Quality assurance in online learning: The contribution of computational linguistics analysis to criterion referenced assessment

Asking students as a group what they have learned from an assessment and analysing their responses using computational linguistics software can provide a necessary and complementary perspective to criterion referenced assessment. This can ensure an assessment is meaningful, relevant, and designed to optimise learning and assure quality in online education.

1. Introduction

Open learning advocates a barrier-free approach to education that includes learning via the Internet and other forms of telecommunication (Bates, 2005). The University of Tasmania (Australia) offers a newly-developed, fully online Bachelor of Dementia Care degree designed specifically for adults who are working in aged care who wish to understand more about the diseases of dementia, provide evidence-based care, and advance their qualifications (Kelder et al., 2013; Kyndt, Dochy, Onghena, & Baert, 2013). These adult learners bring enriching life experiences along with the challenge for their new learning and assessments to be problem-based, meaningful, and relevant to their work (Fischer & Heikkinen, 2010; Ross-Gordon, 2011).

Criterion-referenced assessments, or carefully-constructed rubrics, form an important part of quality assurance in the online learning for this degree. This method of independently assessing students’ learning against a clearly stated list of criteria is considered an integral component of a student-centred approach to assessment (Biggs & Tang, 2011; Cordiner, 2011). It has replaced norm-referenced assessment, the previous mainstay of university grading schemes, where students were compared with each other to generate performance standards according to a normal distribution (Biggs & Tang 2011; Wakeford, 2006).

In addition to evaluation criteria, a well-developed rubric contains quality definitions, and a scoring strategy so that students can derive comfort and a sense of fairness from judgments of their performance that are transparent, publicly stated, and equitably applied (Biggs & Tang, 2011; Cordiner, 2011; Ellis & Kelder, 2012; Kairuz & Bond, 2013; Reddy & Andrade, 2010). In a critical review of 20 published studies across higher education programs, Reddy and Andrade (2010) stipulated that positively-used rubrics need to be (a) available to, and possibly co-created by, students before any assignment; (b) focused on performance; (c) developed to actively guide deeper learning and self-and peer- assessments; and (d) used to
enhance teaching and learning as well as to evaluate. Panadero and Romero (2014) reiterated the value of rubrics in facilitating the accuracy with which students assess their own work. Rubrics also need to be valid and reliable, an area in which continued work is needed (Cordiner, 2011; Humphry & Heldsinger, 2014; Reddy & Andrade, 2010).

However, even with established content and construct validity, rubrics may not provide an instructor with an overall perspective of what students are learning and how they prefer to learn. The inclusion of computational linguistics to analyse students’ feedback can provide a valuable complement to rubrics to facilitate quality assurance in online learning and promote mixed methods statistical analyses of effective education strategies (Ivankova, 2014).

As an authentic case-based task promotes higher quality student learning and can facilitate the social and cultural relevance of learning about the neuroscience of dementia (Illes et al., 2010), students in a recent unit on the Biology of Ageing and Dementia completed a comparative case study. A detailed rubric assessed their ability to: (a) administer three specific tests to two older adults, one of whom had dementia, (b) analyse and interpret information, citing relevant literature, and (c) write a clear, informative and accurate summary of their findings. With one exception, all of the 76 students passed the assessment, 22 with a pass (50-59%), 13 with a credit (60-69%), 22 with a distinction (70-79%), and 18 with a high distinction (> 80%). Students then were asked “What did you learn from the case study?” A computerised content analysis of their responses (n = 65; 4,427 words), using Leximancer software (https://www.leximancer.com/; Smith & Humphreys, 2006) provided an important over-arching thematic and conceptual analysis. Leximancer runs on Windows, MacOS, Linux and Unix platforms - with IE8+, Firefox7+, Chrome 14+ and Safari5+ supported browsers. At present, the software will run on Windows XP. However, as Windows XP has passed end of life and is no longer supported by Microsoft, it is no longer officially supported (http://info.leximancer.com/operating-systems/). The software is not free; currently an academic perpetual desktop license costs $1,500 (AUD) and an academic annual desktop license costs $750 (plus GST for Australian residents). There are alternative digital tools that can be used for content analysis (see Halper, 2011), but Leximancer compares favourably with these products given its validity study (Smith & Humphreys, 2006), published scholarly applications, cost, installation, technical support, and user friendliness (Bell, Campbell, & Goldberg, 2014).

In Leximancer analysis, concepts are viewed as related word groups, e.g., the concept “knowledge” may contain the keywords “learning” and “information.” The keywords are weighted as to how often they occur in sentences containing the concept compared to how often they occur elsewhere in the text. The meaning, or sense, of the words in context can vary. Leximancer analysis then clusters the identified concepts into higher level themes and ranks the most important themes, relative to one another, in percent.

The themes and underlying concepts that were identified from students’ comments are shown in the visual map in Figure 1. The themes were: Cognitive (100% - with the underlying concepts of “ageing,” “assessment,” and “possibly;” sphere 1); Person (35%, sphere 2); Required (33% - with the underlying concepts of “providing,” “answers,” and “individuals;” sphere 3), Learned (27%, sphere 4); Test (26%, sphere 5), and Interesting (24%, sphere 6). When word ambiguity occurred, as, for example, in the theme of “test,” the investigator was able to manually check the related text blocks in isolation and in context to clarify content meaning. This demonstrates an important feature of Leximancer: it is automated but also features multiple interactive windows that facilitate more detailed scrutiny (Bell et al., 2014).

![Figure 1. Concepts derived from students’ responses about the case study, their connectivity, and the relative importance of the themes (centred and in percent in each of the six spheres) under which any additional concepts clustered.](image-url)
In an objective way, this conceptual categorization of responses illustrated students’ insight into (a) the cognitive and functional differences between older adults with dementia and those without dementia, and the importance of understanding individual differences between people with dementia (spheres 1-3), (b) the range of additional information gained from the experiential task (sphere 4), (c) the challenge of obtaining informed consent, choosing appropriate tests, and administering and scoring them accurately (sphere 5), and the interesting nature of the case study (sphere 6). Of interest, no student mentioned the rubric in their responses. The computational linguistics analysis confirmed that the case study was a meaningful and relevant assessment activity that assisted in grounding information students had learned in lectures and readings (Hodge, 2014; Melkun, 2012) as demonstrated by the following comments:

**Student 40:** It was interesting to see how cognitive impairment can make tasks that seem quite simple to complete really complex and difficult.

**Student 24:** It gave me insight into coping strategies used by the person with dementia. It also gave me an opportunity to use assessment tools which have not been part of my job description, giving me greater insight into the overall assessment of people with dementia.

**Student 48:** Being able to apply previous knowledge and putting acquired learning into practice with a person with dementia enhanced the learning process. Like any learning, actually applying it to real life situations only enhances learning outcomes and encourages critical thinking.

### 2. Conclusions

Asking students as a group what they have learned from an assessment and analysing their responses using computational linguistics software can provide a necessary, objective, and complementary perspective to criterion referenced assessment. The software is helpful in conducting an efficient analysis of lengthy narrative data, rather than relying on isolated anecdotal comments. It facilitates pattern recognition that can then be used by instructors to support conclusions about learning objectives and assignments, and gain insight into what students are learning and their learning preferences, all of which are essential aspects of the design and delivery of online education. Thus it can be considered as one of a range of tools to ensure that an assessment is meaningful, relevant, and of high quality and presented in a way that optimises learning.
References


