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Tuning the Undergraduate Construction Curriculum: Embedding Health, Safety and Environmental Issues in Order to Improve Employability

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Abstract

The Chartered Institute of Building (CIOB) has recently stressed the importance of the inclusion of health and safety in the curriculum of courses accredited by them. This is evidenced by the recent survey carried out regarding the inclusion of health and safety in the curriculum, plus the issuing of an addendum to the CIOB's educational framework regarding these issues. In the 1994 and 2002 frameworks health and safety knowledge attainment is incorporated in an overall programme expected learning outcome with environmental literacy. The CIOB are therefore indicating a Safety, Health & Environmental (SHE) approach to the delivery of these elements in the curriculum. The Construction Studies undergraduate curricula at Liverpool John Moores University have been analysed in depth in order to determine:

- Whether the curriculum maps adequately against this element of the framework
- What changes could/need to be made in order to improve provision in the SHE area
- How the curriculum generally could be tuned in order to improve the employability of graduates.

This case study details the processes undertaken in order to address these issues, and changes that have been made to the curricula subsequently. It is hoped that the revised curricula will increase the safety, health and environmental literacy of graduates and improve overall employability.

Keywords: Accreditation, Construction Management, Curriculum Design, Curriculum Development, Employability, Health and Safety, Undergraduate Students

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Background

Construction stakeholders have been advising universities for years about the skills and competencies that they require of graduates. This has occurred at Liverpool JMU via comments from industrial External Examiners, Industrial Liaison Panels, and more recently on a national level via articles produced in professional body publications. Their main issues over the last few years have tended to concentrate on key skills development, and this has been addressed by UK universities and to a certain extent via HEFCE. The funding council has made it compulsory for all programmes to produce programme specifications that allow for mapping of potential key skill developments, which should promote key skill development through raised awareness. It has also made compulsory the introduction of progress files by September 2005, which again is very much linked to improving key skills through student reflection and planning of their learning which it is hoped will lead to an improvement in the lifelong learning skills of graduates. At Liverpool JMU, key skills are strongly embedded into the construction programmes, so much so that additional 'bolt-on' key skills modules have not needed to be developed.

Curriculum Review

The use of the programme specification mapping matrices has however illustrated that there are plenty of opportunities for students to develop some skills and acquire certain knowledge, whereas in other areas the curriculum is lacking, such as health and safety, environmental literacy and human resources management issues. The adoption of the RAPID software (http://rapid.lboro.ac.uk/) globally within the School of the Built Environment is the starting point for the development of progress files, but has again highlighted that there are gaps in the potential for acquisition of knowledge in some areas via the curriculum.

After undertaking the employability skills audit developed via the CEBE Skills Plus Special Interest Group (SIG), which concentrated on the identification of the 39 employability aspects, further gaps were identified. These included: the need for more interdisciplinary approaches; too few 'unscaffolded' problems; and the fact that reflectiveness was under-represented in the programme.

The two final pieces of the jigsaw that prompted a complete curriculum review were feedback from the LJMU advisory industrial panel who stated that employers were unhappy with the level of knowledge that graduates had regarding Safety, Health, and Environmental (SHE) issues related to the construction industry, and a visit from the CIOB accreditation panel who identified gaps in the mapping of the curriculum exercise. The mapping exercise is part of the CIOB accreditation process, expected learning outcomes are detailed in the accreditation documentation and these are very specific. Programmes are mapped against these outcomes, and although minor variations in the mapping exercise are acceptable, it was evident that there were some significant topics missing entirely from the JMU programme, whilst some subjects included in the programme are now not deemed to be required.

Problem Mapping

The work undertaken has resulted in a complete review of the curriculum for the undergraduate programmes managed via the Construction Section and include degrees in:

- Construction Management
- Building Design Technology and Management
- Construction Commercial Management
- Quantity Surveying

In some instances only minor 'tweaking' was required, but in the areas of safety, health and environmental issues there were deemed to be major omissions in the curriculum offered. This case study focuses on how this particular problem was addressed. The programme leaders believed they had taken an holistic view to SHE (Safety Health and Environmental) issues in the programmes and had followed the CIOB framework carefully. They believed via the curriculum that they had addressed the CIOB 1994 framework aim to allow the development of:

> *"a knowledge of **safety, health and welfare, along with maintenance and improvement of the environment is considered to be essential** and is inherent and examinable in all subjects in the Education Framework. Similarly information technology and quality management are considered integral to all syllabuses." (CIOB, 1994)*

However, during presentations by final year students in May 2002, it was evident that knowledge of safety, health and environmental issues was very superficial. For example the students had been asked via the assessment brief to produce an environmental management strategy for a given building project. The responses varied from the sublime to the ridiculous! One group mentioned warm water recycling i.e. taking water from the hot water taps and pumping it back into the heating system. Another group talked at length about utilising geothermal energy to heat the building (in Liverpool!). In virtually every scheme, token solar panels had been added to the schemes with no justification for doing so, except for the fact that they believed that this was environmentally friendly. There was no mention at all of utilising sustainable construction principles such as recycling or reusing materials, and there was also no mention of developing and using an Environmental Management System in the scheme. The students appeared to know what BREEAM was but had little idea as to how to apply its principles. This was worrying because it was assumed by the programme leader that the curriculum promoted an integrated approach to the teaching of SHE issues, which in turn should have led to improved student knowledge.

From the mapping exercise, it became evident that the prescribed curriculum did not promote an integrated approach to safety, health and environmental issues. Even though module leaders were including the SHE topics in their lecture slots, this approach was fragmented and did not appear to promote student learning. This knowledge is seen as

essential from an employability perspective and is identified as a primary aim in the CIOB 2002 framework:

> *'To establish the learning experience within the context of construction application, thus enabling the integration of theoretical knowledge and understanding with best industrial practice, including health, safety and welfare and environmental sustainability' (CIOB, 2002).*

This reiterated the need for change in the curriculum at JMU as the existing curriculum, although intended to satisfy the aim of the 1994 framework, did not appear to be working as has already been explained.

A literature review investigating curriculum design and development best practice was also undertaken before the changes were incorporated.

The revised programmes are currently going through Periodic Programme Appraisal and if that is successful the revised programmes will run from September 2003. The success of the changes made will be monitored carefully over the coming years from an employability perspective. The evidence for this should be the improvement of the performance of the students in applying health, safety and welfare issues in project work. This evidence should now appear in level 2 and the final year with the new scheme. Additionally it is hoped that the sandwich year employers will recognise improvement and report these back to the School.

Findings of the Literature Review

As student learning was not deemed to be effective in the existing curriculum, another approach to the teaching of SHE issues was therefore required. The objectives of the initial literature review were to ascertain:

- what is considered best practice in curriculum design in construction education
- what approaches to curriculum development are deemed most appropriate

Curriculum Development

The literature review focussed on the inclusion of safety, health & environmental issues into the curriculum. As the CIOB framework clearly links health, safety and environment together in a SHE approach, it was deemed suitable to focus the review on the inclusion of environmental issues into the curriculum. Also, this was identified as a major thread to be addressed throughout the programmes from the mapping exercises carried out as part of the curriculum review.

Wolfe (2001) asks the question, "Is there a "best" approach to incorporating environmental learning into the curriculum?" and answers it by saying no. Courses can be designed around "content inputs" or "learning outcomes" and learning outcomes can be modular specific, level specific and/or programme specific. A learning outcome is defined as something that students can do now that they could not do previously (Ecclestone, 1995).

However it is sometimes easy to fall into the trap of assuming the programme has been designed around learning outcomes when in fact the learning outcomes have been written based on the content input. This will usually be based on staff expertise as opposed to what the course team really want as an outcome. One overall aim of the programme should be that students will be SHE literate on completion of their studies, not just knowledgeable in some aspects of the areas where staff expertise exists.

Wolfe (2001), Auchey et al. (2000) and Huack (1998) all believe that a learning outcomes approach to curriculum design is the most suitable approach, and this is supported by the Chartered Institute of Building (CIOB, 2002b) new educational framework that is also based on learning outcomes. Indeed the trigger for the development of a set of common learning outcomes for construction courses was the Latham Report, which advocated greater teamwork and a better awareness of the roles of other construction professionals (Watson, 2002). The report led to the Construction Industry Board (CIB) appointing the Construction Industry Council (CIC) as an implementational agency which resulted in the development of a Memorandum of Understanding in 1997. The result was a set of 'common learning outcomes' which all construction professionals can acquire. These common learning outcomes are focussed on transferable skills such as communication, group dynamics and professional awareness. One of the outcomes under professional awareness is:

'Candidates are required to engage in an activity where issues of protection and/or care of the natural and built environment are central to the problem'

At this time fourteen of the most prominent professional bodies involved in construction are participating in the Memorandum of Understanding, the CIOB being one of them. This illustrates that the industry professional bodies realise not only the importance of students appreciation of the impact of construction work on an holistic basis, but also that a learning outcomes approach to curriculum development is the most effective.

Auchey at al. (2000) found that by using a Learning Outcomes Template in the design of a curriculum it can:

- Guide the process of evaluation and change so we do not have change for change sake but true continuous quality curriculum development
- Precipitate the development of progressively more difficult problem solving skills at the appropriate levels of curriculum progression
- Overcome the "If it ain't broke don't fix it" resistance that some faculties might have
- Recognise and capitalise on increasing skill levels to teach management, leadership and team building skills
- Provide a guide for improving the combined effectiveness of faculty team teaching effort
- Help students understand the natural process of information acquisition throughout their academic experiences

- Help students to learn and better retain knowledge by being involved in the teaching process

All of which are very desirable in UK HEIs at this time if enhancing employability is an aim.

Supporting this approach to curriculum design, Huack (1998) states that successful curriculum reform has been listed as the primary reason university programmes in construction management implement active outcomes assessment programmes. However there are sceptics, Hussey and Smith (2002) believe that many academics state their learning outcomes only if obliged to do so, but that this is seen as a chore, rather than a useful exercise. Once the QAA visit is over they will not be looked at again until the next visit is due. They explain this by stating that the fault lies with academics who could be either just lazy or are reluctant to specify precise and ascertainable outcomes for fear that this will expose their poor teaching. However it could also be because academics are not convinced by the virtues of learning outcomes, because there is the argument that making learning outcomes too specific prevents changing of the curriculum during the teaching programme if new developments occur in the academic's field. New legislation, government policies or one-off events may require changes to the programme that are not covered by the original learning outcomes, but the programme may benefit from inclusion of these topics. Therefore, is it right not to include them because there is no specific learning outcome linked to them? Finally the argument that learning outcomes add no value to a programme could potentially be true, but without learning outcomes there is no control of the curriculum, and ad hoc changes can occur to such an extent that the programme leader is unaware of course content.

Considering the support of, and reservations to a learning outcomes approach, it was still deemed as most applicable to the re-evaluation and reform of construction management programmes, especially as it is so well supported by construction professional bodies. The overall programme learning outcomes were developed using the CIOB educational framework 2002, and the QAA subject benchmarks for building and surveying.

Interdisciplinary Approaches

The construction industry is complex and fragmented with many of the decision makers working for different organisations and being of different professions. The ability to design solutions which reflect a holistic appreciation, requires working closely with other professions. Jucker (2002) supports this idea and believes that we need to overcome the disciplinary straightjacket of current education, which is one of the main reasons for our unsustainable situation because it prevents us from looking beyond one's own narrow field of vision.

Wolfe (2001) sees the benefit of an interdisciplinary approach as greatly improving the programme in many ways, as it will introduce students to the different ways of approaching SHE issues. This is supported by Norberg-Hodge (2000) who believes that we need to actively promote the generalist - the one who sees connections and makes links across different disciplines.

Graham (2000), whose research focussed on increasing employability through interdisciplinary approaches, found that it is important for teachers to explain the role of building professions in relation to each other, in the development of resource aware practices and the procurement of sustainable buildings. One of the goals of his research was to enable students to situate and explain their own environmental perspective using examples appropriate to their professional specialisation. Of course this approach relies on teachers themselves having enough knowledge of other professions in order to explain roles to students. It also requires the teachers themselves to be free of excessive bias to their own profession, which may not always be the case in built environment faculties.

There is a consensus of opinion that using interdisciplinary approaches to teaching as much as is possible is a very positive advantage in construction courses. However this must be achieved without students losing the opportunity to develop the skills and acquire the knowledge required for their chosen discipline.

To summarise, Robson et al (1996) define the benefit of this approach as:

> *"by bringing together disciplines and focussing their efforts on a common project, the students prepare to better meet the needs of industry."*

which has to be of benefit in the long term. This was taken into account in the new curriculum design and there is more commonality via shared modules between the four programmes, and projects using interdisciplinary groups. Also the exposure to staff with different discipline backgrounds has been increased via reviewed teaching responsibilities.

Module Design

Graham (2000) believes that aspects of SHE performance are not objective empirical concepts but are subjective and context dependent. Therefore they need to be placed in a framework for understanding that explains how all of these activities interrelate and why they are important. Generally a constructivist learning environment needs to be developed by using authentic study materials and cases, by using forms of co-operative learning and by stressing both knowledge acquisition and problem solving (Dochy et al, 2002). Again this point was taken into account in the curriculum redesign, specifically in module design where SHE was included in non-specific modules such as management and construction technology.

Action Points

To summarise the recommendations gleaned from the literature review the following have been addressed in the curriculum redesign as much as possible:

- A learning outcomes template has been designed and used
- Safety, health and environmental studies have been introduced into the majority of core modules
- Specific modules have been introduced to condense knowledge

- Utilisation and promotion of high levels of multi disciplinary work that have problem solving emphasis has occurred

The Curriculum Re-Design

In order to develop a curriculum, the starting point is to identify the qualities that SHE literate construction professionals need to have. From this list of qualities the knowledge that they require to achieve these qualities can then be determined.

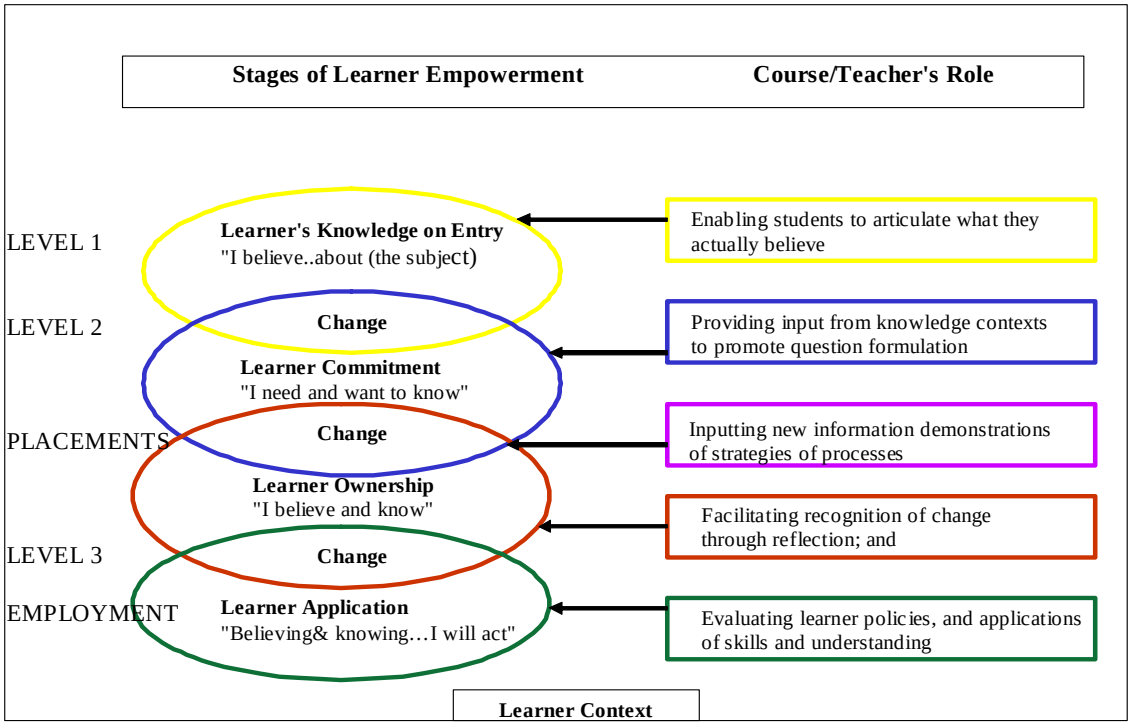

Figure 1 Model of teaching for learner empowerment

Utilising the concepts detailed in figure 1 (after Emmit and Graham, 1991; Graham, 2000) and a list of essential elements of a construction curriculum, a list of definitive learning outcomes for each level of study and the overall programme was compiled.

On completion of an initial draft of the curriculum, it was tested to see that it complied with the recommendations of Mills et al (1996) who identified some of the main objectives of a construction programme as:

- It must balance the construction education concepts of practical experience based knowledge with academic enquiry
- It must be a dynamic, practical, applied academic model
- It must maintain a strong identity within the university and industry
- It must integrate people and communication skills with pragmatic building construction skills

The integration of health, safety and environmental issues into the curriculum as opposed to fragmenting has clearly been shown to be the best approach in achieving environmental literacy and this should be achieved by each and every module on the programme having a

learning outcome that has an SHE relationship to the core subject. However this is fairly radical and this occurred wherever staff expertise allowed. This has been supplemented by development of module content and more inclusion of SHE specific modules. Most of the logistical barriers to the successful curriculum development were overcome with the encouragement and support of the staff that teach the programme.

Main Curriculum Changes

Included in the appendix is a list of expected learning outcomes for an undergraduate programme in Construction Management. These have been taken directly from the CIOB 2002 Educational Framework, but there are some additional LJMU outcomes included. Also in the appendix is the mapping exercise that was undertaken for the 'old' programme at LJMU. The matrix has been colour coded as follows:

Green: The module expected learning outcomes do not map against any of the new framework Expected Learning Outcomes
Blue: These modules are NOT core, but needed to be if the programme Expected Learning Outcomes were to be achieved
Pink: These Expected Learning Outcomes were not mapped against the existing modules at all in the core modules
Yellow: There were significant deficiencies in the course content regarding the mapping of these Expected Learning Outcomes.

The Expected Learning Outcomes that related to health, safety and environmental inclusion were some of the worst to be addressed and changes have been made to the programme to address this issue. Table 1 shows the modules in the existing programme that had some content related to SHE principles and the changes that have been made in the new curriculum model.

Existing Programme	Proposed Curriculum	
Level 1		
One lecture in Construction Technology One lecture in Management Environmental Science	Core theme of Introduction to the Built Environment Addressed in every lecture in Construction Technology and Services Environmental Science Integrated Design Project	
Level 2		
Four lectures in Construction Technology One lecture in Building Production of HSW Environmental Science	Addressed in every lecture in Construction Technology Addressed in every lecture in Innovative Technologies and Environmental Services Energy and Environmental Studies, a new module that addresses concepts of sustainable design, construction and management Building Production-H&S core module theme Economics of Design, Production and Development- Environment a core module themes Integrated Design Project	
Level 3		
Energy and Environmental Studies- Now moved to level 2 of the programme to enable knowledge to be applied during IT year and final level studies Construction Technology Project- minor elements of project	Sustainable Construction Resources Management Modules Construction Technology Project Integrative Studies	All of these now have a strong SHE focus

Table 1

Conclusions / Summary

A wide variety of stakeholders need to be satisfied in order to produce a curriculum which seeks to address employability. The curriculum review has been informed by the mapping of the CEBE SIG Skills *Plus* employability aspects; the production of QAA driven programme specification mapping matrices; Industrial Liaison Group meetings and a visit from the CIOB accreditation panel. Whilst an extensive range of skills and knowledge have been demonstrated, the opportunity has been taken to embed Safety, Health and Environmental issues into the curriculum, which were previously seen as lacking on programmes. The regular review and monitoring of the programmes and validation of entitlements available within the curriculum is seen as a worthwhile exercise. Changes proposed within the curriculum will be carefully evaluated over the coming years from an employability perspective.

These changes will hopefully be approved during the PPA process and implemented during the academic year 2003-2004. It is hoped that these changes will strive to achieve the overall programme aim of the CIOB framework that is linked to Safety, Health and Environmental issues, and this again will hopefully lead to improved employability of LJMU graduates. The core themes of construction management are still very strong in the programme, but this approach should enable the student to develop a holistic approach to construction work.

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Footnote

The changes to the Construction Studies undergraduate curricula at Liverpool John Moores University were introduced during 2003-2004 and the curriculum changes are being monitored in the light of current developments. Early informal feedback has indicated that students are more aware of safety, health and environmental issues. This should increase over time, due to the programme wide approach adopted within the curriculum.

This case study forms part of the final reports and outcomes produced by the CEBE Skills Plus SIG which was concerned with 'tuning the undergraduate construction curriculum' to enhance student learning and employability. The SIG resources, including final reports of the group, an analysis of curricula with reference to the 39 aspects of employability, case studies and advice for others planning similar activities may be accessed at http://www.cebe.heacademy.ac.uk/learning/sig/skillsplus/index.php

Appendix

Learning Outcomes based on CIOB 2002 Educational Framework plus additional JMU required outcomes

Level 1 Principles and Context

LEARNING OUTCOME	RANGE	Map Ref.
Demonstrate an understanding of the key factors affecting foundation design	Soil/rock types, S.I. techniques, H&S issues, contaminated land, ground improvement	A1
Describe the functions of basic structural and non-structural members in buildings	Foundations, floors, walls, columns, beams, slabs, partitions, ceilings, roofs	A2
Demonstrate an understanding of the basics of structural behaviour	Loads, stresses, tension, compression, bending, shear, torsion, deflection	A3
Describe the properties of building materials	Stone, brick, concrete, steel, timber, non-ferrous metals, glass, plastic, plaster, paint	A4
Describe the effects of natural phenomena on building materials	Chemical, electro-chemical, bio-chemical, radiation, heat/cold, wet/dry	A5
Demonstrate an understanding of the basics of building science	Thermal capacity/ insulation, vapour/condensation, ventilation, natural/artificial lighting, smoke, fire, sound weather	A6
Explain the basics of land surveying	Linear, angular, tacheometric, geodetic	A7
Demonstrate basic competence in land surveying	Tape, level, theodolite	C1
Demonstrate an understanding of the functions of building services	Water, gas, electricity, phone, cable/satellite, sewerage, heating, ventilation, air conditioning	A8
Describe the nature and extent of the UK construction industry	Output, scope, history	A9
Describe the constraints to the construction process	Planning, social, material, technological, environmental	A10
Outline the English/Scottish legal system inasmuch as if affects the construction process	Criminal/civil law, tort, contract, property, H&S, environment	A11
Describe the economics of the UK construction industry	Market, structure, land, materials, plant, labour, finance, supply/demand	A12
Describe the elements of the construction process	Concept, brief, feasibility, design, procurement, execution, operation, operation maintenance, disposal	A13
Describe the operation of a construction company	Objectives, market, resources, finance, HR, operations	A14
Demonstrate basic communication skills		D1
Demonstrate basic IT skills		D2
Demonstrate the ability to work with others		D3
Agree personal learning plan and record progress		C2

Level 2 -Analysis and Application

LEARNING OUTCOME	RANGE	Map Ref.
Demonstrate a further understanding of ground technology and engineering	Site investigation, ground water, ground stabilisation, soil mechanics, adjacent structures, deep foundations and basements	A15
Demonstrate and understanding of building production	Excavations, roads and services, formwork, reinforcement, insitu concrete, steel /timber frame erection, pre-cast concrete, component installation	A16
Demonstrate a further understanding of construction technology	Architecture/aesthetics, integrated design, industrialised building, refurbishment, change of use, environmental sustainability	A17
Demonstrate a further understanding of construction law	Contracts, liabilities, negligence, trespass, nuisance, breach of contract, damages, 3rd parties, risks, insurance, warranties, covenant, employment law	A18
Demonstrate an understanding of property development	Markets, property finance/investment, land/building purchase, partnerships, sale/rental strategy, bespoke/speculative development, letting, disposal	A19
Demonstrate an understanding of health safety and environmental issues	Safety Plan, CDM procedures, hazard and risk management, site H&S procedures, waste, pollution, recycling	A20
Demonstrate a further understanding of the construction process	Project finance, design, estimating tendering, procurement, programming, site management, subcontract management, quality management	B1
Demonstrate a further understanding of construction finance	Capital balance sheets, profit and loss accounts, cash flow budgets, fixed/variable costs, dividends, tax	B2
Demonstrate an understanding of management in construction	Management theory, HR procedures, organisational theory, ethics, values, motivation, leadership, delegation, teamwork, behaviour, attitude	B3
Demonstrate an understanding of site costs and measurement	Documentation, cost control procedures, indents/invoices/payments, methods of measurement, valuations, variations, pricing, subcontract finance	A21
Demonstrate further communication skills	Oral, written, graphical, presentation	D4
Demonstrate further IT skills	Information handling, reports, spreadsheets	D5
Demonstrate research skills	Define project, identify, gather and analyse information needed, formulate conclusions, prepare and present report	D6
Demonstrate management skills	Leadership, delegation, teamwork, negotiating, decision making, problem solving	C3
Take further control of personal learning plan and demonstrate results.		C4

Level 3-Synthesis and Evaluation

LEARNING OUTCOME	RANGE	Map Ref.
Demonstrate further understanding of management in construction	Operational Management, HR management, IR law, EO law, H&S law	B4
Demonstrate further understanding of contractual procedures	Contracts with clients, procurement, subcontractor selection, contract operation/completion/determination/settlement of accounts, claims, disputes, arbitration	B5
Demonstrate planning and programming skills	Define project, assemble data(quantities, resources, outputs), method statement, draft programme, resource levelling, contingencies, updating, barcharts, critical path networks, manual and IT techniques	C5
Demonstrate site management skills	This outcome could be achieved in the context of a real or simulated group project based on a site management scenario. It would include project/role definition, team selection, target setting, operational/production control, decision making, problem solving, feedback, analysis, subsequent action. Project factors will include plan/programme, resource production, health and safety, quality, cot/value, HR, environment	C6
Demonstrate control of personal learning plan, the record of it's achievement, the reflective evaluation of its success and its updating for the post-graduate period ahead		C7

Additional JMU Outcomes

LEARNING OUTCOME	RANGE	Map Ref.
Describe the impact of construction on the environment		A22
Demonstrate a knowledge of the environmental impact of construction		B6
Apply knowledge and understanding of the environment to construction projects		C8
Ability to undertake research and develop ideas		B7
Research for information and critically appraise idea		C9
Present data in a variety of ways		D7
Use of general IT tools		D8

Learning Outcomes Matrix for Existing Programme

		BSc(Hons) Building Contract Management																																														
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	C5	C6	C7	C8	C9	D1	D2	D3	D4	D5	D6	D7	D8
Level 1																																																	
Construction Technology A	BLTBE1101	Y	P																																				P		Y							
Environmental Science	BLTCM1023						Y																																P									
English Law	BLTBE1011											P																											P									
Quantitative Methods	BLTBE1012																																						P									
Construction Technology B	BLTBE1201						P		Y														P																P		Y							P
Site Surveying	BLTCM1032							Y																							P								P									
Building Structures	BLTCM1034		P	Y																																			P									
Economics of the Built Environment	BLTCM1031												P																										P									
Management and Organisation	BLTCM1025	P								P		P			Y						M					M						Y							P	Y	Y							
Introduction to Materials	BLTBE1019				Y																																	P									
Level 2																																																	
Construction Technology C	BLTBE2101		P													Y	Y																						P			P						
Building Contracts	BLTBE2006																		Y			P																					P						
Environmental Science	BLTCM2025																																										P						
Measurement & Estimating Procedure	BLTCM2035																					P		P																		P	Y					
Properties of Materials	BLTCM2																																										P						
Building Production & Marketing	BLTCM2030											P									P			P	P									Y							P	Y					
Construction Technology D	BLTBE2201																	Y										P														P						
Economics of Design & Production	BLTCM2033												Y																														P						
Statistics in the Built Environment	BLTQS2036																																										P	Y	P				
Special Interest Studies	BLTCM2040																			M											Y											P						
Level 3																																																	
Construction Technology Projects	BLTCM3049																												P				Y			Y		P									Y
Planning & Project Management	BLTCM3033																				P			P			M	M						Y												Y
Cost & Financial Control	BLTCM3047																					P			Y			M					Y													
Energy and Environmental Studies	BLTCM3032																										M		P																		
Materials in Practice	BLTCM3050																																															
Project Synthesis and Analysis	BLTCM3039																															Y			Y	Y	Y									Y
Operations Research	BLTCM30																																															
Dissertation	BLTBE3101																																						Y						Y	Y	Y
Options																																																
Work Based Learning	BLTCM3045																									Y	P																					
Business Management	BLTQS3016																											Y																			
Economics of Production	BLTQS3022																										P																				
Building Contracts	BLTQS3030																																														
Health & Safety Management	BLTQS3041																				Y																										
Key:																																																
Y= total coverage																																																