SECTION D

ASSESSMENT FOR LEARNING: AN OUTCOMES-BASED APPROACH TO ENHANCE LEARNING

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ABSTRACT

This paper draws on two case studies from UK universities to advance debate regarding assessment strategies and methods in the ERAU Worldwide. It focuses on the use of summative and formative assessment, the role of feedback, and the importance of learning outcomes for continuous academic improvement. Findings from the first case study, with three cohorts of graduate students, show that, where students are encouraged to learn from their mistakes via formative feedback, improvement is more likely than when standard approaches to assessment are employed. The second case study identifies one university's approach to changing the design, delivery and assessment of its courses. Findings reveal the need to match assessment and learning outcomes in order to enhance students' learning experiences.

Introduction

Over the past ten years, there have been many changes in the curricula of Higher Education Institutions (HEIs). In the U.K., this phase of change was instigated largely as a result of the Report of the National Committee of Inquiry into Higher Education, often known as the Dearing Report (1997). The recommendations of this committee, alongside the establishment of the Quality Assurance Agency (QAA), led to a focus on learning outcomes: each HEI now has to ensure that learning outcomes are articulated clearly and linked to teaching and assessment. The QAA audits all universities within the U.K. and checks that appropriate practices are in place for quality teaching provision.

Between the years 1994 and 1999, student numbers in U.K. Higher Education (HE) rose by 18%, with around 30% of all 18 and 19 year-olds entering HE in 2000 (Corver, 2005; Mayhew, Deer and Dua, 2004). Current government policy in England is to increase participation in HE to 50% by 2010 for those aged 18 to 30 (Adnett, Gorard, May, Slack, Smith and Thomas, 2006). In particular, increase in participation is sought from those belonging to groups that are currently still under-represented – for example, those from low-income families. Recent trends in course development are set firmly within this widening participation agenda and focus on attracting and retaining students. HEIs now cater for greater student numbers and a wider range of backgrounds. These include international students who now make up a significant percentage of many graduate classes. Undergraduate courses in the U.K., Europe, and North America also tend to present a greater focus on an interdisciplinary approach to education. This is often reflected in the historically unorthodox titles of recent university courses. It is not uncommon, now, for example, for engineering courses to be combined with management options; the inevitable result is that the balance of subjects taught produces engineers with potentially very different abilities. Now, therefore, lecturers and tutors are teaching ever more diverse academic cohorts. There is much debate as to whether this has played a part in the perceived decline in academic success for cohorts in recent years (Trotter, 2002).

Educational experts in the United States have also recognized the need for teachers and curriculum planners to pay closer attention to learning outcomes. These findings were presented in the 2006 Spellings Commission's Report. Like the United Kingdom's Dearing Report (1997), the Spellings Commission recommended that postsecondary educational institutions measure and report meaningful student learning outcomes through the promotion of quality assessment data instruments — like the Collegiate Learning Instrument — and through other, information-rich and quantifiable evidence-based measurements of student progress. Indeed, the Spellings Commission goes further than the Dearing Report in urging that university accreditation bodies should place performance outcomes at the core of their assessment, rather than inputs and processes. The Spellings Commission warns that, among other deleterious outcomes, failure to implement evidence-based curricula and accreditation norms will lead to further decline in the quality and academic success of American university graduates (Spellings, 2006).

In addition to the reports of government commissions, there have been many recommendations and suggestions as to how to reverse the decline of quality in secondary education; one of today's panaceas in pedagogy is blended learning. Blended learning has had some measured success in universities within the U.K. (McAndrew, Sinka and Wills, 2006), Europe and North America, but whether this is due to the Hawthorne effect (Rice, 1982) or not is still to be established. Any group that perceives it is being singled out for special consideration may try harder and therefore skew results, as may be the case with cohorts targeted with new methodologies such as blended learning. Hand in hand with changes in learning and teaching methodologies have come changes in assessment strategies. This paper looks at how best to employ assessments *for* learning and how to harness these and learning outcomes as tools for continuous academic improvement.

Assessment and Clarity

Assessment is still the dominant method by which we consider student ability, class comparisons, and overall success. The view is frequently held that, according to this paradigm, a full

and deep understanding of a subject must be shown and demonstrated by a student to achieve a top grade. In addition, any planned action to assist a student in learning may often be criticized as "grade inflation"; in fact, if we accept a more qualitative approach, the reverse is true and the results actually 'buck the trend'. It is important not to be constrained completely by old views.

Before assessment can be planned, it is important to remember its purpose. Most assessment is either summative or formative in nature. The majority of assessment, perhaps, is still viewed as summative: that is, providing a measure of students' performance. Formative assessment, on the other hand, provides feedback and helps students to learn. Within these two types of assessment there are also diagnostic assessments, self- and peer-assessments/reviews, normative assessments (that judge a student's performance against statistics given for a particular body of students) and criterion-based assessments. Those which are criterion-based are particularly pertinent to the discussion here. These are assessments that "judge the student against a set of criteria and that often provide backing for credentials certifying the candidate's learning" (Monk, 2005, 4).

Bloom (1956) showed in his pioneering work of cognitive skills that what students needed to demonstrate depended on their level of study. It has been argued that, even now, students are asked to complete tasks that are beyond their academic ability or level. Indeed, students are often richly rewarded with higher marks for the simple act of recollecting facts, which itself belittles the standard of graduate classes. This paper is not written with a view to spoil lecturers' approaches to assessment, but with respect to how alternative approaches to assessment planning may enhance improvement.

If we compare Deming's (1986) approach to improving knowledge (see figures 1 and 2, below) there is an academic hurdle to cross. Figure 1 shows a hypothetical spread of marks from an assessment. It shows that a percentage of students fall into the top grade distribution, and the remaining proportions into other grade distributions. Statistics can be used to calculate the expected percentage in each grade distribution, and those expected to fail. A lecturer that achieves this profile

may be classified as successful in that his assessment has divided the cohort according to statistical theory: a very good, balanced assessment that allows the good student to shine and the weaker to struggle. On the surface, this may be so, and we could, indeed, argue that this model is both what academics and students expect (Kornbrot, 2005). In this paper we take this distribution of ability to be the starting point for further discussion.

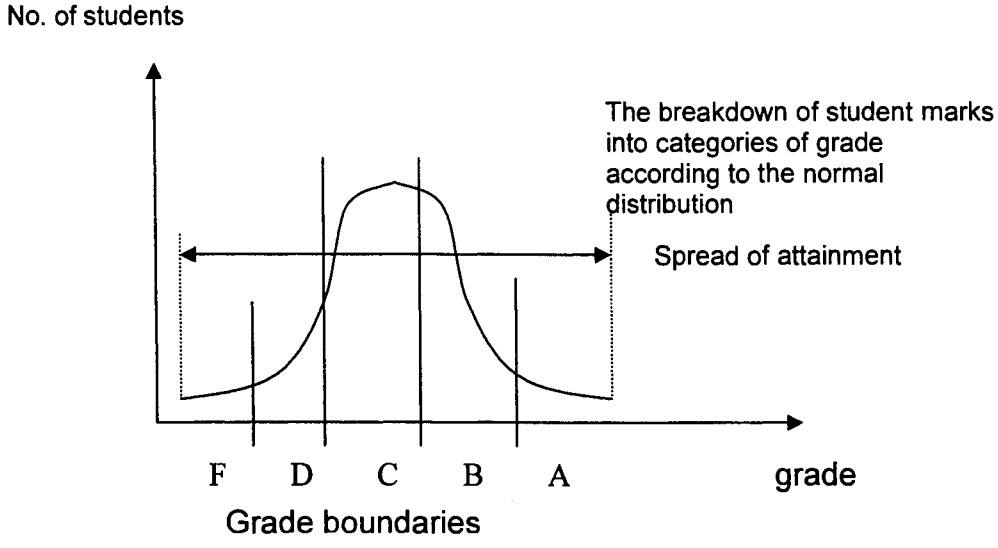

Figure 1 Normal distribution of student ability according to theory

If this model is accepted, all future assessment is expected to replicate the same results; students may improve, but they will have a reduced chance to increase their overall Grade Point Average (GPA). Too many "A" grades may demonstrate that the lecturer is lenient in his marking, rather than that the lecturer has enhanced a cohort's ability. Clearly, this model restricts academic improvement and keeps those with exceptional ability always at the top, and those that struggle wondering if they will ever improve. The alternative suggested here is as an aim, rather than a model that must be achieved, and is shown below in Figure 2. If the cohort from Figure 1 could be developed to achieve the top grade this would be good; nevertheless, some may question the validity of the assessment.

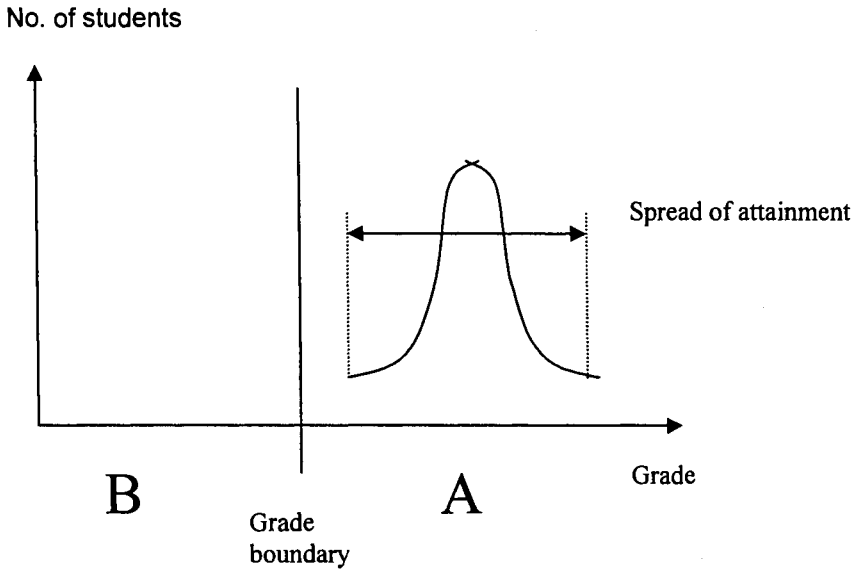

Figure 2 Deming's model of academic enhancement

This model shows that all students have improved: those at the bottom end to the greatest extent but, considering the model in its totality, all students have earned a higher grade. All have achieved the maximum grade. This model illustrates an ideal situation, which requires quantum shifts in all aspects of teaching, learning and assessment; however, these are not reasons why the result cannot be achieved. It must be conceded that, by reviewing practices, this model may one day be realized.

Learning outcomes

Most universities in Europe and North America have syllabi and course outlines that provide descriptions of the course, the course's goals, and the desirable learning outcomes. Embry-Riddle Aeronautical University Worldwide is no exception to this rule. While syllabi and course outlines form a map for a lecturer, defining the scope and boundary of the subject, they do not necessarily provide the same information for a student. If we take the example from a recent mathematics course outline, we find that it states: "Graph polynomial functions of varied degree using standard forms, symmetry and intercepts (Schoppert, 2007)."

It must be noted that students will not have the experience to know what is meant by "standard," until they have seen the range of all possible questions pertaining to this outcome. Thus, it could be argued that stating the outcome in this format is superfluous in the context of a student wishing to enhance his grade. Positively written learning outcomes can assist. For example, if an outcome states, "a student must be able to plot a sine function graph from first principles," a student can measure this outcome even without the need for assessment, as it will be self evident whether he can accomplish the task or not. The implications and importance of learning outcomes that are clearly stated are addressed here.

Course descriptions tend to inform students of the likely chapter headings in a book and are most useful to the lecturer. Course goals may only indicate the general headings of assessments. Syllabi are, generally, of more use to academics and administrators than students. Some research has suggested that, as subjects become more qualitative than quantitative, the learning outcomes also offer little support to the academics (Lilley and Barker, 2005). This fact was also noted by the Spellings Commission (2006) in its admonition that educators and curricula planners must pay greater heed to meaningful learning objectives, rather than processes and inputs, as processes and inputs are of little use to parents, students, and prospective employers. The question that remains is: How do we help students to understand assessment measurement criteria? If they do not know what is asked of them, they cannot deliver. Inversely, if a course description is too prescriptive, there will be no cognitive understanding needed to achieve a top grade.

Comparing academia to industry draws certain opposites. Within industry and military work, personnel are taught, not assessed on, their understanding at early stages. Only after they have attempted and even attempted again will any evaluation be made. Within industry and the military, the focus is not to ensure that a certain percentage fails, but rather to ensure that all meet the minimum standard necessary to be considered competent. If we take this cut-off point to be the A/B grade-boundary, we have a parallel for this study.

Should academic assessment be more in-line with industry and military training in order that it may achieve true academic enhancement? The Spellings Commission (2006) seems to endorse the importation of best practice in assessment from industry. If we remain steadfast in our adherence to the standard approach to assessment, will the achievement of academic enhancement ever be realistic?

Designing Assessments: A Case Study

The first case study presented here draws on a graduate level syllabus at the University of Hertfordshire, England. The students were all graduate level from within the Department of Aeronautical, Automotive and Mechanical Engineering. The course was normally taught to 30 students in a conventional format with lectures, tutorials and associated support. Traditionally, the students were given two coursework assignments that were group-work based, accounting for 50% of the overall mark. These two assignments were large assignments where students had to divide the tasks accordingly and present their findings in the form of a report and oral presentation, including a questions and answers session. The remaining marks were derived from an examination. There were several years of data sets that could be used to set as a datum. It was decided that the last three years' results (2003-2005) would be averaged to allow for year on year variations (Russell et al. 2006).

With this particular cohort (2006), the class size was larger, 42 students, than in previous years and the opportunity was taken to divide the class into two separate groups. The two groups were taught by the same lecturer, and, with the exception of the assessments, all other procedures remained identical. To eliminate any cross-group collusion, students were informed that all assignments would be different, but no more detail or information was given.

The first group (A) was given two group assignments, as in previous years, and the examination. The second group (B) was given three, rather than two, group assignments as well as the examination. For group B, the first assignment was purely formative and did not count for the classification. Both groups of students went through the same procedure with work, preparing a report and oral presentation for each assignment. Feedback was given, but, for group B only, marks did not count for the first assignment.

It could be argued that the existence of an extra assignment would have helped the group B students to practice more and enhance their formation. Conversely, the focus of the students may also have resulted in less effort being used to complete the task. This is why an oral presentation was used, because to stand before peers could always result in embarrassment if work was very poor.

Feedback to the students was positive and focused principally on where students could achieve higher marks in the future, and on how they actually earned their marks. The feedback was standard for all assignments. In the case of group B, the added dimension was to educate the students to learn from their mistakes and to make subsequent use of this knowledge in future assessments. The feedback pulled together the students' various backgrounds and experiences. Generally, students tend to focus on the numerical, problem-solving aspects of their assignments, neglecting the presentation and clear explanations, which also form a principal part of the assessed learning outcomes. Formative feedback of this kind can remind students of where they can gain (or not lose) marks: this can make the difference between letter grades.

Methodology

This research investigated how different assessment patterns can influence academic achievements. Two focus groups were used for data comparisons, one historic (using the central limit theorem) the other, current dynamic (Johnson, 2007). The comparison group had an alternate assignment strategy which included a formative assignment in addition to the two direct assignments.

The formative approach included additional positive and encouraging feedback in order that students might see where marks could be improved on in the future. In other words, this formative assignment formed a practice exercise for future assignments to allow for the enhancing of student knowledge. All other factors remained equal.

Results

Table 1 (below) summarizes the results for the previous years according to grade. The bottom row is the average for each of the grades, which incorporates a weighting factor for the number of students in each cohort.

Table 1

PREVIOUS YEARS' RESULTS

Year	No.in cohort	Fail/no not complete	Grade D	Grade C	Grade B	Grade A
2003	32	2	1	8	16	5
2004	34	1	0	9	18	6
2005	29	1	2	5	14	7
Average	32	1	1	8	16	6

The data shown in Table 1 (above) cover the three previous years and the average summary is shown on the bottom row. Here, it shows that there has been a consistency between year groups. These are the data that comprise the comparison set. Below, in Table 2, are the data for the year 2006. The two sets, A and B, are the results for the two cohorts. A is the group where they replicated previous years' work, whilst B is where they were given an additional formative assignment.

Table 2

RESULTS FROM THE TWO ASSIGNMENT GROUPS

	No. of students	Fail/no. not complete	Grade D	Grade C	Grade B	Grade A
Group A	21	1	1	3	12	4
Group B	21	1	1	2	10	7
Difference		0	0	-1	-2	+3

A comparison of the three sets of data (previous years' data, group A and group B) with the percentage breakdown of the data is shown below in Table 3.

Table 3

COMPARISON OF DATA EXPRESSED IN PERCENTAGES

	Fail/no. not complete	Grade D	Grade C	Grade B	Grade A
Average	3.124	3.125	25	50	18.75
Group A	4.75	4.75	14.5	57	19
Group B	4.75	4.75	9.5	47.6	33.3

The degree of freedom for this analysis is therefore 4 (d.f.), thus the Yates co-efficient factor is ignored and the formula used will be:

$X^2 = \Sigma$ (expected-achieved)/expected.....eqn 1.1

The dividing factor for the statistical confidence with 4 d.f. will be 9.49 @ 5% and 13.3 @ 1%.

For Group A:

$X^2 = (4.75 - 3.125)^2 /3.125 + (4.75 - 3.125)^2 /3.125 + (14.5 - 25)^2/25 + (57 - 50)^2/50 \ (19 - 18.75)^2 /18.75$

$X^2 = 0.845 + 0845 + 4.41 + 0.98 + 0.003 = 7.083$

This value of 7.083 is less than 9.49 to be 95% certain of a significant change. Thus, we can conclude there is no change between this set of data and those from previous years. However, this is not surprising, as it is replicating the previous years' work, and can be seen as a validation of the control set of data.

For Group B:

$X^2 = (4.75 - 3.125)^2 / 3.125 + (4.75 - 3.125)^2 / 3.125 + (9.5 - 25)^2/25 + (47.6 - 50)^2/50 + (33.3 - 18.75)^2 / 18.75$

$X^2 = 0.845 + 0845 + 9.61 + 0.1152 + 11.29 = 22.70$

This value is far in excess of the 13.3 to be 99% of a significant change. Therefore, it can be concluded that by adding a formative assessment to the process the attainment of a cohort can be increased. Feedback that has assisted students to reflect on their understanding has produced significant results differing from the control group. It is also not surprising, as building upon experience is a fundamental aspect of job learning.

There are, of course, limitations to these findings; these have been shown to be significant in the results between groups A and B. It needs to be confirmed that there is only one reason for this outcome, and that this it was not compounded by the enthusiasm of the lecturer to dictate the outcome or marking of the assignments, or indeed by any other confounding variables. Clearly, the study needs to be repeated within another cohort to validate these results. Using feedback to highlight deficiencies in an assignment is only one aspect of feedback. This must not, and cannot, be at the expense of identifying good practice within a student's work.

Learning outcomes and their assessment: the LOTA project

Good practice of the kind outlined above arose partly out of the change in pedagogy encouraged by the Dearing Report (1997) and QAA guidelines. At The Open University (OU) in the U.K., the new changes led to a university-wide initiative that re-examined the planning, design, delivery and assessment of courses and it is this initiative that forms the focus of the second case study in this paper.

The project, set up in 1999 and known as LOTA (Learning Outcomes and Their Assessment), helped guide the University towards an outcomes-based approach. This was, at the time, a tall order: the OU has over 200,000 students (undergraduate and postgraduate) and offers approximately 580 courses over 12 subject areas. The vast majority of its students study part-time at home via distance learning and have family, work or other commitments. OU students are also taught through face-to-face tutorials, day schools, on-line conferencing and telephone tutorials. The changes demanded that staff learn to think in a new way about the design and delivery of the curriculum and even, to some extent, learn a new 'language': that of learning outcomes, linked to assessment, rather than simply learning objectives.

The Dearing Report and QAA had recommended that HEIs develop learning outcomes in terms of:

- Knowledge and understanding: related to subject content
- Key skills: communication, information literacy, learning how to learn
- Cognitive skills: analysis, synthesis, critical reasoning
- Practical and professional skills: eg those required by regulatory or professional bodies

Students often identify the acquisition of subject content as their only true 'learning'; nevertheless it is clear that a great deal of other 'learning' goes on and, as HEIs, it is important that we help students to recognise that there are other skills that they acquire. Thus key skills and cognitive skills need to be made explicit.

With respect to assessment, traditionally this had not been linked to learning outcomes at the OU. However, the change in focus enabled people to work on identifying and putting together learning outcomes with forms of assessment that could best support and develop them. This kind of process was repeated at all levels: for individual courses and for awards such as certificates, diplomas and degrees.

The links between teaching and learning, assessment and learning outcomes can be seen in Figure 3 below (Dillon, Reuben, Coats and Hodgkinson, 2005, 4):

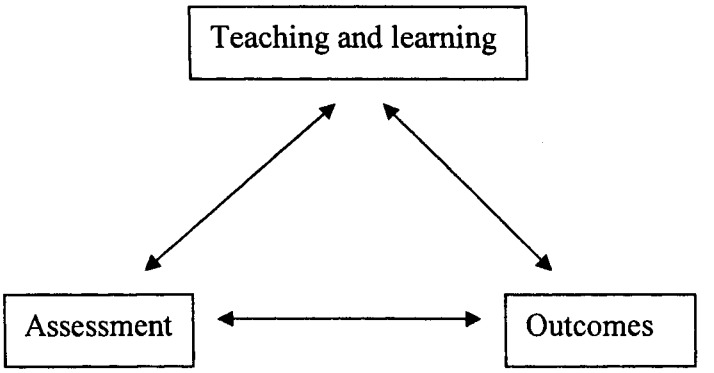

Figure 3 Quality enhancement: the learning and teaching triad

Dillon et al (2005) highlight three main principles that underpin this triad: *transparency*, *transformation* and *transferability*. *Transparency* underlines the importance of ensuring that students and staff alike are presented with clearly identified learning outcomes and assessment methods. If the criteria are understood by all, then tutors and students are able to more successfully work together to progress through the course and tackle any problems that may arise. *Transformation* reveals the nature of the students' engagement with their learning: if other forms of assessment, for example formative or self-assessment, are used in addition to summative, then students play a more active part in understanding how they are learning. *Transferability* highlights the need to ensure that each student becomes an independent learner and thus is able to transfer skills learnt within HE to other environments.

Within the LOTA project at the OU, it was felt that all three principles underpinned the curriculum, the opportunity to enhance learning and staff development. Assessment was (and still is) seen very much as part of the learning process through both summative and formative assessments, with award outcomes assessed and mapped against the outcomes of those courses contributing to it. The focus on an outcomes-based curriculum also provided the opportunity to turn the curriculum from

a model which was largely 'top-down' into one which is more interactive, with student engagement at all levels (Coats and Stevenson 2006). Willis (1993, 394) sums up neatly the need to look beyond purely summative assessment within this kind of model:

> If, however, one is concerned with improving the quality of learning, and encouraging students to engage in worthwhile activities that stimulate student motivation for future learning it is necessary to look beyond the outcome to examine the process. Rather than assessment being something you do to people it is an interactive activity between students and teacher that can play an important role in providing feedback, the aim of which is to improve the quality of future learning

LOTA challenges

The OU's aim was to be able to "claim that an outcomes-based approach can support the transition from the assessment *of* learning to assessment *for* learning and to recognise the role of assessment as part of the *process* of learning" (Coats and Stevenson 2006). In order to encourage this kind of change in academic thinking, the OU put together a team drawn from all eight faculties within the University. This was supported by central OU funding which allowed staff 'buy-out' for two days a week and facilitated their commitment to the task in hand. The members of the team then set up links with their faculty teams to: a) identify main learning outcomes for all courses and b) explore how these could be supported by assessment. Over the three-year period, the LOTA team:

- Met monthly to talk about learning and teaching
- Exchanged ideas across faculties and academic areas
- Carried out course audits
- Held workshops
- Ran pilot projects (nine case studies)
- Fostered staff development.

In order to make sure that assessment supported learning outcomes, the LOTA project employed Associate Lecturers as consultants to audit courses; these members of staff were experienced and worked closely with the academic teams responsible for producing course materials.

LOTA Findings

As a result of the course audits, gaps were identified between: a) intended learning outcomes and their assessment, b) what is assessed and what is taught, c) what is actually assessed and what is assumed to be assessed and d) the information and guidance given to students and that given to tutors (Dillon et al 2005, 5). This information, together with that gleaned from the case studies developed within the pilot projects, led to a number of findings and recommendations. Many of these are detailed and course-specific and cannot, with ease, be discussed within the bounds of this paper. However, a number of findings and recommendations emerged that are relevant to the HE community as a whole and the most salient of these are discussed here.

Tasks, guidance and feedback

"The assessment tasks, the guidance given to students and tutors, and the feedback provided by the tutors were not always well aligned with the intended learning outcomes of a course" (Dillon et al 2005, 7).

As a result of this finding, it was recommended that assessments be devised to match learning outcomes. In practice this means that each assessment task needs to highlight precisely which learning outcome is the focus of attention and in their feedback to students, tutors need to refer specifically to the relevant learning outcomes. It was also clear that marking schemes for tutors needed to match closely the guidance given to students (cf the *transparency* principle underpinning Figure 3 above).

Assessment and learning

"It was not always clear whether assessment was 'for' learning or 'of' learning" (Dillon et al 2005, 8).

The recommendation following this finding led to support for both summative and formative feedback. It was felt that tutor comments should provide students with the opportunity to improve their performance: thus feedback should include comments not only on the quality of the assignment set but also on ways in which students can gain further knowledge and reflect on their work and understanding (cf similar findings from the University of Hertfordshire, above). It is important that academic staff "think consciously about what a piece of assessment is for and be explicit about how it supports learning" (Dillon et al, 2005, 8).

Different disciplines

"Different academic areas will see things in different ways" (Dillon et al, 2005, 8).

Academic areas do differ and therefore it should not be assumed that one approach to outcomes-based learning and assessment will suit all. The recommendation here was that each discipline should take firm ownership of its learning outcomes and assessment, thus ensuring that different styles and expectations (of students and staff) can be considered.

The LOTA project team readily admitted that there are 'no quick fixes'. In order to truly move to a match between assessment and learning outcomes, a great deal of ground needs to be covered at HE level, with continuing staff development at the heart of enhancing learning for our students. At the OU, all new courses provide full details of learning outcomes and assessment strategies before they are approved. Other courses are undergoing, of have undergone, considerable revision.

Conclusions

Within Embry-Riddle Aeronautical University Worldwide, graduate classes are also assignment-driven towards better grading for students, i.e., the aim is for the highest GPA. When assessing a lecturer's performance, a key indicator is the percentage of "A" grades awarded within

each class. It can be argued, (Lavour, 2005) that this focuses the assessment to obtain a cluster pattern to match the expected results, rather than an assessment that allows a student to achieve the highest grade. Additionally, such prescriptive criteria can reduce the efforts of the academic staff to support enhanced learning, when they may be criticized for achieving higher than expected grades in their cohort.

Adopting a formative role in assessment-planning will remove the concerns listed above, and encourage academics to allow all students to reach their potential. Of course, there will need to be safeguards to prevent assessments from not being planned, and the automatic awarding of "A" grades. Nevertheless, matching learning outcomes with assessments, both formative and summative, will allow this to be validated. There can be no excuse; we need to enhance both learning and assessment outcomes.

Enhancement of education carries the risk of the GPA being considered as a sign that marking is lenient, albeit this assumption is not necessarily true. Promoting students to achieve higher grades may be resisted when the implications are reviewed. Nevertheless, where enhancement can be improved by matching learning outcomes with assessment, real gains can be made. This paper has addressed how formative assignments can be shown to improve outcomes and statistical analysis has identified that this has, in the referenced cases, produced tangible results. Applying this model to Embry-Riddle Aeronautical University Worldwide's graduate assessment allows for substantial improvements in student grades without lowering standards. Building upon knowledge, whether through learning from mistakes or experience, will assist more students to realize their potential. This can only be achieved when we ignore the GPA profile and when the evaluation of a course is based on measured learning outcomes, and not on how few "A" grades were awarded.

Student learning is enhanced by linking outcomes with assessment and teaching and through using assessment for learning. Embry-Riddle Aeronautical University (ERAU) has, amongst other goals in its Mission Statement, a dedication to "develop mature, responsible

graduates capable of examining, evaluating and appreciating the economic, political, cultural, moral and technological aspects of humankind and society". Clear learning outcomes provide not only staff but, more importantly, each student with the knowledge and language to describe his or her skills – to friends, family and employers. Indeed, ERAU's Mission Statement anticipates many of the exhortations contained in the Spellings Commission's (2006) report. If we ensure that our assessment methods support the development of these learning outcomes, then ERAU will also have contributed "to the development of a well-rounded individual prepared for personal and professional success".

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