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# Education and E-Learning Evaluation and Assessment

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## INTRODUCTION

The assessment of e-learning shares most of the needs and requirements of face-to-face teaching, including clarity of the main objective, needs analysis, comprehensibility of objectives, definition of resources, and balance report (Calvani & Rotta, 2000). However, in e-learning environments the qualities of both monitoring and formative assessment have prominence, and can even determine the success of the course (Moore & Kearsley, 1996).

In the *learner-centered* approach, typical in e-learning, the student is the protagonist of the teaching-learning process and thus, assessment is considered from a new perspective. It can be defined as the systematic process of correction, revision, collection, and use of information regarding both the students and the course in order to favor the progress and the learning of each student (Palomba & Banta, 1999). Assessment and evaluation are two different concepts even though they are interconnected: the former determines the student's knowledge, skills and attitudes while the latter is necessary to express an opinion on learning results and on the quality of teaching.

## ASSESSMENT OF E-LEARNING

According to the leading experts in this field, the assessment of e-learning is a key process which not only evaluates the coherence between the objectives achieved by learners and what has been planned in terms of content and methods, but also monitors the dynamics of the process. In this way, it is possible to

obtain useful information to replicate the formative action and/or make it more flexible.

The assessment of online training courses refers to various aspects (Fragno, 2002):

- Learning assessment
- Process assessment
- Course evaluation
- Interaction assessment
- E-learning platform assessment

In the *learning assessment*, based on timing and content, it is possible to distinguish:

- *Diagnostic assessment* of which the aim is to identify students' background knowledge and/or their needs in order to personalize teaching and to set up a suitable learning program;
- *Formative assessment* of which the aim is to highlight the knowledge, competencies and skills acquired by each student at the end of each teaching module;
- *Summative assessment* of which the aim is to check the level of competencies and skills at the end of a course or to evaluate the effectiveness of the formative action. It must include several tests administered both during and at the end of a course.

The *process assessment* is intended to test the efficiency and the effectiveness of the managerial and organizational variables as well as of all those aspects which can be involved when developing and teaching a course. This kind of assessment can make use of a

questionnaire to gather information referring to the students' reactions to the training experience and to produce useful feedback on what the course has meant for the students. Teaching effectiveness and the training process are closely linked because a deliberate teaching plan can be critical for the students to reach the course objectives. As a result, student evaluation of learning means assessing the validity of the teaching process.

The *course evaluation* is divided into three phases. The first is *ex-ante* and it refers to the identification of a series of indicators which are evaluated by a financial body on the basis of the planning prospect target of the institution that proposes the course of study. The purpose of the other two phases, *in-itinere* and *ex-post*, is to identify the discrepancies and the conformities between the planning proposal and the implementation of the plan. In particular, the formative assessment (*in itinere*) can be divided into learning assessment (*effectiveness*) and process assessment (*efficiency*). As far as the latter is concerned, two different kinds of data exist: the objective data are provided by the organization which offers the course (obtained through the official reports that are submitted throughout and at the end of the course) and the subjective data which are provided by the students (gathered through questionnaires) who express their opinion about:

- Instruction (competence, effective timing, interest in the contents, clarity and articulation of topics);
- Course structure (presentation, articulation of contents, timeliness);
- Teaching material and contents (conformity to the course's general objectives and to the students' background knowledge);
- The e-learning platform adopted (functionality, clarity, and intuitiveness);
- The experience (pros and cons of the course).

Both during *the interaction assessment* and the *e-learning platform assessment*, it is necessary to emphasize that integrated e-learning environments are mainly based on written and asynchronous communication which provides the possibility to pair collaborative learning with *learning by doing*. These environments are generally used for social-constructivist learning processes where a virtual community collaborates in the development of mutual products or interaction about the course topics. Technological equipment used for this

process must be able to support each of the necessary practical activities (exercises, simulations, etc.). It is important to verify immediately what the participants have learnt. Assessment is also based on the observation of the interaction among participants and on their means of collaborating and learning together. A balance between tests based on quantitative aspects (the number and distribution of messages in diverse work areas) and qualitative ones (content of messages) is fundamental. In analysing several online training experiences, it can be emphasized that the best results from the learning perspective are obtained when a frequent and positive collaboration between the instructor and the students (vertical interaction) is achieved in addition to frequent communication between the students (horizontal interaction) (Bocconi, Midoro, & Sarti, 1999).

The interface in virtual learning environments should be intuitive and friendly so that students' needs are facilitated by their use. Especially in the case of short courses, the time necessary to learn how to use the system should be proportionate to the course objectives. It is also important that the environment should offer a series of useful features for adequate support of the participant in the learning process.

## TOOLS TO EVALUATE E-LEARNING

Some e-learning environments provide the possibility to track and elaborate a great quantity of information automatically thus making data collection easy, are very important. Moreover, one of the most important features of e-learning is the monitoring method that typically includes *tracking systems* and *e-portfolio*.

### Tracking Systems

A tracking system is usually characterized by:

- The *login* accesses the e-learning platform which identifies the user, tracking the connection date;
- The *login session* allows measurement of the duration of the connection to the e-learning platform by the user;
- The *visited areas* of the platform allow monitoring of the areas visited by the user during the login session;
- The *testing evaluation* scores the tests completed by the user;

- The *training course summary* provides overall data about the course attended by the user.

By tracking individual logins to the e-learning platform, it is possible to measure the frequency distribution of contacts within a fixed time interval (per week, per month, per year) and the reason for the login (downloading material, establishing contacts with the instructor, chatting sessions, taking part in discussion forums, etc.). The information that is gained from the tracking facilities indicates whether the login trend has been constant and if it has followed the insertion of the material provided by the instructors or if there has been a particular concentration activity during certain periods (for instance before the final exam). It is clear from the tracking process whether the user logs in only to download the course material, or to post an answer to the instructors or to actively participate in the virtual community while developing a cooperative learning experience.

Through *text analysis of forum discussions and chats* it is possible to understand the dynamics of the user's learning process and of the gradual progress of the community.

Tracking data and the analysis of the materials are fundamental to evaluate the project as a whole as well as the online activities of each student. Interpretative models as well as algorithms are necessary to go beyond the single numerical datum, in order to consider the quality of online activities and data relationships, and to integrate the quantitative analysis of online activities with the semantic analysis of written texts. At the same time it is necessary to develop models of online interaction typologies through which it is possible to establish the planning and the realization of interoperating and customizable environments. One of these methods of analysis is the *social network analysis (SNA)*. It is a quantitative-relational analysis of the interaction flow and, unlike traditional quantitative methods based on the characteristics of each participant (sent messages, received messages, etc.), it is based on relational data: connections, contacts or links that characterize a group of people or of organizations (families, associations, societies, countries, etc.) (Scott, 1997; Wasserman & Faust, 1994).

As already stated, in e-learning, the construction of knowledge is not only achieved through the activity of the single user but through the participation of a virtual community with which it is possible to share

competences and knowledge, collaborating with the others to reach the same goal. The SNA permits the description and analysis of the structure of interaction to be considered during exchanges within a group or in a virtual community, evaluating the impact each has on the relational structure and observing the effectiveness of the role models (tutors, moderators, etc.) as they interact and communicate. Moreover, the SNA can be a useful instrument for the tutor to monitor while developing the process of cooperative knowledge construction. In particular, the SNA identifies some critical moments of group dynamics (isolation, attention catalyzation, non-mutual interaction) that should trigger immediate intervention by the instructor in order to quickly make any necessary modifications to the program.

Another important aspect of SNA is the option to display the relationships and communication among the different net components called knots through the use of diagrams, graphs and maps by using a tool such as *NetDraw*. Furthermore, it is possible to study the factors that influence the relationships among the knots by considering, for example, the age, the context, and the background of the individuals involved in the analysis. This study can be carried out by using traditional statistical techniques such as the correlation, the analysis of variance, the factor analysis, and so on.

## ELECTRONIC PORTFOLIO

A portfolio is a useful instrument to evaluate learning and there are a variety of portfolios.

It is possible to describe the portfolio as a *profile* containing a list of certificates and credits obtained during an individual's school years and any possible certification of training and work experience. However, it is also possible to consider the portfolio as a *portfolio of competencies* which allows the documentation of an individual's particular learning process. This model produces a personalized interpretation of learning and provides the opportunity to document, evaluate and create awareness of the acquired competencies. From a didactic point of view, the interest in the portfolio is related to the way in which teaching is planned with an emphasis on a personalized, learner-centered approach and reflection. The way through which the portfolio develops in addition to the role of the student may change the purpose of the portfolio from an instrument used for the documentation and evaluation of the processes to

a tool used to acquire awareness of the process (Rossi, Magnoler, Blam, & Alessandri, 2004).

In e-learning, the portfolio is called *e-portfolio* (*electronic portfolio*). It consists not only of the simple reproduction of a paper-based portfolio in a digital format but also allows the user to collect digital artifacts, to share them and to connect them in reticular structures.

A standards-based e-portfolio makes use of a *database* and *hypertext links* to identify the relationship between the appropriate goals of the course and the final artifacts. As Barrett (2000) says it is important to not only collect artifacts but also to document a process that evolves dynamically over time in order to study its evolution.

Many e-portfolios are based on the model first used by Danielson and Abrutyn (1997) and then revised by Barret (2000). This model consists of the following fundamental steps:

1. **Collection:** A description of the artifacts to be collected by students will be evaluated by the tutor/instructor on the basis of the portfolio's audience, purpose and future use of the artifacts.
2. **Selection:** A selection of the materials chosen by students to be included in their portfolio according to certain criteria that reflect the learning objectives established for the portfolio. The tutor/instructor directs students in making the choices so that the materials are representative of the level of learning achieved during the course.
3. **Reflection:** An overall review by the students of the collected material which allows reflection on each piece in their portfolio. The self-assessment brings added value to the review process.
4. **Projection/direction:** Students review their reflections on learning and set new goals for the future. They receive feedback which is useful to direct their competencies.
5. **Presentation:** Students share their portfolios and request feedback from others. Documents are converted into a format which allows hyperlinks.

As already stated, if the portfolio is useful to document individual competencies, an e-portfolio allows students to connect materials situated in different files and retrieve any work that is considered meaningful both in their own course and in those of the other students or instructors. This process results in the assembly of

newly synthesized materials that can be compared and interpreted. In this way, it is possible to *personalize* the process and learning increases through sharing and the construction of meaning.

## TOWARDS AN INTEGRATION OF E-LEARNING AND E-ASSESSMENT

By accounting for the socioeconomic theory according to which the training and assessment process is divided into different phases, Kirkpatrick's (1994) four-level model is a truly appreciated approach that utilizes:

- **Reactions:** A measurement of how well the students enjoyed a particular training program (customer satisfaction);
- **Learning:** What competencies the students have absorbed;
- **Application:** Students' ability to transfer and apply new competencies;
- **Impact:** The result of training as it relates to effectiveness and efficiency.

In e-learning, assessment needs to be re-defined according to new learning scenarios. Various scholars have attempted to describe the quality of training experiences from a cognitive perspective. Savery and Duffy (1995) underline that the concept quality of learning is possible when:

- The student is actively involved in the learning process;
- The student constructs the student's own knowledge;
- The student acts at a metacognitive level;
- Social negotiation is involved in understanding.

According to the constructivist perspective, the importance of evaluating learning from the learner's viewpoint has gained a new value after changes which have occurred in traditional teaching. Learning is considered the result of internal and external factors which are inextricably woven together and which involve the learner in the training process. In this case, methods that bring instructors and evaluators closer to the learner's point of view may be required. It is also necessary to let the instructors and evaluators recognize that the



interpretation of the learner's performance is effected by their own experience.

Within a learning community, the importance of understanding learning from an "internal" viewpoint is further strengthened. Some experts (Henry, 1992; Henry, Charlier, Daele, & Pudelko, 2003) underline that in order to support effective training courses, it is necessary to establish an assessment dimension, negotiated by the community, which reflects the idea of assessment as a knowledge process. Thus, the process of assessment means truly understanding the new learning scenarios.

Quality of learning is connected to individual and collective experiences validated by the course community (instructors, designers and students). As a consequence, learning is the result of a group process where the students both as individuals and also as members of a group learn through the adoption of new practices. This process is not only active but also reflexive. Learning assessment is based on individual and group reflections as well as on the suitability and accessibility of knowledge and materials and also on the concrete realization of what has been learned.

The significance given by each participant to the training experience emphasizes the need to focus on the evaluation of its quality and the fundamental factors in the development of a learning community. Active involvement of the students in the discussion and in metathinking regarding the training process is fundamental to obtain a valuable review of the ongoing process.

Supporting the student in becoming an effective thinker is a useful strategy to adopt. In this way, he/she may evaluate the learning process by reflecting on the online experience and focusing his/her attention on the social interaction that facilitates the e-learning process in group settings. Metathinking leads to a clear awareness of individual needs within the community structure. It aids in the definition of a common goal and emphasizes the possible achievements of the student as a result of his/her being a member of a community.

A metathinking approach should contain two different aspects of learning: *learning in a virtual community* (interaction and group activation, communication mediated by the computer, including an instructor role) and *contents learning* (effectiveness of activities and an ultimate satisfaction of expectations).

Without doubt, the element that influences the community is *emotional involvement*. The sense of

membership, encouraged by the course activities and by tutor messages, is a fundamental element for the course success.

## CONCLUSION

Everything considered, recently there has been an increasing interest in e-assessment. It is necessary to go beyond a purely mechanical assessment of the skills of a student, since the entire process of learning has been placed in a relational dimension and in a precise environment where motivation can affect the course results.

There are different ways to control a face-to-face training session. In contrast, it is possible to monitor, check and evaluate the entire e-learning process thanks to the data generated by the virtual platform. However, only taking into account the data concerning the standard objective tests would mean ignoring the cooperative and dynamic essence of a course.

In e-learning, assessment processes are essential because they turn the scrutiny of the course evaluation from collateral and/or final activities to ones that may have continued throughout the course. Additionally, the assessment changes from being other-directed to a co- or self- managed practice. As a consequence the goals and the evaluation criteria are shared by all the actors involved in the learning process (Varisco, 2004). Thus e-assessment also incorporates the *context* of a course, and is considered fundamental in an environment constructed to facilitate learning.

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## **KEYWORDS**

**Assessment Item:** A questionnaire, a test or any other activity used to evaluate whether a student has achieved the objectives that have been established.

**Chat Room:** A virtual place where Internet users meet and communicate in real-time using instant messaging applications.

**Forum:** An asynchronous online communication environment consisting of virtual message boards where it is possible to leave messages in order to create a new discussion or to reply to a pre-existing one.

**Practices:** Any activities that allow students to put into practice the knowledge and skills acquired through the study material. These activities include case studies, exercises, quizzes, tests, laboratories, simulations, and so forth.

**Self-Assessment:** The educational process involving students who make judgements about their own level of knowledge and competencies.

**Survey:** The technique used to collect data useful to acquire homogeneous answers to specific questions. It can be conducted by direct or telephone interviews, paper questionnaires, online forms, and so forth.

**Tracking:** The process of recording the training path followed by a student in a training management system. Tracking allows the instructor to constantly monitor the students' training activity.