Engaging students with higher order learning (or not): insights into academic practice

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Assessment is recognised in the literature as a driver of student learning; framing how they engage in and prioritise their learning. With this growing recognition, a plethora of literature has emerged about how to improve student experiences of assessment in universities. While the development of higher order skills of analysis, synthesis, evaluation and creation are espoused in the literature of good assessment practice, how well represented are they in the teaching and learning practice of academics? This paper reports on the environmental scan undertaken as part of a wider study into the use of technologies to support assessment of higher order learning at an Australian university.
The scan surveyed 133 academic staff to canvass the scope of the learning outcomes being addressed and how they were being assessed.
The initial findings from the scan indicate a predominance of lower order learning outcomes, raising questions about academics' understanding of:

- *The processes underpinning higher order learning*
- *The design of learning outcomes to include a focus on higher order learning*
- *The development of assessment strategies to support higher order learning*

The challenge for academics in engaging students more actively in their learning lies in addressing the predominance of lower order and the paucity of higher order outcomes at all levels, from first year to post-graduate level.

Keywords: *assessment, higher order learning, learning outcomes.*

Introduction

From our students' point of view, assessment always defines the actual curriculum. In the last analysis, that is where the curriculum resides for them, not in the lists of topics or objectives. Assessment sends messages about the standard and amount of work required, and what aspects of the syllabus are most important (Ramsden, 1992, p. 187)

Despite the increased recognition of the importance of assessment, and researchers such as Biggs' (Biggs, 1999) advocacy of aligned assessment to support higher order learning, Bryant and Clegg (2006) recently lamented that the focus of much of our assessment is on 'testing knowledge and comprehension and ignores the challenge of developing and assessing judgments.' (p. 3)

Involving students in authentic tasks requiring higher order thinking skills such as analysis, synthesis, evaluation and creation are among the ways that learning can be designed to engage students.

Bloom published his taxonomy of learning outcomes to provide a framework for describing outcomes as cognitive processes (Bloom, 1956). The six categories in Bloom's taxonomy were knowledge, comprehension, application, analysis, synthesis and evaluation arranged in a hierarchical ascending order of difficulty, beginning with knowledge acquisition. Williams (2006) describes higher order learning as the highest levels of learning in the cognitive domain of Bloom's taxonomy (2006); analysis, synthesis and evaluation.

In revising Bloom's original taxonomy, Anderson and Krathwohl (2001) included a '*creation*' category to the Cognitive Process Dimension and moved from using nouns to verbs to imply active learning. They also developed a matrix by adding a Knowledge Dimension. The matrix format (See Table 1) was selected to highlight the array of possible objectives and the relationship between them (Anderson, L., & Krathwohl, D. (2001).

Table 1: The taxonomy table

Knowledge Dimension	**Cognitive Process Dimension**					
	Remember	Understand	Apply	Analyse	Evaluate	Create
Factual Knowledge						
Conceptual Knowledge						
Procedural Knowledge						
Meta-cognitive Knowledge						

Higher order learning is typically associated with the bottom right of the matrix. While the value of higher order skills such as problem solving, leadership, innovation and creativity are increasingly acknowledged (Bath, Smith, Stein, & Swann, 2004), integrating many of them into assessment strategies has proven a challenge (Astleitner, 2002; Burns, 2006; Clarkson & Brook, 2007; Race, 2001, 2003).

Assessing higher order learning

As suggested by Race (2003), measuring students' achievement of relatively routine objectives, is much easier than measuring their achievement of really important objectives. In presenting their framework, Anderson & Krathwohl (2001) acknowledged that it is difficult to assess metacognitive knowledge by simple, traditional methods. The tools and processes for assessing lower order skills, such as remembering, may be simpler to develop and administer than those focusing on higher order skills such as metacognition.

The literature around the assessment of graduate attributes reinforces this difficulty. For example, Kift acknowledged that 'academic assessment in law has traditionally been based on a quite narrow set of tasks, which have emphasised knowing rather than doing' (Kift, 2002) .

In addition to the perceived difficulty of designing assessment tasks to engage students in higher order learning, academics need to understand the processes underpinning higher order learning. There is little evidence in the literature of how much academics understand about these processes and how to integrate them into learning activities and assessment tasks.

The study

This paper reports on the first stage of a wider study into assessment of higher order learning and the use of assessment technologies at a research intensive university in Australia.

The first phase of the study, which is reported in this paper, aimed to establish a broad overview of:
1. Academics understanding of the principles underpinning higher order learning
2. The extent to which these principles are translated into their assessment strategies

The second phase will explore the relationship between assessment practice and the use of technologies.

Procedure

Because of the technology context of the broader study, participants were limited to academics already using technology in their teaching. Participants were convenors of online units taught in Semester 2, 2007. Invitations were emailed to a total of 482 unit convenors, to participate in a survey to identify:

- what assessment methods are currently used
- whether higher order learning is being assessed and
- which online tools are used for assessment (not reported in this paper)

They were invited to respond to the questions in relation to a unit they had taught. The survey was delivered online using Survey Monkey.

Analysis

Quantitative questions were analysed in Survey Monkey. The analysis of the qualitative data mapping the levels of learning targeted for each of the units, along with the assessment activities and tools used, was undertaken using nVivo. The coding schemes were developed using the Anderson and Krathwohl framework as the basis for categorising which knowledge type and cognitive processes were targeted by the stated learning outcomes; and also themes emerging from the data.

Results

From a total of 482 invitations, 133 responses were received (27.5%).

Table 2 indicates the discipline areas of respondents.

Table 2: Respondent Disciplines

Disciplines	Total responses	% of responses
Education	23	19.0
Economics and financial studies	28	21.4
Law	5	3.8
Science incl. Ling and Psych	27	20.6
Humanities incl. SCMP	18	18.7
Life Sciences	29	22.1
Other (not covered by divisions)	1	0.8
	133	100%

Fully on-campus units accounted for 45.6% of the sample; 48.8% were a mixture of on-campus and distance/ online units; and 5.6% were fully online (n=125).

Undergraduate programs accounted for 63.2% and 36.2% were postgraduate (cf University Profile of 35.5%) n = 125.

Stated learning outcomes

Participants were asked to list the learning outcomes for their unit and these were categorised as shown in Table 3, according to Anderson and Krathwohl's matrix.

Table 3 - Categories of Learning Outcomes

Dimension	**Sub-category**	**Coding frequency**
Cognitive processes	Remember	1
	Understand	154
	Apply	93
	Analyse	14
	Evaluate	13
	Create	2
Knowledge type	Factual	5
	Conceptual	165
	Procedural	106
	Metacognitive	1

The results suggest a predominance of the levels of learning associated with the upper left hand section of Anderson and Krathwohl's matrix (2001). In the Cognitive dimension, the most frequently used code was 'understand', mainly in relation to the knowledge dimension of 'conceptual'. An example is:

> *To be able to describe the relationship between language and its social context* (Respondent 19)

'Understand' was also used in relation to the knowledge dimension 'procedural', for example:

> *Understand how to pose and define a problem in relation to accounting information systems, clarify the issues involved and select and monitor the most effective process to use (Respondent 50)*

The second most prevalent code used for the cognitive dimension was 'Apply', for example in relation to 'conceptual knowledge':

> *Competence in applying geoscientific principles to understanding the sedimentary and igneous environments in the world around you* (Respondent 46)

And, in relation to 'procedural' knowledge:

> *Use a computer package to find solutions to formulated problems* (Respondent 133)

Many of the examples coded as 'apply' targeted generic skills such as problem solving or communication, without any links to the discipline context. An example is:

> *Be able to make appropriate use of primary and secondary sources in mounting an argument (Respondent 66)*

There were limited examples of 'analysis' and 'evaluation', for example:

> *Comparative analyses of aspects of HRM in operation in schools and workplaces* (Respondent 15)

Some examples seem to suggest higher order learning but have not included sufficient detail to be sure. An example is:

> *Ensure that procedures are safe for personnel and ethical with regard to flora and fauna (Respondent 69)*

This was coded as 'evaluate procedures', but more detail is needed to determine whether this was in fact what was intended.

Two learning outcomes were categorised in the cognitive dimension as 'create', for example:

> *Develop change management strategies (Respondent 39)*

Only one was coded as 'metacognitive', however, this specific example was not explicitly expressed as a learning outcome. It was part of a statement about generic skills:

> *Problem solving skills: Any piece of assessment is a problem to be solved. You need to identity the problem and implement the most effective and efficient solution. You are then able to reflect on past assessment to learn how you may be able to improve your problem solving skills. How could you do it better next time? How can you apply this to other scenarios?*

As demonstrated by the above examples, there is a wide variation in how learning outcomes are articulated:

- Some focused on the intentions of the teacher
- Some focused on learning processes
- Some focused on generic skills without embedding these into the specific discipline context
- Some included no verb at all, although this may have been due to academics' paraphrasing their unit outlines, rather than including the exact wording

How these outcomes were assessed

Participants were then asked to indicate the assessment strategies used for each learning outcome. The following table shows the results, in order of frequency.

Table 4 - Assessment Strategies

Strategies	Response Percent	Response Count
assignment	80.3%	57
discussion	54.9%	39
essay	49.3%	35
practical	49.3%	35
quiz	25.4%	18
individual presentation	22.5%	16
group presentation	16.9%	12
reflection/ journal	15.5%	11
role play	11.3%	8
simulation	8.5%	6
portfolio	8.5%	6
other	42.3%	30

(n=71)

Assignments, discussions, essays and practicals were the most commonly used strategies. This seems to align with the cognitive processes 'understand' and 'apply' and the types of knowledge 'conceptual' and 'procedural'.

Some respondents used tools such as essays to assess all their listed learning outcomes. An example is the use of an essay to assess everything, including generic skills such as comprehension skills and the ability to construct an argument (Respondent 17).

Alignment between the stated learning outcome and the assessment strategy was not always obvious. For example, Respondent 47 indicated that the learning outcomes of '*report writing skills*' were assessed by an essay.

In another example, Respondent 54 cited using an online quiz to assess students' capacity for '*planning effective learning experiences for children*.' This is an example of where the assessment strategy significantly limits the achievement of the outcome. Quizzes require students to select from a range of options. While they can be effective for assessing outcomes such as understanding key concepts, they do not enable students to 'create'.

Difficulties with assessment

Participants were asked if there were any learning outcomes they found difficult to assess and if so, why.

As can be seen in Table 5, the challenging areas for those who had difficulties were all related to generic skills.

Table 5: Difficulties with Assessment

Overall	Sub-category	Frequency
No		17
Yes	Generic skills	4
	Communication/ interpersonal skills	1
	Practical skills	2
	Teamwork/ group work	4
	Participation	2

Some identified specific areas that they felt were difficult, for example:

> *Would like to improve my assessment of online discussion, so that students participate more in the process (currently I assess guided by set criteria)* (Respondent 51)

Some respondents did not specifically indicate that there were outcomes they found difficult to assess, however in the previous question, they had listed outcomes and not attached assessment strategies, which may indicate some difficulty. For example, of the eight outcomes listed by Respondent 75, four related to the discipline content and four to generic skills such as 'develop critical analysis skills'. Only two of the content-related outcomes were assessed.

Discussion

The aim of the survey was to identify the assessment methods currently used and whether higher order learning was being assessed.

The results suggest that there is a wide variation in how academics express learning outcomes in their units; with many outcomes appearing to be focused on the lower order section of the matrix. There were examples of what appeared to be appropriate use of assessment strategies linked to the stated outcomes; however the results indicate there were also many examples of overassessment and misalignment.

If transparency and alignment are part of establishing a climate of student engagement, then the links between learning outcomes and assessment are crucial. Ercikan (2006) suggests that 'although there is overwhelming evidence to support the link between assessment and learning, to date there is little evidence to suggest that a consideration of this linkage is widespread (p. 931). Although this statement is made in relation to a schools context, the same trend is evident in some of the scan results.

An understanding of assessment processes and strategies as part of the whole curriculum and which technologies may help support these strategies, would help resolve issues such as the use of an online quiz to assess students' capacity for 'planning effective learning experiences for children.' Quizzes require students to select from a range of options. While they can be effective for assessing outcomes such as understanding key concepts, they do not enable students to 'create'.

Many indicated that they did not encounter any difficulties in assessing their outcomes, yet there were examples of obvious misalignment. Others indicated that they had encountered

difficulties – whether these issues are currently being resolved or whether there are underlying issues blocking change will be explored further. In the next phase of the study, workshops will be conducted for academics to examine their own unit and the outcomes they envisage for their students; how they currently articulate their outcomes as mapped against Anderson and Krathwohl's matrix and how to construct the learning outcomes to express higher order learning.

Conclusion

In the current environment of strategic learners, Boud & Falchikov (2005) warn that students will use the assessments rather than the wider curriculum as the driver for their activity. If the assessment tasks target lower order learning, then this will be the outcome for the students.

The results of this initial stage of the study suggest that there is a wide range of approaches academics take to constructing learning outcomes for their units; some use clear language to convey higher order learning outcomes to their students and some do not; some align their outcomes with assessment strategies and some do not. Later stages will explore these issues in more detail. In phase two, interviews will be undertaken to explore the specific teaching and learning contexts of units: the academics' perspectives of the roles of assessment in learning and teaching; alignment of learning outcomes and assessment strategies within the discipline context; and the levels of learning intended and articulated in both the outcomes and assessment tasks.

References

Anderson, L., & Krathwohl, D. (2001). *A taxonomy for learning, teaching and assessing: a revision of Bloom's taxonomy of educational objectives, New York: Longman*.

Astleitner, H. (2002). Teaching critical thinking online. *Journal of Instructional Psychology, 29*(2), 53 - 75.

Bath, D., Smith, C., Stein, S., & Swann, R. (2004). Beyond mapping and embedding graduate attributes: bringing together quality assurance and action learning to create a validated and living curriculum. *Higher Education Research & Development,, 23*(3), 313-328.

Biggs, J. (1999). *Teaching for quality learning at university*. Buckingham: SRHE/Open University Press.

Bloom, B. (1956). Taxonomy of Educational Objectives: The Classification of Educational Goals. *In B. S. Bloom (Ed.) Susan Fauer Company, Inc.* , pp. 201-207.

Boud, D., & Falchikov, N. (2005). Redesigning assessment for learning beyond higher education. *In Research and Development in Higher Education, 28 Brew, A. and Asmar, C. (Eds.). Sydney: HERDSA*, 34-41

Bryan, C., & Clegg, K. (Eds.). (2006). *Innovative Assessment in Higher Education.* . Abington: Routledge

Burns, M. (2006). Tools for the mind. *Educational Leadership, 63*(4), 48-53.

Clarkson, B., & Brook, C. (2007). Achieving synergies through generic skills: A strength of online communities. *Australasian Journal of Educational Technology, 23*(4), 248-268.

Ercikan, K. (2006). Developments in Assessment of Student Learning. In P. Alexander & P. Winne (Eds.), *Handbook of Educational Psychology* (pp. 929-953): Routledge.

Kift, S. (2002). *Harnessing Assessment and Feedback to Assure Quality Outcomes for Graduate Capability Development: A Legal Education Case Study.* Paper presented at the AARE Conference. Retrieved 7 March, 2008, from http://www.aare.edu.au/02pap/kif02151.htm

Race, P. (2001). *The Lecturer's Toolkit: A Practical Guide to Learning, Teaching and Assessment.* London: Kogan Page.