

# Chapter 1

## E–Assessment and Multiple– Choice Questions: A Literature Review

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### **ABSTRACT**

*The use of information and communication technologies (ICT) in the assessment process is becoming an asset, giving rise to the so-called computer-based assessment or e-assessment. Nowadays, its use is becoming more usual in higher education institutions. Closed formats for questions, namely multiple choice, are the most commonly used. This chapter presents a literature review of the main aspects related to this topic, including the main modalities of assessment (summative assessment and continuous assessment). Issues related to multiple choice questions (MCQ) are discussed with more detail, referring to the various formats of MCQ, its advantages and limitations, with a particular focus on its use in mathematics tests. Also, some guidelines for the quality assurance of MCQ with quality are included.*

### **INTRODUCTION**

Information and Communication Technologies (ICT) raise challenges and at the same time, offer tools that allow teachers to create differentiated learning opportunities for students. Its use is recommended by several European organizations, such as the European Parliament (Redecker, 2013; Redecker & Johannessen, 2013). The use of ICT in the assessment process becomes a reality in more than one way, namely through the electronic or e-assessment format. In this case, ICT are used throughout the assessment process from the development of the tests to the storage of the results (Stöðberg, 2012). A

DOI: 10.4018/978-1-5225-5936-8.ch001

possible approach consists of the development of specific environments for this end (Boticki & Milasinovic, 2008; Dascalu & Bodea, 2010; Llamas-Nistal et al., 2013). Another approach consists of the use of the so-called Learning Management Systems (LMS) (Burrow, Evdorides, Hallam, & Freer-hewish, 2005; Salas-Morera, Cubero-Atienza, Redel-Macías, Arauzo-Azofra, & García-Hernández, 2012). LMS have the advantage of providing a vast set of tools specifically designed for the implementation of e-assessment. Among these tools we highlight tests, which can include several types of questions, such as multiple-choice, true/false, matching, short answers.

Bearing in mind its purpose, assessment may be formative and/or summative, or diagnostic (Jacob, Issac, & Sebastian, 2006; Redecker & Johannessen, 2013; Stödberg, 2012). We can consider that summative assessment reflects the paradigm of “Learning for Assessment” whilst diagnostic and formative assessments reflect the paradigm of “Assessment for Learning” (Jacob et al., 2006). The first paradigm seems to be the most common one in the assessment traditionally made in Higher Education, which consists of carrying out one or more previously scheduled tests (Flores, Simão, Barros, & Pereira, 2015, p. 1525). E-assessment has come to serve as a catalyst for a change of this first paradigm to the second one, given that in relevant scientific studies on this issue, the use of formative assessment or of both types, formative and summative simultaneously, is more common than the summative assessment (Stödberg, 2012).

Another important aspect is to see how the type of tasks carried out in e-assessment.

As a result of a careful review of the literature in relevant scientific journals in the area and since it corresponds to our practice as teachers, a classification with which we identify ourselves is presented

by Stödberg (2012), where the author lists five categories: i) close-ended questions, such as multiple-choice or matching questions; ii) open-ended questions; iii) portfolios; iv) products, such as computer programs; and v) discussion between students. The same study concludes that close-ended questions are the most frequently used in e-assessment. Among close-ended questions, multiple-choice questions (MCQ) are particularly relevant and are related to some specificities, presenting advantages and limitations. These various aspects, as well as the comparison of this type of assessment with others, have been the object of scientific research in this area (Bible, Simkin, & Kuechler, 2008; Bush, 2015; Haladyna, Downing, & Rodriguez, 2002; Lee, Liu, & Linn, 2011; Liu, Lee, & Linn, 2011; Rod et al., 2010; Torres, Lopes, Babo, & Azevedo, 2011).

In the study presented in Torres et al. (2011) some advantages of tests formed by MCQ are introduced, such as: i) usage in diverse contents; ii) measure of a wide variety of educational and learning classes; iii) adaptation to various levels of cognitive skills; iv) usefulness for assessing numerous classes; v) automatic correction and grading of the tests and statistical analyses can be easily carried out, using computerized systems, as in the case of LMS, and; vi) they provide the most useful format for comparisons over time, due to its objectivity. Concerning the limitations of MCQ tests, the same study concludes that these tests: i) may be difficult to construct for higher levels of cognitive skills; ii) require written skills from the teachers, so that the questions are clear; iii) require reading skills from the students, in order to correctly interpret the questions; (iv) fail to measure some types of learning outcomes, such as the ability to communicate; (v) many times it is difficult to find good distractors, which correspond to the non-correct choices; and (vi) some students might be tempted to guess the answer.

In terms of scientific research related to MCQ, one of the main research topics is related to how MCQ should be developed. An important study presented in Haladyna, Downing and Rodriguez (2002) introduces a set of guidelines for the construction of MCQ. This work considers 31 guidelines divided into 5 categories, namely: i) content concerns, e. g., to avoid trick questions; ii) formatting concerns, e.

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