

Chapter 4.3

Formative Assessment in Distance Learning Education with Cognitive and Metacognitive Measurements

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ABSTRACT

Traditional forms of assessment used in face-to-face and distance learning education are insufficient to ascertain the learning progress of student and therefore do not provide enough information to detect student learning gaps and improve learning. Another point is that traditional assessment ways rarely involve the student in monitoring his or her own learning through his metacognitive abilities. This article presents a model for formative assessment in distance learning education based on cognitive and metacognitive measurements that will make possible the identification of student learning gaps. Moreover, it presents the architecture of a computational environment for student knowledge mapping that will allow identifying more specifically the learning gaps in order to supply the educational system with qualitative information.

INTRODUCTION

The assessment process plays an important role in producing information that can help students, parents, teachers, and educational administrators to know and deal better with learning gaps. Teachers and the Intelligent Tutoring Systems (ITS) can use this information to adapt the instruction to students' learning needs and difficulties.

The Assessment Reform Group (1999) based on their research stands that successful learning occurs when learners have ownership of their learning; when they understand the goals for which they are aiming; and when, crucially, they are motivated and have the skills to achieve success. Not only are these essential features of effective day-to-day learning in the classroom, they are also key ingredients of successful life-long learning.

Another important aspect in the learning process relates to the student's metacognitive abilities (i.e., the process of reflecting about their own knowledge), which Flavell (1979) called metacognition. Knowledge about knowledge itself is very important to learning with quality.

Many teachers rely on a traditional pretest and post-test design to document student progress, as shown by Shepard (2001). Pretest results are used to establish each student's achievement level or location, but typically are not used to gain insight into the nature of a student's understanding (e.g., when a problem is missed, it is not known what partial knowledge or competing conception is at work). Moreover, to develop students' metacognitive knowledge about what helps in their own learning, there might be explicit discussion of both the facilitating and inhibiting effects of background knowledge.

The ongoing assessment that aims to diagnose and improve learning instead of merely classifying the students is basic in distance learning education in order to increase the adaptability of the systems and the personalization of education, thus increasing motivation and reducing evasion rate, besides increasing the quality and productivity of learning. Moreover, it can help to minimize the problems of credibility lack on who effectively took the assessment, allowing monitoring of the evolution of learning instead of having only one measure at the end of the course. In distance learning education, the majority of computational environments involves some kind of ongoing student assessment in which observation is based on documentation of the student's interactions with the environment, as shown by Silva and Vieira (2001).

This article presents a model for formative assessments in distance learning education based on cognitive and metacognitive measurements that will make possible the identification of student learning gaps. Moreover, it presents the architecture of a computational environment to implement the proposed model.

The model will support the monitoring and development of metacognitive processes in order to allow the student to have control of his or her own learning through the process of self-regulation, which is self-monitoring, self-evaluation, and self-reinforcement. As a cognitive measurer, this article will propose the Knowledge Acquisition Level (KAL) obtained for each item of the knowledge domain, making possible the identification of the gaps of learning. KAL is not only a prompt measure, but its evolution can be tracked during the process through continuous assessment.

The article is organized as follows. Section 2 discuss continuous assessment and knowledge monitoring. Section 3 presents our proposed model for formative assessment in distance learning education by monitoring the Knowledge Acquisition Level based on some measurers. Section 4 describes the architecture of a computational environment to implement the proposed model. Finally, in Section 5, some considerations about this work and future work are made.

CONTINUOUS ASSESSMENT FOR KNOWLEDGE MONITORING

Assessment and feedback are essential for helping people learn. An assessment process consistent with the learning principles should be continuous as part of the instruction and supply information about the student's learning level to teachers, parents, and the student. This is formative assessment (Bransford et al., 2003; Perrenoud, 2000).

In a continuous learning assessment and accompaniment process, first of all, it is necessary to identify the purposes of assessment. Falchikov (2005) has classified these purposes into two main categories: summative and formative. In the first group, the main purposes of assessment are restricted to selection, certification, accountability, and effectiveness monitoring. Purposes in the latter group are more student-centered

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