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Methods and Tools for Online Objective Testing

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INTRODUCTION: ONLINE TESTING

Online Testing, also known as *Computer Assisted Assessment (CAA)*, is a sector of e-learning aimed at assessing learner's knowledge through e-learning means. In recent years, the means for knowledge evaluation have evolved in order to satisfy the necessity of evaluating a big mass of learners in strict times: *objective tests*, more rapidly assessable, have gained a heavier weight in the determination of learners' results.

Multiple Choice question type is extremely popular in *objective tests*, since, among other advantages, a large number of tests based on it can be easily corrected automatically. These items are composed of a *stem* and a list of *options*. The *stem* is the text that states the question. The only correct answer is called the *key*, whilst the incorrect answers are called *distractors* (Woodford & Bancroft, 2005).

Several commercial and Open Source software systems are available for managing and administering online tests. At present, most *online testing* systems are part of a more general purpose e-learning system, often called *Learning Management System* (*LMS*) or *Course Management System* (*CMS*). These products offer a complete set of functionalities for e-learning, both for online learning and for *blended learning*. They are primarily used for administering online learning material, commonly referred to as *Learning Objects* (*LOs*). *Online testing* systems can be evaluated from the support of a list of desirable features, analyzed in the sequel.

In *online testing* it is important to administer tests composed of good quality questions (*items*). By the term "quality" we intend the potential of an *item* in effectively discriminating between strong and weak learners and in obtaining tutor's desired difficulty level. There are statistical models which can help tutors in understanding whether their *multiple choice items* have good performances or not. Statistics can be displayed or used in *online testing* systems for determining question quality.

Another important aspect of e-learning, which has also been applied to *online testing*, is the standardization of e-learning systems. Standardization efforts in e-learning are mainly aimed at achieving *interoperability* among *LMS* and *LO* authoring tools. For *online testing* it can be important to share test data and to track learners' interaction during test execution. This is valuable information for understanding the learner's behavior when taking a test: in the past, several experiments have been carried out to this extent.

The rest of this article is organized as follows: the next section describes some basic principles of assessment, gives some basic definitions and introduces *objective tests*; the subsequent section focuses on item quality and its management in *online testing* systems; then, another section, called "*Online Testing* and Standardization", is devoted to describe the standardization process and its application to *online testing*; the subsequent section describes *online testing* systems, presenting a parade of the most desirable features for these systems and a survey on their support in some of the most popular *LMSs*; before concluding, a description of some experimental features treated in research literature is presented.

ASSESSMENT AND OBJECTIVE TESTS

In the last years *objective tests*, as an integrating part of the learning process, have aroused a growing interest in educators. Nevertheless, *objective tests* are often designed with superficiality, ignoring the indications that *docimology* has achieved through research activity and experiments.

Assessment can be *formative* and *summative* (Frignani and Bonazza, 2003). *Formative* assessment occurs during the learning process, gives information on the learning state of each learner and allows the tutor to decide the most suitable learning path for her/him. *Summative* assessment, instead, occurs at the end of the learning process (of a learning unit or a temporally bound learning process) and is used for the evaluation of the learning state of each learner.

In many traditional learning contexts assessment is regarded as a single process, without distinguishing between the verification and the grading phases. Research, instead, considers assessment as composed of two different phases: the *measuring* and the *grading* ones. The *measuring* phase consists of gathering information on the learners; the *grading* phase lies in expressing a judgement on the information obtained in the previous phase.

Grading can be performed by using one of following criteria: in *absolute grading* the passing threshold is established a priori; in *relative grading* the passing threshold is established only after the results of all the learners have been recorded.

Tests can be classified on the basis of *stimulus* and *answer* types. The *stimulus* is the part of the measuring phase which induces the learners to express their knowledge (i.e. the outline of an essay, the *stem* of an item and so on). *Stimulus* is *open* when the learner is free of interpreting what s/he is asked to do, *closed* when s/he has some constraints on the performance (length, ordering of the concepts to exhibit). The *answer* is *open* when the learner can feel free to elaborate the answer in a personal way, *closed* when s/he must choose the answer among a list of options. The classification of some test types is summarized in table 1 on the basis of the possible values for *stimulus* and *answer*. *Objective tests* have *closed stimulus* and *answer*.

Objective tests are considered *objective* since it is possible to establish the grade to give to right and wrong answers of each question a priori (at the time the test is constructed); the correction of the test, and, consequently, its grading, is independent from the corrector/grader; lastly, the learners are all in the same condition, since they are all required to perform the same task, in the same time interval, in the same environmental conditions. Objectivity makes tests free from several distortional effects, such as emotional judgements and so on.

Nevertheless, *objective tests* have some disadvantages: i.e., they do not allow the tutor to verify the expressive capacity and the ability to organize the answers. Furthermore, test construction, especially when using *multiple choice* questions, can require a long time.

ITEM QUALITY

The experience gained by educators and the results obtained from several experiments provide some guidelines for writing good *multiple choice* items, such as: "use the right language", "avoid a big number of

Table 1. Test classification on the basis of stimulus and answer

		Answer	
		Open	Closed
Stimulus	Open	Oral examination, essays	Typical case: while the tutor is teaching, asks a learner for an approval sign (it can be useful for monitoring learners' attention during lessons)
	Closed	Short answer, summary	Objective tests, grammatical exercises, mathematical expressions

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