Chapter 12

Operationalizing Computerized Testing in Mathematics Competition

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ABSTRACT

This chapter seeks to take a modest and yet formative approach in proposing computer-based test (CBT) as the inevitable next wave in digital assessment. The major section reports on the practical design of developing and administering CBT in a mathematics competition by HOTS educational innovation development (HEID) in a mathematics competition. This chapter describes the CBT developmental process undertaken by HEID, which focuses on constructing multiple-choice test items, administering CBT, and scoring the test. While CBT offers the possibility of improving assessment, the process of preparing items and conducting online competition have nevertheless encountered several challenges such as getting quality test items, school and teacher readiness, seat time in front of computer, computer compatibility, and internet speed. As with many other educational reforms at infancy, more research in the area of implementing CBT to facilitate international competitions is needed in landscaping the assessment platform of Education 4.0.

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INTRODUCTION

Internet of things, artificial intelligence, cloud computing, and robots as learning partners are a few of the drivers that characterise Education 4.0 as a result of Industry 4.0 that has revolutionized global workforce and talent requirements in the digital economy. It is estimated that 65 percent of primary students schooling today will be employed in jobs, which are currently not in existence. This in turn spurs the need to treat students, their learning environment, and their learning tools as one cognitive system and in the present context of Education 4.0, the direction taken cannot afford to stray from technology. Accordingly, assessment in the 21st century can no longer just be designed to testing students’ knowledge per se. The need to answer the clarion call of extending its capacity to effectively and efficiently evaluate students’ knowledge application using technology support, particularly computer-assisted assessments can no longer be ignored. This urgency to design CBT, however, need to be meticulously planned and conducted, without compromising test reliability, validity and fairness, especially in view of battling against the challenges of implementing CBT in the global context of only four billion having access to internet connection among a population of seven billion. Ultimately, re-inventing assessment practices and aligning it with Education 4.0 is shaping the assessment landscape of this century as assessment shapes what, when and how students study. Assessment determines how much effort and work students are prepared to invest and the approach they will take in achieving the desired outcome. Therefore, the assessment design is one of the most influential aspects to consider in the pursuit of enhancing the quality of learning achieved at the end of any learning programme. This is needless to say that improving student learning begins by firstly improving the assessment design (Higher Education Academy, 2012).

Understanding Assessment in the Contexts of 21st Century and Education 4.0

Advocates of High Impact Educational Practices emphasise that where students study is not as important as what they do while they are there (Kuh & Schneider, 2008). Thus, within the context of associating assessment to the essence of Education 4.0, Schneider (2008) argues that the definition of ‘student success’ needs to encompass evidence of student learning as a measure of the quality of education that has been received. This is because of the nature of learning “always entails participation in relationship and community transformation both of the person and of the social world” (Packer & Goicoechea, 2000, p227). Therefore, the quality of the education can only be assured if the education is valued by the society and empowers the individual (Schneider, 2008).

Retention and graduation are best described as partial indicators of student success—necessary, but scarcely sufficient. The college degree is meaningful, after all, only when it represents forms of learning that are both valued by society and empowering to the individual. Twenty-first Century metrics for student success need to capture that reality. They need to address evidence about the quality of learning as well as the evidence about persistence and completion (Schneider, 2008, p. 2).

In an attempt to determine what is deemed valued, National Association of Colleges and Employers [NACE] in 2016 commissioned a survey, Job Outlook 2016 to ascertain what graduate attributes were sought for employability. Findings revealed that the academic skills such as written (70.2%) and oral communication (68.9%), problem solving skills (70.2%), analytical or quantitative skills (62.7%),

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