomy of Educational Objectives: Volume II, Dave's version of the Psychomotor Domain The theory was first presented at a Berlin conference 1967

## 5.3 Content Objective Matrix

The Competencies Pyramid is applied in the DVWO Quality Model to establish quality criteria such as:

- Skill-based selection of a trainer/instructor
- Learner's objectives
- Recognition of learning outcomes

As illustrated in **table 1,** in the Content Objective Matrix of the DVWO Quality Model the following components appear:

**Table 1 Content Objective Matrix**

| Content (what) | Teaching (who) | Learning (how) | Transfer (wherefore) |
|---|---|---|---|
| Learning content shaped by customers expectations | Teachers qualifications identified with the Competencies Pyramid | Learning objectives identified with the Competencies Pyramid | Recognition of learning outcomes identified with the Competencies Pyramid |
| Content | 6 | 5 | 4 |

The Content Objective Matrix and the Competencies Pyramid point out learning objectives and the required measurement of training outcomes, which are necessary for assessment and evaluation.

## 5.4 Open and closed curriculum

A curriculum is the set of courses and their contents. It describes the collective teaching, learning and assessment materials that are available for that particular educational services or the (vocational) training program.[10]

A closed curriculum has specific goals and is partially or entirely determined by the training institution. It is often used in the education of technical knowledge. When students should be able to pursue their own educational interests, an open curriculum is preferable.

By planning an open curriculum casual objectives as general goals are appointed. In the beginning of the open curriculum, however, the student and the teacher intensify these general goals in behavioral terms (Mager, 1962), to mark the individual interest and development. [11]

## 5.5 Proposed solution: didactic assessment

Controlling the achievement of educational objectives according to DVWO, defining the audit criteria according to ISO 9001, measuring the maintenance of the AZWV approval, and the adoption of corrective measures in negative cases demanded a new assessment design.

The following process model can be considered as an "Assessment Wheel" freely adapted from the classical Plan / Do / Check / Act / circle (PDCA Deming Wheel or Shewhart cycle).[12] The Assessment Wheel is a model for a 360° view of assessment. It has four spokes marking the intersection of each evaluation section.[13]

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[10] http://www.finntrack.com/courseware_policy.htm

[11] Robert F. Mager, Preparing Instructional Objectives (Palo Alto, California: Fearon Publishers, 1962).

[12] Deming, W. Edwards (1986). Out of the Crisis. MIT Center for Advanced Engineering Study;
Shewhart, Walter Andrew (1939). Statistical Method from the Viewpoint of Quality Control**.** New York: Dover.

[13] Scholz, Helga, Evaluation von Bildungsdienstleistungen, Poster**:** Jahrestagung DeGEval - Zukunft der Evaluation vom 10. bis zum 12.10.2007 (www.degeval.de)
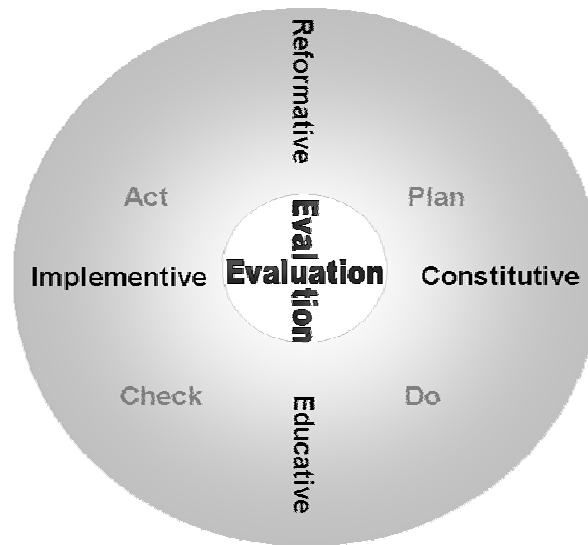
Adapted Plan-Do-Check-Act-Zyklus/ Deming

**Figure 2 Assessment Wheel**

The Assessment Wheel serves as an evaluation framework for:
a) **Plan** - Administrative regulation of the quality of the system, the teachers, the organization (ISO 9001)

b) **DO** - improvement of the program and the instructional process (DVWO/AZWV )

c) **Check** - students' requirements and final merits or learning transfer (DVWO/AZWV)

d) **Act** - About appropriate standards and functions of evaluation (German Association for Evaluation DeGEval)

By using the Assessment Wheel as a framework the evaluator does not only analyze and describe facts, he/she also evaluates and judges educational decisions with respect to various criteria.

### 5.6 Evaluation spokes

The entire target of evaluation is to provide knowledge that can support decision making such as program changes or revision. By planning the Assessment Wheel, it was intended to develop a strategy, which outlines the steps involved. The Assessment Wheel has four "Evaluation Spokes", which mark the intersection of each evaluation section: constitutive, educative, implementive and reformative evaluation (see footnote 13).

### 5.7 Constitutive evaluation (ISO 9001)

Constitutive evaluation serves as the starting point for evaluation work in the area of institutional performance such as budgetary analysis, internal control environment, management requests etc.

### 5.8 Educative evaluation (DVWO/AZWV)

The direct task of educative evaluation concerns the assessment of the educational program in a wide sense (teacher, learning objectives, means, contents, learning experiences, organization, etc.), as well as the educational curriculum itself (open/closed).

### 5.9 Evaluation function

The DVWO Quality Model sets up the requirement to assess and evaluate the implementation, and the maintenance of the open and closed curriculum. Instructional design is a complex process with numerous critical activities that are linked together. To evaluate these interdependencies - depending on the purpose and context of the selected curriculum, three different evaluation functions are used.

Scriven points out three different functions that evaluation can adopt, the formative, the summative and 2004 the ascriptive. The formative evaluation describes an evaluation of a program in progress with the objective of improving it. The summative evaluation checks at the end the effectiveness of the program among other things to make decisions about its continuity. Ascriptive evaluations evaluate programs as a concept; it is an evaluation done simply for the record, or for interest, rather than to support any decision.[14]

Working on the pilot projects one of the authors (H. Scholz) employed the summative, formative and ascriptive evaluations to assess quality and consistency of the open and closed curriculum. **Table 2** shows this relationship.

**Table 2 Relationship Matrix**

| Evaluation | Curriculum | Learning objectives | Base |
|---|---|---|---|
| Formative | Open | Casual to describe the goals | Improve a program while it is being applied |
| Summative | Closed | Determinate | Control a program |
| Ascriptive | | | Research |

Formative evaluation can contribute more to the development of education than summative evaluation. While forming a closed curriculum it makes sense to conduct a trial run by using an open curriculum with an formative evaluation to estimate the learning objectives, teaching methods, etc. toward future application in a closed curriculum.

### 5.10 Implementive evaluation (DVWO/AZWV)

The implementive evaluation tests the implementation of the learning objectives to determine whether it provides the intended outcomes. It demonstrates the effectiveness of the curriculum. Implementive evaluation estimates the value of an already concluded program (educational service). This evaluation seeks to provide an analysis of outcomes and lessons learned. If the student's performance does not meet the standards determined by the Content Objective Matrix, then adjustments can be made in two ways: Improve the performance, or lower the objectives.

### 5.11 Reformative evaluation (DeGEval)

Reformative evaluation analyses the effectiveness of the evaluation program and the intrinsic value of evaluation for the improvement of educational services (meta-evaluation). Reformative evaluation - finally - a strive for creating a climate favorable for new evaluation work by using standard criteria such as relevance, efficiency, effectiveness, and sustainability.[15]

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[14] Michel Scriven, Evaluation Checklists Project, www.wmich.edu/evalctr/checklists

[15] Deutsche Gesellschaft für Evaluation – DeGEval on October 4th, 2001.

## 6 Integration into SCORM

The taxonomies of the Competencies Pyramid can be reflected in the SCORM Content Aggregation Model (CAM) due to the definition of the learning packages' structure in that model. Here an embedding in the mandatory *<resource>* element that contains a list of files and other resources is possible due to the opportunity to represent the taxonomies as a XML structure. Every item will reflect one taxonomy and one competency level and refer to the *<resource>* element as illustrated in **figure 3**.
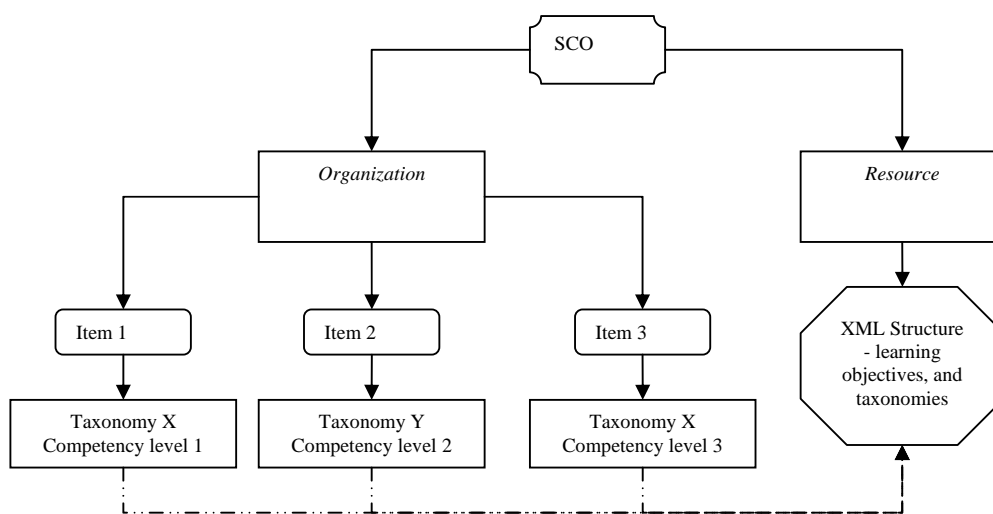
**Figure 3 Mapping of the Competencies Pyramid onto the SCORM CAM**

The SCORM Sequencing and Navigation (SN) part concerns the control of the learning process. Consequently, it can reflect the content – learning objective – scheme, and particularly the open and closed curriculum matters. As the structures are already accessible, only the availability of these learning objective structures in the particular Learning Management System has to be ensured. Figure 4 illustrates the different approaches for the open and closed curriculum evaluation.
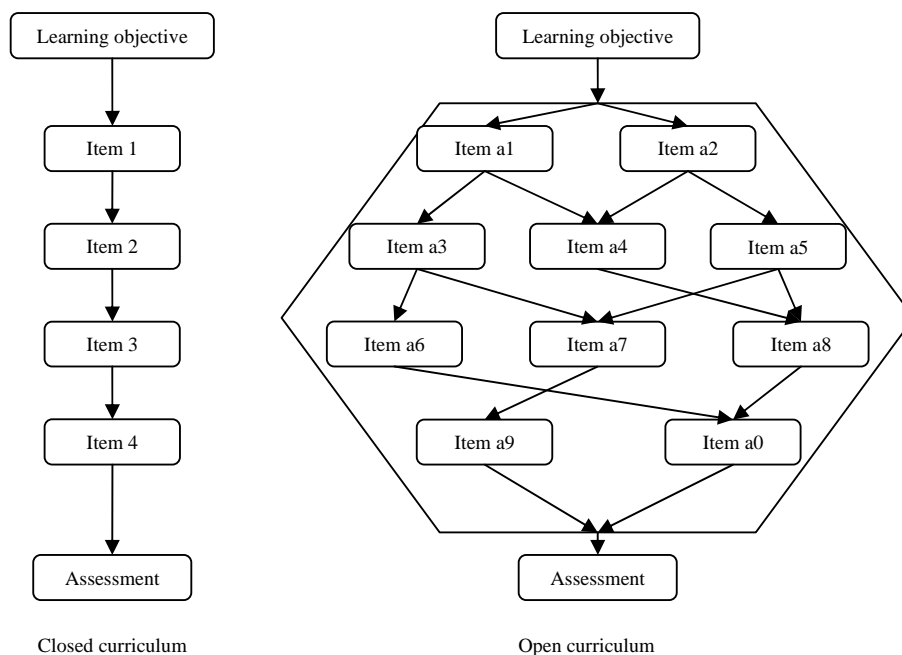
**Figure 3 Mapping of the open and closed curriculum onto the SCORM SN**

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## 7   Implementation

Some aspects of the proposed framework for assessment integration in SCORM are being implemented by the Business Area Data Representation and Interfaces, Fraunhofer IDMT, in a project named EDMedia. EDMedia is a LCMS that ensures the interoperability of the content by the use of XML based exchange formats. The implementation of the ADL SCORM 2004 3rd Edition standard enables exchange and reusability as well as processing of SCORM-compliant learning objects (SCO's).

## 8   Summary

This proposed framework for a "360° view of assessment" provides an overview of the environment within which the programs or projects are operating and offers e-Learning educators a better theory, principles, and pedagogy to build up their future teaching approaches, in order to advance student learning.

The Assessment Wheel provides a guidance to improve the preparation, implementation, performance, and evaluation of educational services. It is targeted at educational institutes that want to certify the quality of their educational services to be conform to ISO 9001/DVWO and the AZWV approval specifications. It supports trainer, training associations and e-Learning educators wishing to self-evaluate and assess the quality and consistency of their training scheme.