Chapter XI

Variations in Adaptive Testing and Their Online Leverage Points

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Abstract

This chapter builds on foundational work on probabilistic frames of reference and principled assessment design to explore the role of adaptation in assessment. Assessments are characterized in terms of their claim status, observation status, and locus of control. The relevant claims and observations constitute a frame of discernment for the assessment. Adaptation occurs when the frame is permitted to evolve with respect to the claims or observations (or both); adaptive features may be controlled by the examiner or the examinee. In describing the various combinations of these characteristics, it is argued that an online format is preeminent for supporting common and emerging assessment practices in light of adaptation.
Introduction

The digital revolution has brought dramatic shifts in the activities and conceptualizations of modern life by providing easily transformable digital representation, dramatic computing power for calculation and decision making, and the use of large-scale databases. Internetworking technologies are having a similarly impressive impact by allowing geographically and computationally distributed combinations of this representational, computing, and database power. Having inherited many of our current conceptualizations and tools from pre-digital and pre-networked times, it is prudent to reexamine our understandings and language in light of these new possibilities. In the context of a globally linked digital world of computation, representation, and data, one area of potentially great benefit is that of computer-adaptive testing. Online presentation is greatly affected by the simulation and display technologies that continue to emerge; task selection is greatly affected by the availability of computing power and the availability of databases that may need to be remote from the user.

As the assessment community moves forward in harnessing these opportunities, it is important that discussion not only occur in the language and dimensions inherited from a pre-digital era, but that we re-examine the language and categories available to us to take advantage of the wide range of possibilities at hand. The focus of this work is to lay out a conceptual framework and taxonomy of adaptive assessment based on discussion of probabilistic frames of reference (Shafer, 1976), and dimensions of evidentiary reasoning that serves as the foundation for modern assessment (Mislevy, Steinberg, & Almond, 2003). This will be addressed in the context of a pragmatic delivery model (Almond, Steinberg, & Mislevy, 2002) that has been embedded in industry computing standards and in large-scale online assessment systems (Behrens, Collison, & DeMark, in press; Behrens, Mislevy, Bauer, Williamson, & Levy, 2004).

There is no shortage of ways to classify assessments. One may consider assessments in terms of: classical test theory (CTT) vs. item response theory (IRT), linear vs. adaptive, large scale vs. small scale, high stakes vs. low stakes, diagnostic/formative vs. summative, and of course, computer-based vs. paper and pencil. Building from Shafer’s (1976) conception of a “frame of discernment” in probability-based inference and Mislevy et al.’s (2003) work on “evidence-centered” assessment design, we propose a taxonomy that differentiates assessments along the three dimensions of: (a) observation status, (b) claim status, and (c) locus of control. This foundation allows us to highlight the inferential roles that adaptivity can play in assessment. It offers a principled perspective for examining advantageous features of various adaptive testing models such as reduced time and increased precision in adaptive observation assessments and diagnostic capability in examinee-controlled assessments. In detailing the taxonomy, we point out ways in which online assessment enables or enhances these features.