# TOWARD A HELPING SYSTEM FOR A GOOD ASSESSMENT IN E-LEARNING

Nour-eddine El Faddouli
Mohammadia Engineering School, Avenue Ibn Sina BP 765 Agdal-Rabat
faddouli@emi.ac.ma

Mohammed Khalidi Idrissi [1], Fayssal Smawi [2], Youssef Blqasmi[3]

***Abstract*** **- Generally and more particularly in E-learning, the evaluation is an essential tool in the training process. It is formative when it is used to allow the learner to maximize his learning. It can be also summative when it is used to validate the competencies acquisition. Although several techniques are offered to the evaluation author (True/False, MCQ, free Question…), he is always confronted to the difficulty to choose the most suitable ones guaranteeing a good evaluation. In our project, regardless the technique to be used, it is necessary to take into account the learner profile and his dynamic at the time of the training. We then propose an assistance system for the evaluation generation. This system is based on the learner profile and the evaluation object content, and also provides a help for the choice of the most adapted method.**

*Index Terms* - E-learning, assessment, evaluation, evaluation method, training, learner profile.

## Introduction

In the field of the e-Learning the evaluations represent an important factor for the success of a formation. The evaluation allows:

- To determine if learner has the necessary knowledge to follow the formation.
- To ensure the learner's follow-up throughout the training course.
- To determine the learner's acquisition degree and to identify knowledge or competences that he has difficulties to acquire.

Contrary to a traditional formation, the E-Learning does not profit from the advantage that a teacher is in direct liaison with his scholar to judge their level of acquisition and to notice their dynamism and their progression in the courses. This is due to the fact that learners find themselves isolated in front of their machines using their only autonomy to progress in the courses, without any appreciation or encouragement, only the result of the evaluations, will reveal if they acquired the evaluated knowledge or competence[6].

Our research aims at designing and implementing an evaluation environment that is adapted to E-Learning. In this paper, we describe our decision making tool that would allow to select the most appropriate evaluation method. This selection is done in terms of the pedagogical objective and in terms of the learner profile. Thus, we begin by describing the research problem followed by the definition of our contribution to solve that problem. Then we present i) the different levels of training that our system has to take into consideration, and ii) the evaluation methods thet currently exist. After that, we propose then an architecture that highlights our evaluation environment. We finally concluded the paper by exposing the current state and the future of research works.

## Problematic

In a formation on E-Learning, there is several means to evaluate learners, such by simple test (True/False, QCM, FIB, Opened Question …) or by achievement of tasks or resolution of problems. It is clear that these means represent different levels of difficulty; indeed, a True/False test type is definitely easier than an Opened Question. In the first case, all that it is necessary to do is to identify the good answer among both presented, while for an Opened Question learner must make proof of more autonomy and build himself the answer. Consequently, it would be more interesting to take into account the difficulty of the teaching activity to evaluate, compared to the context of the formation, when we are choosing the mode of evaluation [5].

In addition to the problems to find the good method to evaluate concepts with varied difficulties, there is another problem involved in the evaluations. This problem relates to the difference between the knowledge acquisition levels of learners in the same group. Indeed, in the same class each learner progresses according to its own rhythm. It is acted in fact of the personal profile of each individual in a class. So if some learners manage to assimilate the questions of one test and consequently to answer it, others will be able to be blocked failing to understand a question which treats a concept that they control probably well but the question is badly formulated. Consequently, it is note possible to make sure that the result of an evaluation reveals reality about a learner. I.e., if this last misses its test, the question to ask is: did (s)he fail because (s)he does not have the required knowledge to answer the test or because the test itself is badly designed.

[1] Khalidi Idrissi Mohammed, Mohammadia Engineering School, khalidi@emi.ac.ma
[2] Fayssal Smawi, Mohammadia Engineering School , fayssal.smawi@emi.ac.ma
[3] Youssef Belqasmi, Enset-Mohammadia, youssef@belqasmi.net

## Contribution

In fact, the problem which installation is that of the heterogeneity of the learner's profiles within a group, and the negligence of this profile by the author when he's designing an assessment. In traditional teaching, the teacher does not take into account this aspect and even if it is conscious, it tries to propose intuitively an assessment covering the majority of the profiles of his class. The risk of failure of learners whom have problems on comprehension or interpretation of the assessment subject remains very great.

We define a success evaluation as being: "*An evaluation which reflects the exact level of acquisition of knowledge or awaited competences, and reveals the places of gaps to fill thereafter*".

In order to concretize this concept of good evaluation, we propose in this paper, a decision-making system intended to assist the author during the design of the various assessments which he intends to propose to his learners, in order to choose the adequate method and type of test for each of its assessments. This system will be based as well on the meta-data describing in detail the contents in the context of the formation, as on the individual profile of learner who will be evaluated. The meta-data will allow determining the objective of a teaching sequence.

## Level of training

The system that we propose to assist the author, must take into account the profiles of learner to evaluate. So that the assessment is succeeded for the whole of learners we must be based only on one profile which characterizes the entire group. We define a Standard Profile as being a profile which can characterize a group of learners whose acquisition capacities and rhythm of progression are similar. Thus, the first stage of our study consists in classifying learners according to their profiles in significant groups.

The learning profiles can be classified according to several criteria: teaching Objectives, the degree of difficulty and psychomotor characteristics. The mechanism of classification proposed in our paper rests on the taxonomy of B. BLOOM. This classification, based on the teaching objectives, consists in organizing information in a hierarchical way; it is implemented by higher said cognitive faculties. This classification can be summarized in six levels [1] in relation to the cognitive fields, every higher level including the preceding levels. Every level corresponds of typical operations [Table I]. A person can progress of a level to another by filling the corresponding tasks.

TABLE I
LEVEL OF TRAINING

| Category | Key words |
|---|---|
| Knowledge | defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states. |
| Comprehension | comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives Examples, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates. |
| Application | applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses. |
| Analysis | analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates. |
| Synthesis | categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes. |
| Evaluation: | appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports. |

This taxonomy helps the teachers to formulate questions which make it possible to locate the level of comprehension of the scholars. For example, a question can be used to determine that a pupil is qualified in the facts knowledge, comprehension, the application, the analysis, the synthesis and the evaluation. By structuring the questions, the teachers are led to know in a better way the weaknesses and the forces of the scholars, which make it possible to support the progression of the training towards higher levels

## Methods of assessment

As we stated before our objective is to conceive a system intended to assist the author of the evaluations to choose the best method to evaluate a given concept. There exists much of means to evaluate a concept such by simple test (True/False, QCM, FIB, open Question…), by resolution of problem or by project. The author can also proceed by a combination of several methods to conceive the same assessment. However, how can we determine the criteria which the choice of these methods will be carried out? We estimate that a classification of the methods evaluation is necessary. For that, once again we will use the taxonomy of B. BLOOM [1], considering its generics to treat all what relates to education, but this time to classify the methods assessment, by associating each category to a method. For example, for the Knowledge category the best means of evaluation is to use simple test such True/False or QCM type, whereas for the Application category it would be more interesting to propose a project to the learner.

## Architecture of the system

In our article we propose architecture [figure 1] based on the description of the contents, and the profile of learning how to evaluate. The contents, being in conformity with a standard, must be defines in a very precise way, by bringing back the maximum of properties which can influence on the choice of a method evaluation. The profile also, must be represented in a very detailed way, in the form of properties characterizing the dynamics of learning, and thus to conclude on its cognitive state compared to a resource or a teaching concept. In the following paragraphs we will detail each component of this architecture.

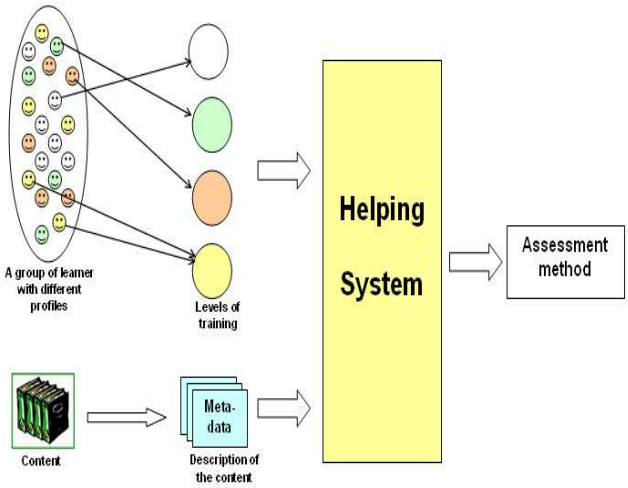


FIGURE 1: GLOBAL ARCHITECTURE OF THE SYSTEM

### *1. Description of the content and the profile*

The first stage in this architecture consists in describing the contents and the profile. For that we based ourselves on a whole of standards. As regards the contents, standard LOM [4] of the IEEE proposes the most detailed description under format of categories (nine categories). Each one of these categories has a whole of properties. For our study only the Educational category seems to be important. As its name indicates it, this category described the key teaching characteristics of the resource. These characteristics are: Type of interactivity, teaching Type of resource, Level of interactivity, semantic Density, supposed Role of the end-user, Context, Age bracket, Difficulty, Time of Average Training, Description, Language. As for the profile, there are two means to describe it. First is to use a model of description. Among these models, most known is the Overlay model also says by partial expertise or covering. This model uses the representation of the knowledge of a field to model that of learning. This model [3] regards the knowledge of learning as a subset from the knowledge of an expert. The construction of such a model this fact as learning it progresses in a teaching course. We can also press us on the existing standards to describe a profile like IMS-LIP [3]. By using IMS-LIP which is based on a data model which describes the essential categories to record and manage the academic course, the objectives of the formation and the results of learning. We will profit from a rather detailed description of the learning profile, realising a whole of characteristics: *Identification, Goal, Qcl (Qualifications, Certificates & Licences), Accessibility, Activity, Competency, Interest, Transcript, Affiliation, Securitykey, and Relationship.*

### *2. The correspondence profile - level of training*

The heterogeneity of a group will imply the multitude of the learning profiles what complicates the choice of the method evaluation suitable. In order to simplify the process of decision-making aid, it is more interesting to reduce the number of profiles by gathering them according to certain characteristics. The levels of training can play a part interesting and represent consequently, the groups in question. This operation could be described, as being a correspondence between a profile and a level of training. The total system will thus have, on the basis of an unspecified profile, to determine the level of training to which this profile belongs.

### *3. Description of the helping system*

The last stage in this architecture relates to the computerized decision-making system. This system with for goal to propose an optimal solution with the problem of the methods evaluation. All the stages seen until now were with an aim of simplifying the internal mechanism of the computerized decision-making system. This last will have to propose with the author a method evaluation which takes account of the level of training of learning and the difficulty from the taught resource. Indeed, a first approach of the mechanism interns would be to make a kind of correspondence level of training - method evaluation; however this idea remains naive and could not propose an adequate method.

A second approach of the system would be to exhibit a unit $\mathbf{X} = \{\mathbf{x_1}, \mathbf{x_2}, \mathbf{x_3},..., \mathbf{x_n}\}$ of properties being able to characterize a method evaluation, which will be tested according to c1 criteria, $\mathbf{c_1}, \mathbf{c_2}, \mathbf{c_3},..., \mathbf{c_p}$ formulated starting from the description of the levels of training and the meta-data of the contents. The importance of these criteria lead us to affect weighting coefficients to them, that is to say $\boldsymbol{\alpha_1}, \boldsymbol{\alpha_2}, \boldsymbol{\alpha_3},..., \boldsymbol{\alpha_n}$, such as:

$$\sum_{i=1}^{N} \alpha_i = 1$$

For a property $\mathbf{x_i}$, we will carry out an evaluation according to criteria's $\mathbf{c_k}$ ($1 \leq k \leq p$), noted $\mathbf{e_{ik}} \in \mathbf{R}$. We will thus obtain the table below [Table II].

TABLE II
DECISION'S MATRIX

| Criteria propriety | $c_1$ | $c_2$ | $c_3$ | … | $c_k$ | … | $c_p$ |
|---|---|---|---|---|---|---|---|
| $\mathbf{x_1}$ | $\mathbf{e_{11}}$ | $\mathbf{e_{12}}$ | $\mathbf{e_{13}}$ | … | $\mathbf{e_{1k}}$ | … | $\mathbf{e_{1p}}$ |
| $\mathbf{x_2}$ | $\mathbf{e_{21}}$ | $\mathbf{e_{22}}$ | $\mathbf{e_{23}}$ | … | $\mathbf{e_{2k}}$ | … | $\mathbf{e_{2p}}$ |
| $\mathbf{x_j}$ | $\mathbf{e_{j1}}$ | $\mathbf{e_{j2}}$ | $\mathbf{e_{j3}}$ | … | $\mathbf{e_{jk}}$ | … | $\mathbf{e_{jp}}$ |
| $\mathbf{x_n}$ | $\mathbf{e_{n1}}$ | $\mathbf{e_{n2}}$ | $\mathbf{e_{n3}}$ | … | $\mathbf{e_{nk}}$ | … | $\mathbf{e_{np}}$ |

Thus we managed to formulate a computerized decision-making system multi-criterion which we can solve thanks to the traditional algorithms.

## Conclusion

The solution that we proposed is to conceive a computerized decision-making system to choose the good evaluation method. This choice is based on the description standardized of the learner profile and the teaching contents, object of the evaluation. This system will have to facilitate considerably the task of evaluation design, by assisting the author in the choice of the most adequate method in order to evaluate objectively the learners.

In term of preferment, we could formulate the problems related to the difference in levels of learner acquisition, and developed the total architecture of the system which answers these problems. In prospect we intend to refine the system specifications, to define a complete architecture, to develop and validate compared to the concepts, objects of our research. At last, we will implement our system.

### REFERENCES


[1] Sokolova, M. Totkov, G "About Test Classification in E-Learning Environment", *International Conference on Computer Systems and Technologies*, 16-17 June 2005.

[2] Goldstein, I.P "*The Genetic Graph: A Representation for the Evolution of Procedural Knowledge*". In D. Sleeman and J.S. Academic Press, London, 1982.

[3] IMS Global, "*IMS-LIP(learner Information Packaging)*", http://www.imsglobal.org

[4] IMS Global, "*LOM (Learning Object Metadata)* ", http://www.imsglobal.org

[5] A.BENKIRAN, Y.BELQASMI, F.TOURE: « L'apprenant et les plates-formes de télé-enseigement», WOTIC'05, Kenitra, juin 2005

[6] Bennani S , Benkiran A, Landry Defo Kuate PEDAGOGICAL DESIGN INTEGRATION IN SMART LEARNING AUTHORING SYSTEM, Conference elearn'2005, 7-9 July 2005, Washington