Utilising Learning Contracts to Stimulate Student Ownership of Learning

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***Abstract**: Tendering and entering into binding contracts has been a part of our society for a considerable time. This arrangement may be adapted to pedagogic environments as classroom situations create the potential for entering into contracts. This paper describes a strategy for lecturers to negotiate learning contracts with students, which has been implemented to individualise student learning within a design project whilst at the same time maintaining a focus on the core skill of "design for the environment". Negotiations were based on a supplied pro forma. Students were advised to examine their professional development profiling areas and to select areas in which they would like to acquire more expertise. Over time students develop strategies to fulfil their contract and to meet the specific assessment criteria they selected.*

Introduction

There are a number of sources of pressure on professional educators from the technological domain, including Engineering, to individualise the range of pedagogical and general instructional techniques employed to engage students. This trend has led to a shift from teacher-centred approaches to more student-centred approaches. The applications of strategies to achieve "student centredness" include Problem Based Learning and Project Centred Learning, especially when applied to a "blended learning" context. This is evident in many aspects of teaching e.g. the types of activities in which students engage in the classroom, and the methods of assessment used to assess their learning. This concept of subject individualisation and the encouragement of autonomous learning have for a considerable time been encouraged, as evidenced in the National Foundation for Education Research (1991), statement:

"The shift in focus implies a shift in teaching and learning strategies away from the traditional transmissive mode of formal lectures towards an emphasis on students' responsibility for their own learning...students would construct knowledge rather than receive it; would do so with greater independence and opportunity to work in small groups and be assessed by procedures which acknowledged the nature and context of their learning".

A number of educational systems are moving toward variations of outcomes-based curriculum design and assessment. As students are assessed in terms of outcomes, the assessment conducted is essentially individualized, as students in any one class perform at different levels. The impact of an outcomes orientation on curriculum design and specific student classroom activity is that activities will be designed to assist students in progressing toward the next level of outcome attainment. This

level may be different for each student. This implies that each student may be working on different activities, or a different level of the same activity in any class. So the incentive is to design activities, structure curricula, and assess students individually. Figure 1 provides a conceptual framework for this showing the progression of development as students progress through each of the phases of planning, negotiating, implementing, demonstrating and reflecting on the process.

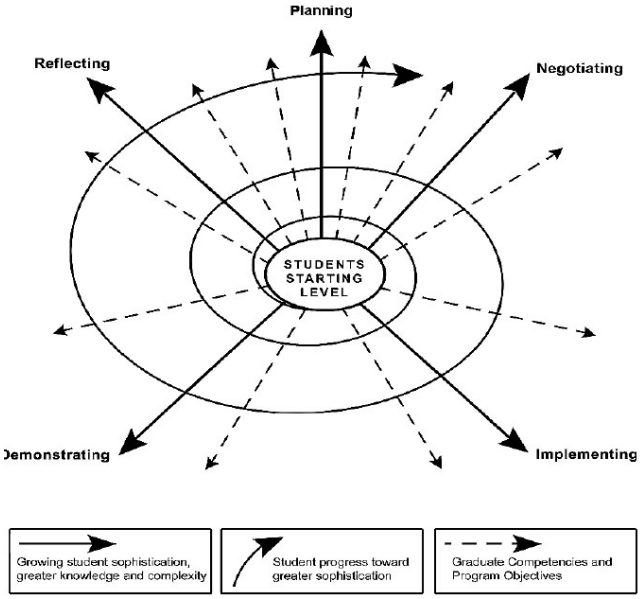

Figure 1: The Learning Contracts Capability Spiral (concept based upon Laycock and Stephens (1994) work

Research in pedagogy has been encouraging the use of student-centred learning in the classroom. However because of strong didactic teaching traditions in professional education domains, change has been slow despite the opportunities information technology provides.

Problem Context

At the University of Newcastle, a university wide restructure of programmes, as a major rationalisation process, has created a situation where the development and delivery of a course entitled "Design and the Environment" is delivered to a multidisciplinary cohort of students. A wide range of students from the Engineering and Built Environment Faculty enrol in this course. The cohort consists of full-time on-campus students and distance learners who are located at diverse, remote locations (some of which are international). The course is increasingly selected as an elective by students from a range of disciplines including Construction Management, Engineering and Architecture.

The course redesign was underpinned by a number of key principles including:

- The role of a designer should be pivotal in shaping not only the instant appeal or otherwise of an artefact but also the long-term costs and consequences of owning and operating it, both for the owner/user and for the wider community.
- It should be possible for a student from a particular discipline to define boundaries appropriate to the context of their discipline. This should include:
  - the nature of the environmental impacts,
  - their assessment,
  - the generation of design alternatives that will minimise them.
- The accepted norms for one discipline can reasonably be expected to differ somewhat from those of another discipline.

The last issue posed a challenge to the course designers. Historically the students who took the course as an elective were expected to adopt the norms of the group for whom it was a core element of their

programme. However the increasing acceptance of holistic approaches to problem-solving within science and society suggests that the development of a generic, trans-disciplinary understanding of sustainable design is desirable.

Challenges associated with developing a generic template for sustainable design for the multiple disciplines within the cohort included:

- the attitudes and expectations of clients for their services,
- the availability and nature of decision support tools to assist them during the design process,
- the acceptance by the end users (who might be different from their clients) of their designs and the consequences of their design decisions,
- the extent to which it is cost-effective or indeed even feasible to conduct an accurate assessment of the life-cycle costs. This depends to a considerable extent upon the availability of published data regarding the materials being used. This in turn reflects the relative maturity of research being conducted in each of the disciplines, and
- the differences in the nature of the artefacts generated by the students in the assessment process. Product designers might wish to concentrate on producing a full-size model or even a working prototype, whereas those working in the built environment tend to prefer to generate a documented, graphic model of a built environment.

In summary, the new course has produced environmental generalists who share a common understanding of what it means to be an environmentally aware designer, whilst continuing to address the context of the range of discipline-specific constraints represented by the group. It was quickly recognised that forcing the entire cohort to study a compromise range of material and to undertake an assessment that was tailored to no specific group's needs would be sub-optimal. Such an approach would be both frustrating and disheartening for the students, who might question the relevance of much that they were studying. It is important to note that the student cohort for which the course is a core requirement of study is now the numerical minority.

Assessment Driving Learning: The Case for Learning Contracts

It has become axiomatic to say that assessment drives learning (Hedberg and Corrent-Agostinho, 2000), and this is reflected in the design of undergraduate programmes in the School of Architecture and Built Environment at the University of Newcastle in Australia. Here Problem Based Learning is widely used across the disciplines of architecture, construction management and industrial design. Whilst each programme uses unique assessment strategies they all embrace constructivist theory, encouraging each student to create their own knowledge as they solve complex problems (Savery and Duffy, 1994), thus empowering the students to take charge of their own learning.

However, students from other Faculties are more often used to a traditional programme structure where individual courses are based upon content delivery, placing the course lecturer in the position of "knowledge director", thereby assuming responsibility for the students' learning (Knowles, 1986). In a course where the majority of the students are used to this model of delivery and yet the deliverers are firmly constructivist, the challenge becomes one of finding an assessment mechanism that drives student learning and knowledge creation, whilst concurrently telegraphing its professional relevance.

It was realised that by using careful course design, particularly in relation to assessment mechanisms, it would be possible to accommodate a wide range of different students needs, fulfil the course aims and outcomes, and provide a strong motivation for the students to engage with the subject matter and take ownership of their learning.

Learning contracts have long been recognised as a mechanism by which students can be empowered to take command of their own learning, negotiating a range of matters including topics to be covered, criteria for assessment, and the nature of their assessment product (Knowles, 1986). Yet the strong didactic teaching tradition within professional education has dampened their adoption despite the obvious multi-disciplinarity of the technological domain. Consequently the use of Learning Contracts

in the context of professional education has tended to be limited to postgraduate courses and self-directed Continuous Professional Development (Williams and Williams, 1999).

This School had considerable experience of using learning contracts in design courses. Their introduction was in response to student feedback, and their use met with an enthusiastic response (Williams and Williams, 1999). The learning contracts were based upon the principles set out by Knowles (1986) and involved students negotiating:

- their learning goals
- the nature of the evidence to be generated by them
- the means and standards by which their work would be assessed

Such a mechanism was proposed for the course "Design and the Environment".

The Negotiated Learning Contracts

Although the concept of learning contracts is not a new one, it has only been applied in a small number of situations. In recent times the potential of this methodology has been recognised at the tertiary level, though predominantly in the post-graduate domain. In defining a learning contract one has to adapt legal concepts of 'offer' and 'acceptance'. A learning contract is the end result of an ongoing process of negotiation between a teacher and a student with the purpose of developing a learning program that meets both the learning and the teaching agendas. Nevertheless, in the final version of the contract students agree to deliver assessment products that are in principle acceptable to the assessor as appropriate evidence of the achievement of mutually agreed learning outcomes. The contracts typically involve:

> "Students negotiating their learning goals, the methods by which those goals will be met, the means by which the achievement of the goals can be assessed, and at what level. "

This process has a strong relationship to the instructional activity of project planning and major project work consistent with the final years of design programmes. Learning contracts, if applied during the early years of a student's experience, provide a framework to support such major project development activities. Benefits are achieved by continuously revisiting learning outcomes or goals, and relating progress to them, which subsequently reinforces learning experiences. This looping process is demonstrated in Figure 1. The diagram not only illustrates the phases of the methodology but extends the concept to demonstrate "growth" of learners in these phases as they participate in this learning process.

The Course Content

The course content was conceived using a systemic perspective of the design process. This formed the basis for both content selection and course structure. This approach was driven by the idea that the designer was subject to a variety of influences that often competed with each other for attention and predominance, and that (s)he was constantly making decisions that balanced one with another. When drawn as a Venn diagram (Figure 2) it is possible to see that the eventual solution to the design problem lay in a decision space at the intersection of all the influence domains (shaded black). These influences were made explicit in the course outline, and reflected in the course outcomes.

However the novelty of this course lay in the fact that students designed their own learning experiences, including the criteria against which their work was to be assessed. Figure 2 describes a situation where all of the influences are given equal prominence. However the fact that they are set in the context of a learning contract environment indicates that they in turn are influenced by the learning experience. In practical terms this meant that the student was at liberty to choose to assign different weightings to each influence, and to articulate them in their learning contract. Furthermore, the range of issues contained within "each influence" group could themselves be subject to relative weightings. The role of the "Assessment Rubrics" are critical to this phase of the process as they both guide the students in the development of their design as well as assisting them to frame their item specifications to align with the assessment requirements. The first page of the learning contract provides the venue

for the students to articulate their intentions through their item specifications and the assessment weightings assigned to each, and this is done through the variable scales with defined parameters to retain the integrity of the course learning outcomes. A completed first page of the learning contract can be seen in Table 1: this was an initial example completed in week 3 by the lecturer to illustrate the principles involved. Later in the course it was used as the point of departure to discuss the ways in which the issues articulated in it could be refined to best reflect the student's research and experiences, and thereby maximise their assessment outcomes.

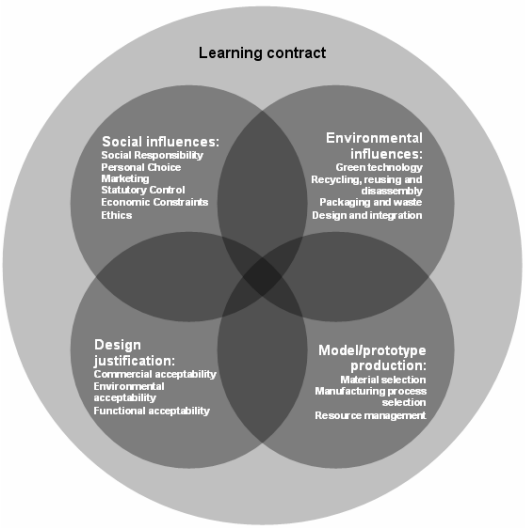

Figure 2: Influences on the Course Design

Naturally, the negotiations concerning the individual learning contract would be conducted with the course coordinator. However it was felt that presentations in a group situation could provide powerful feedback for individuals, and therefore it was decided that a group seminar would be undertaken in the early weeks of the course. Group feedback would help the students understand whether their strategies to achieve learning outcomes were clear, understandable, and achievable. It would also help surface alternative strategies and techniques, both in terms of the learning contract and the assessment product (Knowles, 1986).

The eventual outcome of the students' learning experience, agreed upon with the lecturer, and enshrined in their individual learning contract would look more complex and "messy", reflecting the inherent complexity and "messiness" of real world problem-solving. Above all, each student's solution would be unique, representing their understanding of the issues and the relative importance of each to the generation of a holistic design solution. This would eventually be reflected in the mix of assessment items and weightings nominated by the student in their learning contract.

Once a student had documented what (s)he intended to achieve it was possible for them to propose strategies to make this happen. Due consideration would need to be given to resourcing these outcomes, in terms of human and material resources, tools and techniques, as well as time. The use of project planning techniques, such as Gantt charts and method statements were recognised to be both helpful and appropriate. These would include performance specifications that allowed both the student and the assessor to gauge the extent to which the evidence presented met with the agreed performance specifications.

IDEA2461 Design and the Environment: Learning Contract

Student name		Student number			
Graham Brewer (the student)		*123456*			
Assessment item	**Item specification (negotiated)**	**Item weighting (negotiated, insert value)**	**Item rubric grade (x/100)**	**Final item grade (cols 3x4)**	**Item rubric**
Project plan (5 - 10%)	*List of key activities and milestones required to complete the project together with time estimates for each and completion deadlines. These will be presented in a Gantt chart.*	10%	0	0	Rubric
Project model/prototype (10 - 40%)	*I am going to produce a model of a generic university course delivery system that is carbon neutral.* *It will be based on the development of a Blackboard course template.* *The objective will be to enable paperless delivery of course materials, interaction with students, and assessment.* *This will be cross referenced with University policies to check for consistency and absence of conflicting requirements.* *In addition to the template a sample course will be developed for IDEA2461, which will include:* ** Artwork for attractive course appearance* ** Two self marking 20 question multichoice tests, with banks of 60 questions each* ** Two Turnitin assignments*	40%	0	0	Rubric
Project documentation (10 - 40%)	*This will consist of a portfolio of documentation detailing the course structure, relevant policies and evidence of compliance, development sketches for artwork, etc. The environmental evaluation for the coursewill be based on savings in materials (e.g. paper, printing, etc) as compared to the costs (computers, electricity, student printing costs, etc). This will reflect the life cycle costs associated with computer ownership, and power generation, as offset by savings in student travelling to campus (assuming distance learning delivery). The balance of any carbon defecit associated with the course will be costed in terms of carbon credits purchased from accredited sources.*	20%	0	0	Rubric
Evaluation/reflection (10 - 20%)	*This will consist of a reflective journal updated on a weekly basis that records reflection on action, together with reflective annotations in my portfolio where appropriate. These will endeavour to record reflection in action. Post completion reflection will evaluate the finished course relative to the item specification for the project model/prototype.*	10%	0	0	Rubric
Seminar presentation (20%)	*Powerpoint slides including notes that outline the key concepts and tools to be included in the course, together with an overview of the concepts included in the environmental evaluation. The presentation will include my Gantt chart.*	20%	0	0	Rubric
			Final course grade	0	
The terms of this learning contract have been agreed upon for completion by:					
Completion date	*5-Nov-07*				
Student name	*Graham Brewer (the student)*	**Signature**		**Date**	*12-Aug-07*
Course coordinator	*Graham Brewer*	**Signature**		**Date**	*12-Aug-07*

Table 1: Front page of a completed Learning Contract

Evaluation

This course brought together two novel ideas, namely the development of students' understanding of design and the environment within a multi/trans-disciplinary context, and the use of learning contracts to facilitate their learning and the assessment of its effectiveness. Both of these initiatives have previously been examined for their effectiveness using a combination of student evaluation questionnaires and focus groups (Brewer et al, 2007). Learning contracts were explored in terms of addressing students learning needs, the flexibility they provided, confidence to explore new areas, awareness of learning accomplishments, and preferred learning methodology. Trans-disciplinarity was explored in terms of its effectiveness in promoting student understanding of life-cycle analysis as applied to a broad range of manufactured products/built artefacts, and the environmental impact their design decisions. In all cases the students expressed satisfaction with, and approval of the initiatives.

The current course cohort is to be similarly sampled with a pre-exit questionnaire towards the end of October 2007. However, preliminary feedback has been obtained during tutorial discussions as to the effectiveness of the course in triggering student learning and awareness of environmental life-cycle

consequences of their design decisions. Noted comments taken at recent tutorials, on the approach to environmental consequences include:

> *"Oh yes, keep these lectures coming – they're why I took this course – to be exposed to wider issues outside my experience"* (industrial design student, on the usefulness of broad ranging topics).
>
> *"I didn't realise what there was to it… I mean you hear about Kyoto and its familiar, but what does it really mean? The stuff on the impact of restaurants and food well I mean…… I will be teaching that to my kids"* (food tech teacher, relating course content to future teaching practice).
>
> *"Never mind that, my flatmates are wondering who keeps switching the lights off all the time!"* (architect, commenting on behaviour change as a result of the course content).

And in terms of the learning contracts:

> *"It was strange at first but then you get the hang of it. It forces you to think about what you are trying to do"* (technology teacher).
>
> *"Yes once you understand your way around it, it is quite simple and it lets you know where you are going and what you've got to do"* (food tech teacher).
>
> *"I think the freedom is the thing I like most about this. Normally we get told what we are going to do and it's all the same"* (industrial design student).

From a course coordination perspective the high degree of secondary structure contained in the marking rubrics introduced a high degree of transparency in assessment outcomes. For the students this introduces a degree of certainty and instils confidence in the assessment process.

By way of example it is useful to consider the way in which a prototype car washer that harvests and uses grey water, and a computer generated model of a carbon neutral dwelling may be assessed. In the first instance each student will produce a design brief, define the boundaries to their environmental assessment, identify appropriate environmental assessment metrics, and state what their deliverables will achieve in terms of functionality, quality, purpose, etc. These will be articulated on the front page of their contract, but these statements will have been informed by the performance attributes given to them in the marking rubrics on subsequent pages of the contract (see Table 2 for example). In the case of the car washer the student might simply wish to demonstrate that the idea works, with little regard to aesthetics, or the eventual design of a production version. By contrast the building design will be articulated in a near professional standard computer model that could be used to drive construction of the real building. Once each student has clearly specified what it is that they intend to produce, and obtained staff sign-off on it, they know exactly what it is that they have to do in order to reach a stated performance band. Lecturer approval reflects both the proposed quality and degree of difficulty involved in the project model/prototype, and will be considered together with the project

IDEA2461 Design and the Environment: Model/Prototype Rubric

ASSESSMENT CRITERIA:	Criterion Weighting	Fail (0-49%)	Pass (50-64%)	Credit (65-74%)	Distinction (75-84%)	High Distinction (85-100%)	PERFORMANCE BAND
Workmanship	**50**	▪ Unsatisfactory, so as to render the model/prototype inadequate for its stated purpose.	▪ Satisfactory, achieving the minimum standard required to render the model/prototype adequate for its stated purpose.			▪ Outstanding, achieving near professional, production-ready standard	***insert letter***
Function	**50**	▪ Unsatisfactory, so as to render the model/prototype inadequate for its stated purpose.	▪ Satisfactory, achieving the minimum standard required to render the model/prototype adequate for its stated purpose.			▪ Outstanding, achieving near professional, production-ready standard	***insert letter***
Back to Learning Contract						GRADE (insert number)	0

Table 2. Example rubric.

documentation, which includes the environmental impact analysis for the project. Some students will opt to focus on one area more than the other, and indeed some projects will demand this as can be seen in the earlier examples. In all cases students will be counselled to play to their strengths

As a result of student feedback and staff experiences a number of minor changes are likely to be made to the learning contracts for next year. The first involves a reduction in the number of assessable items, achieved by rolling into one both the project plan and seminar presentation, and the project documentation and reflection/evaluation. The second requires a rewording of the project model/prototype rubric to remove references to 'production-ready' as this implies that high levels of performance are conditional upon achieving this – something that concept prototypes will never achieve.

Conclusion

The use of the learning contracts in this course has proved effective in raising student awareness of the learning outcomes and what is required in their planning to achieve the outcome. Students' initial response is one of concern but by the end of the semester they have responded well to it. It appears that the factor that most influenced the students' acceptance of the learning process was the highly structured assessment rubric. The ability to be able to set different assessment parameters and see the difference the changes made to their overall assessment profile provided them with a better insight into managing their planning. The concept of the learning contract has provided the flexibility to make a course, which consists of predominantly elective students, both relevant to their context as well as maintaining the integrity of the environmental design content.

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