

Chapter 5

Using Computerized Formative Testing to Support Personalized Learning in Higher Education: An Application of Two Assessment Technologies

Mark Gierl

University of Alberta, Canada

Okan Bulut

University of Alberta, Canada

Xinxin Zhang

University of Alberta, Canada

ABSTRACT

Computerized testing provides many benefits to support formative assessment in higher education. However, the advent of computerized formative testing has raised daunting new challenges, particularly in the areas of item development and test construction. Large numbers of items are required because they are continuously administered to students. Automatic item generation is a relatively new but rapidly evolving assessment technology that may be used to address this challenge. Once the items are generated, tests must be assembled that measure the same content areas with the same difficulty level using different sets of items. Automated test assembly is an assessment technology that may be used to address this challenge. To date, the use of automated methods for item development and test construction has been limited. The purpose of this chapter is to address these limitations by describing and illustrating how recent advances in the technology of assessment can be used to permit computerized formative testing to promote personalized learning.

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INTRODUCTION

Personalized learning was recently described in a highly influential publication by the US Office of Educational Technology titled “Future Ready Learning: Reimagining the Role of Technology in Education” as:

... instruction in which the pace of learning and the instructional approach are optimized for the needs of each learner. Learning objectives, instructional approaches, and instructional content (and its sequencing) may all vary based on learner needs. In addition, learning activities are made available that are meaningful and relevant to learners, driven by their interests and often self-initiated (Thomas, 2016, p. 7).

Although not stated explicitly, one important requirement for personalized learning, as described by Thomas, is feedback. Feedback can be used by instructors and students to optimize the pace of learning; feedback can be provided to students at various intervals throughout the teaching-learning process; feedback can be used by both instructors and students to identify areas where additional support is needed so that outcomes from learning activities are meaningful; feedback can motivate students to modify their learning strategies. In short, feedback is an essential component for personalized learning (Black & Wiliam, 1998, 2010; Hattie & Timperley, 2007; Hwang & Chang, 2011; Kluger & DeNisi, 1996; Popham, 2011; Shute, 2008). Fortunately, feedback can readily be infused into a personalized learning environment through the assessment process (Black & Williams, 1998; Evans, 2013; Haladyna & Rodriguez, 2013; Popham, 2011). Formative assessment can be characterized as a process used by teachers and students during instruction to produce feedback required to adjust teaching so students can better achieve the intended learning outcomes (Council of Chief State School Officers, 2008). Feedback has maximum value when it yields specific information in a timely manner that can direct instructional decisions designed to help each student acquire knowledge and skills more effectively. Outcomes from empirical research demonstrate that formative feedback can enhance teacher effectiveness and produce student achievement gains ranging from one half to one full course grade, reflecting effect sizes of 0.4 to 0.7 or higher (see review by Kluger & DeNisi, 1996). That is, well-designed assessments with formative feedback can have an impact on learning that is both demonstrable and substantial, with gains in learning among the largest ever reported for educational interventions (e.g., Earl, 2013, p.25; Vonderwell & Boboc, 2013).

While a considerable amount of research has been conducted on formative assessment in the K-12 area, much less information is available on how to implement formative assessment for personalized learning in higher education. Yet considerable reform in higher education targeting content standards, curricular outcomes, instructional methods, assessment of student learning is currently underway. The increased numbers of students in higher education coupled with a corresponding desire by academic staff to provide students with feedback has garnered a new interest into how technology can support formative assessment for personalized learning in higher education (Bailey & Garner, 2010; Evans, 2013; Merry, Price, Carless, & Taras, 2013; Tett, Hounsell, Christie, Cree, & McCune, 2012). One of the most commonly-used technologies that is capable of promoting personalized learning for student assessment is computerized testing. Instructors in higher education are beginning to recognize that paper-based testing is no longer feasible or desirable because the printing, scoring, and reporting for this type of testing requires a great deal of time, effort, and expense. Moreover, providing students with feedback using paper-based tests is often ineffective because it comes too late in the instructional sequence for students

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