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CONSTRUCTIVE ALIGNMENT IN THE BUILT ENVIRONMENT: ENHANCING TEACHING IN LINE WITH GRADUATE OUTCOMES

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ABSTRACT

The paper examines the manner in which to review an undergraduate degree in construction management using a top-down approach known as “Constructive Alignment”. The research addresses not only the perceived teaching problems, but it also discusses the methods used to rejuvenate the course in a manner that aligns with the graduate outcomes. However, it was also clear that teaching staff were not especially aware of the need to address the course learning outcomes. This highlighted the need for teaching staff to be involved in a process of constructive alignment to embed the course learning outcomes within their subjects, while also addressing the teaching issues involved with assessment. This process provided an opportunity to determine the incremental skill and knowledge development, both within the subjects, as well as between subjects across the course. The paper concludes with the production of a conceptual framework, which can be used to assist with the alignment of professional standards, course outcomes and graduate attributes into a discipline-specific degree program.

Keywords: Construction Management Education, Teaching Enhancement, Graduate Outcomes

INTRODUCTION

Course reviews are an essential part of the renewal of all university programs. The paper documents the process of undertaking a review using the principles of “constructive alignment”. Many internal and external processes trigger the need for such reviews, and the temptation is to simply change the aspects of the course that are perceived to problematic at the time. However, constant tinkering of courses often leads to a situation where the content and assessment process fall out of alignment with the program as a whole. The paper uses a case study approach to describe a “sandpit” course review conducted at Deakin University in Victoria, Australia.
'Constructive alignment' starts with the notion that the learner constructs his or her own meaning through relevant learning activities. The teacher's job is to create a teaching environment that supports the learning activities appropriate to achieving the desired outcomes. (Biggs 1996). The key is that all parts in the teaching scheme, comprising; curriculum, intended learning outcomes, and assessment tasks, are aligned with each other. All are fine-tuned to the learning activities addressed in the desired Course Learning Outcomes, and the University graduate outcomes. The theory then concludes, that if all of the assessments and learning outcomes are aligned, then the student finds it difficult to escape without learning appropriately.

This process of aligning course content and assessment with high-level graduate/course outcomes is essential for discipline-based course, like construction management. Professional institutes that accredited University construction degree courses are seeking to ensure that when a student graduates that they have met the minimum standards, and have the necessary skills and attributes to begin a career in the industry (Love, Smith et al. 2003, Mills, McLaughlin et al. 2008).

**WHAT IS CONSTRUCTIVE ALIGNMENT?**

'Constructive alignment' has two aspects. The 'constructive' part refers to the idea that students construct meaning through relevant learning activities. That is, meaning is not something transmitted from teacher to learner, but is something learners have to create for themselves. Teaching is simply a catalyst for learning, and in the end the students learn what they do, regardless of what the teacher may have intended. (Boud and Falchikow 2006)

The essential idea is to ensure that the curriculum and assessment drive the learning activities of the student. It’s student-centered in that it is about what skills and attributes graduates can demonstrate on completion of the course. In a good system, all aspects of teaching and assessment are tuned to support high level learning, so that all students are encouraged to use higher-order learning processes. 'Constructive alignment' (CA) is such a system; it is an approach to curriculum design that optimizes the conditions for quality learning. (Treleaven and Voola 2008).

If students are to learn desired outcomes in a reasonably effective manner, then the teacher’s fundamental task is to get students to engage in learning activities that are likely to result in their achieving those outcomes. It is helpful to remember that what the
student does is actually more important in determining what is learned, than what the teacher says. (Shuell 1986). As Ramsden (1992) puts it, the assessment is the curriculum, as far as the students are concerned. They will learn what they think they will be assessed on, not what is in the curriculum, or even on what has been 'covered' in class. (Biggs 2003)

Instructional designers for their part have emphasized alignment between the objectives of a course and subject as being important for assessing student performance. "Constructive alignment" represents a marriage of the two approaches, constructivism being used as a framework to guide decision-making at all stages in instructional design: in developing curriculum objectives, in deciding teaching/learning activities, to assess, and formatively report student performance (Biggs, 2003)

**From Aims to Outcomes**

University teachers almost universally subscribe to high-level aims for the courses that they teach (Entwistle and Percy 1974). However, generalizations such as "To become a student-centered teacher, sensitive to individual student's needs", does not imply any particular teaching approach. This leaves other factors, such as; student numbers, and university administration processes, to determine the teaching and assessment methods used in each subject. Furthermore, other external events like new members of staff, or changes in university policy result in the need to adjust teaching to suit short-term imperatives.

Consequently, the mass lecture with formal examinations, continue as the default modes (Biggs 1996). Very often the need to solve short term problems drive the teaching process, this in turn creates a legacy for the next time the subject is taught. Overtime, many subjects fall out of alignment with the Intended Course Learning Outcomes (CLO) and the university Graduate Learning Outcomes (GLO). Course leaders need to be aware that while short-term problems will continue, their impact is eroding the capacity of the course to deliver high quality learning outcomes. There becomes a point where a reexamination of CLO’s and GLO’s is necessary to bring subjects back into alignment.

In designing an instructional system that supports the sort of outcomes the curriculum nominates, Cohen's (1987) idea of "constructive alignment" he states that when curriculum and assessment methods are aligned, the results of instruction are massively improved; and research has shown that student
achievement have been reported up to four times greater than in non-aligned instruction (Cohen 1987).

In setting up an aligned system, the desired outcomes of the teaching should be specified in terms of both topic content, and the level of understanding. It is then important to set up an environment that maximizes the likelihood that students will engage in the activities designed to achieve the intended outcomes. Finally, the assessment tasks that should be able to show how well individual students have attained these outcomes (Nicol 2010).

The Bachelor of Construction Management at Deakin University, Australia is participating in a Course Enhancement Process (CEP) as part of the Universities strategic plan, LIVE the Future: Agenda 2020. The process of course review is referred to as the “sandpit” exercise, which comprises broad ranging discussions with teaching staff to come to a collective understanding of graduate and course learning outcomes, which are expected by the University.

For instance, the University strategic plan calls for opportunities to provide “a brilliant education, where students are and where they want to go” (Deakin 2012) This statement needs to be contextualized and integrated into the course in a manner consistent with expected competence of a construction management graduate (Love, Smith et al. 2003)

DEVELOPING A FRAMEWORK FOR WHOLE OF COURSE REVIEW

The study was conducted in a Construction Management course as part of a bachelor’s program offered in the School of Architecture and Built Environment at Deakin University, Victoria Australia. The industry accredited course comprises 4 years of full-time study and leads to a degree entitled Bachelor of Construction Management (Honors) or BCM. There are a total of 32 units (or subjects) in the course and each Unit is equivalent to an 11-week Trimester. Each Unit comprises; 36 hours of face-to-face classroom contact and an expectation of at least 72 hours of student engagement including; lecture preparation, reading, assessment, and revision. As a large and comprehensive university in Australia, the student demographic includes both local and international students. The majority of the students undertake the course in full-time mode, and it is known that many students also work in industry while studying.

Course Learning Outcomes (CLO) was developed as part of the Assessment and Learning Design stage. The CLOs align with the Australian Qualifications Framework (AQF 2013) standards as well as
Deakin Course Learning Outcomes for Construction Management, are:

- Demonstrate knowledge of construction management theory, principles and concepts.
- Integrate and appropriately apply construction management in: Construction Technology, Law, Management, and Economics
- Integrate contextual factors that impact on construction management including; sustainability, professional practice, regulations, code and standards, social and cultural factors
- Acquire and apply research skills to initiate and formulate research questions and contribute to new knowledge, based on current research directions.
- Communicate effectively in a range of contexts, to a range of stakeholders, using oral, written, graphical and interpersonal communication.
- Utilize a range of digital technologies and information sources to discover, select, analyze, use, evaluate, and disseminate both technical and non-technical information.
- Use critical and analytical thinking and judgment to identify, evaluate and apply appropriate principals and procedures in: Construction Technology, Law, Management, Economics
- Use advanced cognitive skills to analyze, generate and recommend solutions to complex problems
- Demonstrate self-management through professional and ethical conduct and reflective practice.

Deakin University uses a 4-step process of course enhancement, comprising: (1) Evidence Portfolio, (2) Development of Course-wide learning outcomes (CLO’s), (3) Redesigning Learning Environments, and (4) Evaluation of changes;

Evidence Portfolio

A Course Evidence Portfolio was assembled as part of the initial scoping for the Bachelor of Construction Management (BCM) review process. This identified areas of strength and areas for enhancement. The evidence portfolio comprises a desktop audit of Unit Guides, already in the university’s systems, which identify existing; contact time, learning outcomes, and assessment requirements. The process of identifying the Units/subjects that represent the essential components of the course can sometime be an issue if other courses are nested within the program.
Course-wide learning outcomes

This step comprises the identification of graduate/university learning outcomes, as well as discipline specific learning outcomes. The CLO’s are typically matched with the requirements of the Australian Qualifications Framework (AQF). In this case the, 4-year Bachelor's degree with Honors is matched to meet the requirements of AQF level 8.

Redesigning Learning Environments

This step involves a process of re-imagining the learning and assessments to better align the assessment with the newly developed CLO’s. A workshop was held for the course team to align Unit Learning Outcomes (ULO’s) and unit assessments, and to redesign learning, delivery and assessment materials.

Evaluation of changes

This step attempts to validate the change between the existing course and the new, checking for overlaps or gaps. Finally, it identifies and lessons learned for any Course Enhancement processes that may occur at the University in the future. The 4-step process leads to the development of a matrix that matches the GLO’s with the CLO’s. The matrix then attempts to tease out the implications for the course that would follow from the attributes. So, for instance, the GLO (7) Teamwork, may be matched with the AQF, CLO’s and the Minimum Standards as shown in table 1, below. The full matrix is shown in the Appendix.

Table 1. Matrix of Graduate Learning Outcome for Teamwork

<table>
<thead>
<tr>
<th>AQF Qualification Type Descriptor - Bachelor Honours degree</th>
<th>Deakin Graduate Learning Outcomes (GLO)</th>
<th>Deakin Course Learning Outcomes (CLO)</th>
<th>Minimum standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrate application of knowledge and skills with responsibility and accountability for own learning and practice and in collaboration with others within broad parameters.</td>
<td>7. Teamwork: working and learning with others from different disciplines and backgrounds.</td>
<td>Demonstrate effective team membership and team leadership in multi-disciplinary teams and in the workforce.</td>
<td>Apply collaborative skills for project work including: ~ developing group dynamics, including goals ~ leadership ~ delegation ~ negotiation in decision making ~ presenting and disseminating</td>
</tr>
</tbody>
</table>

The matrix exercise can also be mapped against the accreditation requirements of the course, for each GLO in the framework. In this case, the BCM is accredited by the Australian Institute of Building.
(AIB), Australian Institute of Quantity Surveyors (AIQS), the Royal Institution of Chartered Surveyors (RICS) and the Chartered Institute of building (CIOB). (See Table 2)

Table 2. Matrix of Graduate Learning Outcome for Teamwork by accreditation

<table>
<thead>
<tr>
<th>Alignment with external accreditation requirements - Australian Institute of Building (AIB)</th>
<th>Alignment with external accreditation requirements - Royal Institute of Chartered Surveyors (RICS)/Australian Institute of Quantity Surveyors (AIQS)</th>
<th>Alignment with external accreditation requirements - Chartered Institute of Building (CIOB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply knowledge and skills to demonstrate teamwork</td>
<td>Demonstrate knowledge and understanding of teamwork</td>
<td>To demonstrate the ability to work with others. To develop and apply project leadership to the construction process</td>
</tr>
</tbody>
</table>

The final step is to match the requirements of the matrix to the actual learning outcomes for each of the units, and to develop the most appropriate assessment process. This requires academic teaching staff to understand their role in the overall development of the graduate. In other words, lecturers need to appreciate that they are not just teaching students in an individual subject, they are also charged with the responsibility to ensure that the both course and graduate outcomes are developed. This step requires the teacher to put emphasis on the Unit’s role in supporting the course and university as a whole.

The figure (Fig 1) shows the process undertaken by one of the academic staff involved with the teaching of a cost management Unit, entitled SRQ462 Building Cost Planning. The main purpose of this part of the constructive alignment process is to ensure that the Unit Leaning Activities and Assessments align with the GLO’s and CLO’s.

For instance, the Learning Activities (Fig 1) comprised; lectures, tutorial exercises, readings, and computer workshops. And the assessment comprised: Assignment 1 (10%) describes the stages of cost management, Assignment 2 (20%) Brief stage cost plan, Assignment 3 (30%) Sketch stage cost plan and an exam (40%) that includes short answer essays and calculations.
A key benefit to be derived from mapping to Learning Activities rather than Learning Outcomes is that attribute development would be related more directly to the student's actual learning experience. According to (Nicol 2010) mapping attributes to the student learning experience, is an important issue for ensuring authentic learning. It is also noteworthy that the lecturer for SRQ462 Building Cost Planning has mapped the subject against Bloom’s taxonomy (Bloom 1956), which provides a useful guide to the level of the learning in the unit. Fig 1 indicates that the Unit is reaching the level of “Analyzing” which is a middle order level of education, but which is appropriate for students in the second year of their undergraduate course.

The process of constructive alignment is a helpful for undertaking course reviews, because it emphasizes the importance of the higher level attributes that students need to attain upon graduation. This issue is very easily lost when courses are taught because individual teachers are often indifferent to requirements that are beyond their subject areas.

**DISCUSSIONS AND CONCLUSIONS**

In a contemporary world, economic rationalism means larger classes, which in conventional thinking means more traditional lecturing and more summative exams, especially multiple-choice,
rather than other formats that are time-consuming to mark. However it may be important to remember that while difficult circumstances may have driven short-term decisions that dictate certain teaching approaches, in the end the role of the course is to develop competent graduates. As a result, academics should try to resist the managerial pressure that encourages this type of learning.

The principle of "constructive alignment" evolved with the decision to use a GLO’s and CLO’s to inform learning activities and assessment process within each taught unit. This forces teachers to reflect on what they wanted from the unit/subject, and how they thought they going to get it, which in turn puts pressure on the lecturer to provide appropriate teaching activities to help them do so. In this way, all components in the system become aligned to the high level objectives of course and meet the university Graduate Outcomes.

The 'alignment' approach refers to what the teacher does, which is to set up a learning environment that supports the learning activities appropriate to achieving the desired learning outcomes. The key is that the components in the teaching system, especially the teaching methods used and the assessment tasks are aligned with the learning activities. The student is in a sense 'trapped', and finds it difficult to progress without learning what he or she was intended to learn.

This approach is also very useful for disciplined-based courses, like construction management, that lead directly into a career in industry. The BCM course at Deakin University is accredited by four professional institutes that each has certain requirement for graduates. Part of the challenge for senior academics has been to align the various accreditation requirements with the university and course learning outcomes, in a way that is consistent with good outcomes for students.

Good teachers are expected to be clear about what they want students to learn and what students should have to do in order to demonstrate that they have learned at the appropriate level. The present model provides a framework for systematically operationalizing these issues, in a way that is consistent with the development of competent graduates.

The paper highlights the benefits of this approach in terms of practicality, efficiency, and the disciplinary embedding of attributes. In particular it emphasizes the mindset that needs to be cultured in
lecturing staff so that each teaching decisions are informed by the process of constructive alignment

REFERENCES