



## Text-based sustainable assessment: A case of first-year information and communication technology networking students



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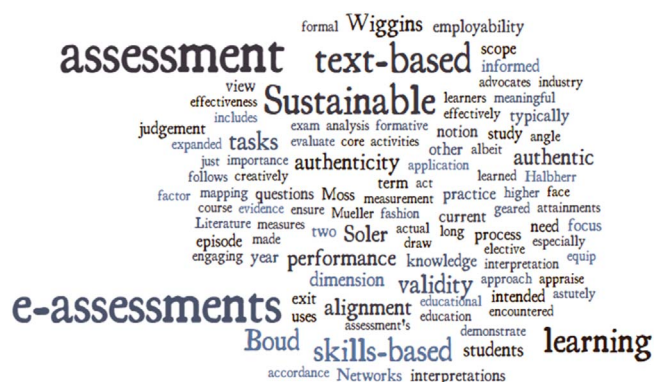
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### ABSTRACT

The notion of sustainable assessment is to equip learners for the challenges of learning and practice they will face once their current episode of learning is complete. More often than not, portfolio and/or 'direct' observation are preferred assessment format. However, lecturers are increasingly faced with administrative challenges when conducting large-scale assessments, due to the large size of their class. In this exploratory study, we innovatively adapted Cloze question types to 'mimic' real-life scenarios. We observed a (Pearson) correlation coefficient value of  $r = 0.7$  between the text-based and skills assessments of the students. This was further supplemented with a Spearman's Rho value of 0.66 with a two-tailed (probability) value of  $p \approx 0$ . For this reason, we put forward that learning management system platforms can provide a technology-rich environment to designing innovative text-based assessments for relatively large classes.



situated in the constructivism domain wherein skills-based cognitive learning interfaces with and incorporates visual learning interfaces (Coffman, 2006, p. 2; Halabi, Essop, Carmichael, & Steyn, 2014, p. 165; Moss & Smith, 2010, p. 333). Just like some skills-based engineering courses, students taking the Networks 1 course are expected to have the ability to move beyond memorization. To be precise, students are expected to be able to think critically (Enns, Cho, & Karimidorabati, 2014, p. 1). Also, the course is a relatively large class and made up of diverse mix of students (Hornsby, Osman, & De Matos-Ala, 2013, p. 8; McGovern & Lockhart, 2015, p. 201). As a large class, engaging in active Teaching and Learning (T & L) methods (inclusive of assessment) is essential, in order to ensure that the students are engaged during class lecture periods and are stimulated to learn. It then follows that students must be stimulated to write assessments that engage them critically and are relevant to the practicality of the industry outcomes of the course.

Within ICT education, there are few literature that examine students' performance in situations representative of some of the high level hands-on activities carried out in the ICT industry (Adesemowo & Kende, 2015, p. 72; Linder, Abbott, & Fromberger, 2006, pp. 239, 241; Webb, 2010, pp. 904, 905). These reported adoptions are mostly associated with the students' technology competency in courses associated with computer programming. There is dearth of literature examining ICT Networking (Adesemowo, Johannes, Goldstone, & Terblanche, 2016, p. 71). Yet, ICT Networking is a critical skill in the ICT industry that ensures the inter-connection of

### 1. Background

[WCI1600] (Networks 1) is a compulsory year-long foundational ICT networking course for first-year students, in the School of ICT of Nelson Mandela Metropolitan University. It is based on the global Cisco Academy suite of courses (Cisco Academy, 2017). As a skills-based course, students are expected to use the taught networking concepts to design, configure and troubleshoot an Information and Communication Technology (ICT) network. The teaching approach used in the course is

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devices and networks without which other layers and services would not be possible. These are skills valued by potential employers (Adesemowo & Gerber, 2014, p. 5)

In Section 2 of this paper, we present the theoretical lens of the study and review on assessment. Section 3 describes the research design and Section 4 presents the findings and discussion on the students' performance from the various assessments taken at different time intervals of the skills-based ICT course. Followed is Section 5 which focuses on the conclusions made from the findings and discussion. Some recommendations for further work to improve assessments for ICT skills-based courses are made in Section 6.

## 2. Theoretical lens and review

In this section, we present the review on assessments, the construct representation in assessment and then compare the text-based to the skills-based assessments. Flowing from the review, we present the rationale for this research work and the research question we seek answer to.

Our research study primarily looks at the flip-side of assessment for ICT (IT application), rather than the use of IT application for assessment. This is the area where not much research has been carried out (see Section 1). In this present paper, the assessment of ICT discipline was looked at from the lens of text-based assessment (which is disjoint from the general notion of the traditional pen-and-paper assessment).

### 2.1. Review: sustainable assessment

Assessment can be categorised into two main parts – one that is part of the learning process and the other that is what has been learned. These parts can be referred to as assessment for learning and assessment of learning respectively (Boud & Soler, 2016, p. 401). The approach typically taken is that of formative and summative assessments.

The other dimension to the assessment phenomenon is that of the outcome of assessment. Literature see this dimension as *sustainable assessment* (Beck, Skinner, & Schwabrow, 2013, p. 327; Boud & Soler, 2016, p. 401). The notion of sustainable assessment, as Boud and Soler (2016, p. 401) put it, is to focus on the need for all assessment practices to equip learners for the challenges of learning and practice they will face once their current episode of learning is complete. That current episode can be the semester or year of study or their formal higher education study. To further illustrate, a student who successfully completes the Networks 1 course, which maps to the Cisco ICND 1 industry exam, reaches an exit point. On one hand, from a higher education programme standpoint, the student may decide to proceed to the next stage of the industrially mapped curricular by taking the Networks 2 course. On the other hand, from international examination standpoint, completing the Networks 1 course gives the student enough background to face the industrial challenges covered in the Cisco ICND 2 exam outside of the university's own curriculum. In the process, the student takes the industrial international exam, thereby improving on their employability. This diversion to industry applies when the year 1 course is taken as an elective course. In both views, the students, on completion of Networks 1, are equipped with the knowledge and skills to exit into a new episode of learning.

What then follows is that informed judgement must be made about students' capabilities, scope of practice and attainments (Boud & Soler, 2016, p. 402). The informed judgement ought to ensure 'constructive alignment' between the teaching system, learning process and assessment tasks as well as alignment of learning to employability of the students, with employability being a long term factor of learning. Sustainable assessment includes the 'capacity to evaluate evidence, appraise situations and circumstances astutely, to draw sound conclusions and act in accordance with this analysis' (Boud, 2007 in Boud & Soler, 2016, p. 402).

Questions or tasks in traditional assessments are typically geared

towards a one-dimensional measurement of a knowledge dimension (Rovai, 2000, p. 142). These tasks becomes building blocks of performance assessments (Halbherr, Reuter, Schneider, Schlienger, & Piendl, 2014, p. 2), and thereafter when performance of tasks demonstrate meaningful application to real-world tasks, it can be considered authentic assessment (Mueller, 2005, p. 2; Wiggins, 1990, p. 2).

At the root of assessments, whether 'pen-and-paper' or performance or authentic or sustainable is the notion of validity. Nonetheless the non-consensus on the term and scope of assessments' validity, the need for an assessment to be 'valid' is unquestionable. Moss (2016, p. 236) advocates for an expanded theory of validity especially regarding the intended interpretations and uses of test scores to the actual interpretations and uses by professionals – albeit in educational contexts.

Wiggins (1993, p. 229) considers authentic measures to be "engaging and worthy problems or questions of importance, in which students must use knowledge to fashion performances effectively and creatively". Thus, by mapping Wiggins' view of authenticity with Moss notion of validity from the angle of intended interpretation, it can be said that the effectiveness of an assessment can be seen in the alignment of validity, performance and authenticity. The narrowed view of authentic assessment as that of a portfolio or physical psychomotor can be broadened. The broadening, whilst noting the core principle of authenticity, takes into consideration the alignment to activities encountered in the real world (Wiggins, 1990, p. 2). As a result, this paper focusses on "sustainability" rather than just only "authenticity".

In this paper, we seek to determine the degree of authenticity as per validity in text-based assessment against generally held opinion, which asserts that authenticity is only achievable in hands-on skill assessment.

### 2.2. Review: construct representation in assessment

The validity or rather put the degree of authenticity has bearing even at the design stage of assessment and at unit level of assessment. Scalise and Gifford's taxonomy (see Shute, Leighton, Jang, & Chu, 2016, Fig. 2), indicate twenty-eight item types for computer-based assessment. The degree of difficulty and possibility of degree of authenticity is stratified along seven lines. In their taxonomy, Cloze question types (see Cloze questions type section), is shown to move down the stack as complex, by being placed under the strata of "completion". This is based on the construct representation of Cloze question types. If the construct of Cloze are used beyond the normal construct representation, can they at least shift horizontally to 'construction' or 'presentation'. If there is a shift to 'construction' level, then students might be able to construct or reconstruct real-world scenarios/problems in assessment.

For this to be feasible, the construct representation of the knowledge and skills being measured require investigation and improvement (Shute et al., 2016, p. 40). More research in reliability and validity of construct representation is needed in relation to innovative large-scale assessments (Shute et al., 2016, p. 41). Part of the required research could be investigating the cognitive-processing demands of assessment tasks to generate stronger validity arguments about students' learning and achievement (Shute et al., 2016, p. 42). The achievement in this instance alludes to sustainable assessment goal (post study era).

In our case, in this paper, we investigate the cognitive-processing demands of text-based skills-like assessment vis-à-vis that of psychomotor skills-based assessment for ICT Networks. In other word, pseudo-psychomotor in text-based assessments.

### 2.3. Review: text-based and skills assessments

Skills assessment is one in which a student carries out tasks on a device and/or in an environment (whether physical or simulated) as would be required in real-life situations (Webb, 2010, p. 904). Hence, there is the element of hands-on activities. On the other hand, text-based assessment is a type of assessment where students provide written responses to the varied types of questions posed to them.

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