MATHEMATICS, CURRICULUM AND ASSESSMENT: THE ROLE OF TAXONOMIES IN THE QUEST FOR COHERENCE

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Extended abstract

Educational assessment which serves accountability or monitoring purposes generally makes explicit the content domains included in the test and in most cases attempts to cover a range of cognitive processes. The Trends in International Mathematics and Science Study (TIMSS) from its inception has made explicit the content domain and the cognitive domain. (The TIMSS acronym originally stood for Third International Mathematics and Science Study (1995), then TIMSS – Repeat (1999) and from 2003, Trends in International Mathematics and Science Study.) Both the content domain specifications and the cognitive domain descriptions have remained comparable, however there have been subtle changes, in 2003, and then again in 2007. The individual items are classified according to both a content domain and a cognitive domain, and reporting complies with these classification categories.

Informing TIMSS and other such systemic testing has been Bloom's Taxonomy of Educational Objectives (Bloom, 1956). This framework was initially conceptualised as an assessment tool which could aid in the classification of items for item banking purposes. The Taxonomy has also provided the language for the associated constructs which enabled curriculum designers and course planners to set a wider range of objectives focussing on learning goals. It was also a means for "determining the congruence of educational objectives, activities and assessments" (Krathwohl, 2002).

The TIMSS framework and the Bloom's Taxonomy (both original and revised) have influenced curricula planning in many participating countries, including South Africa over recent decades. The current Curriculum and Assessment Policy Statement (CAPS) names four categories that align somewhat with TIMSS categories. At the matric exit level it is generally conceded that classifying mathematics items post hoc, and even constructing items to fit into these cognitive domains is open to contestation.

The congruence of educational objectives, teaching and learning activities and assessment envisaged by Bloom (see Krathwohl, 2002) is difficult to achieve. However, given the importance of aligning assessment practices with classroom practices, it is necessary to have a framework that is explicit and in some respects common to both settings.

A current project in which the authors are engaged includes a monitoring component and assessment component: there is also the expectation of feedback to teachers in the interest of improving teaching and learning. The model for this project is based

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on the work of Bennett & Gitomer (2009) which includes a monitoring component, a formative assessment component, and a professional development component. For this model to work optimally, some congruence of expectations is required across all three sites.

The broad question arising from the project needs is:

"Can the essential elements of three components, a monitoring component, a formative assessment component and a professional development component be logically and coherently aligned for the purpose of informing teaching and learning?"

The sub-question is "How may we best design assessment frameworks (the design tool informing the purposes, structure, content of an assessment instrument) in such a way that there is coherence from the mathematical knowledge to be taught and learned, through the set of assessment instruments to providing diagnostic and practical feedback to teachers?"

In this project we explore an alternative to the current practice drawing on Bloom's taxonomy and variations thereof, namely dimensions of understanding which draws on the recent work of Usiskin (2012). We compare and contrast the two frameworks that of Usiskin (2012) and the revised Bloom's taxonomy (Krathwohl, 2002), as explicated in the TIMSS framework in order to inform our practice. An interesting divergence to be explored is that while Bloom's original and Bloom's revised taxonomy claim a hierarchy of cognitive processes, the TIMSS framework claims only minimal hierarchy of domains with a range of difficulty within each cognitive domain. Aligned somewhat with the TIMSS study Usiskin asserts that a range of difficulty is inevitable within each dimension of understanding. The juxtaposition of the two approaches appears to harness a synergy of their strengths.

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